Environmental Assessment

Gypsy Moth

Eradication Program

Lane County

March 18, 2004

Lead Agency: Oregon Department of Agriculture

Cooperating Agency: USDA, Animal and Plant Health Inspection Service

For further information, contact

Plant Division
Oregon Department of Agriculture
635 Capitol St. NE
Salem, OR 97301- 2532
(503) 986-4636
TDD (503) 986-4762

USDA, APHIS
Airport Business Center
6135 NE 80th Ave., Suite A-5
Portland, OR 97218-4033
(503) 326-2814

This publication is available in alternative formats upon request

TABLE OF CONTENT

A. PURPOSE AND NEED FOR ACTION....1

1. Decisions To Be Made And Scope Of Analysis....1
Decisions....1
Tiering....1
Biology of Gypsy Moth....1
History of Gypsy Moth Infestations in Oregon....2
2. Proposed Action....3
Proposed Action: Eradication....3
Alternatives Considered....4
Treatment Options....4
3. Need For Action....5
Goals and Objectives....5
Need for Action....5
Economic Impacts....5
Ecological Impacts....7
4. Authorizing Laws And Policies....8
Federal....8
State....8
5. Environmental Laws And Their Relationship To This Analysis....8

B. PUBLIC INVOLVEMENT AND ISSUES....9

C. AFFECTED ENVIRONMENT....11

Location....11
Environmental Factors....14
Human Factors....16

D. ALTERNATIVES....16

1. Treatment Options Under The 1995 EIS....17
2. Alternatives Not Considered In Detail....17
3. Alternatives Considered In Detail....17
4. Preferred Action Alternative....18

E. ENVIRONMENTAL CONSEQUENCES....18

Bacillus thuringiensis var. *kurstaki*....18
B.t. and Human Health....19
B.t. and Environment....21
Intensive/mass Trapping Using Disparlure....22
Disparlure and Human Health....22
Disparlure and Environment....22
Cumulative Impacts....23
Summary....24
Monitoring....24
Mitigation....24
Ground & Aerial Treatments....24
Aerial Treatments....25

F. RECOMMENDATION OF THE OREGON DEPARTMENT OF AGRICULTURE....25

G. CONCLUSION....26

H. AGENCIES AND PERSONS CONSULTED....26

I. LIST OF PREPARERS & REVIEWERS....28

J. REFERENCES 28

APPENDIX A. PUBLIC INFORMATION MEETING NOTICE PUBLISHED IN THE LOCAL NEWSPAPER..32

APPENDIX B. PRODUCT LABELS 33

APPENDIX C. WRITTEN COMMENTS RECEIVED ON THE DRAFT EA 35

APPENDIX D. LETTERS CONCERNING THREATENED & ENDANGERED SPECIES 38

The Oregon Department of Agriculture is an Equal Opportunity Employer, providing services to the public without regard to race, color, national origin, sex, age, or disability.

A. PURPOSE AND NEED FOR ACTION

1. Decisions To Be Made And Scope Of Analysis

Decisions

The Oregon Department of Agriculture, in cooperation with USDA, Animal and Plant Health Inspection Service (APHIS), proposes to eradicate the gypsy moth infestation in Lane County, Oregon. There is nothing new that we are proposing that has not been analyzed in the 1995 final Environmental Impact Statement (EIS) for Gypsy Moth Management in the United States. Therefore, no new EIS programmatic analysis other than that found in the EIS need be conducted. The proposed action to eradicate isolated gypsy moth infestations in Oregon conforms to integrated pest management principles required by Oregon law, ORS 635.655. The need for this proposed action is based on the potential ecological and economic impacts of gypsy moth infestations on the surrounding areas, the entire state of Oregon, and indeed, the entire western United States.

Tiering

This Environmental Assessment is tiered to the USDA's 1995 final EIS for Gypsy Moth Management in the United States. Copies of the EIS are available for inspection at the Oregon Department of Agriculture in Salem. The preferred alternative in the 1995 EIS is Alternative 6: Suppression, Eradication, and Slow the Spread. Under this alternative, we propose eradication because of the isolated nature of the infestation in Oregon. This site-specific Environmental Assessment is designed to examine the environmental consequences of a range of treatment options under Alternative 6 that may accomplish the program's goals.

Biology of Gypsy Moth

Gypsy moth, *Lymantria dispar* L., is one of the worst pests of trees and shrubs in the United States. It was originally imported into Massachusetts from Europe in 1869 for silk production experiments. Some moths were accidentally released and became established. This gypsy moth infestation has spread relentlessly and now covers the entire northeastern part of the United States from Maine south to North Carolina and west to Michigan and Wisconsin. Gypsy moth caterpillars alter ecosystems and disrupt people's lives when in high numbers. Heavy infestations cause defoliation and tree mortality. Defoliated trees are also vulnerable to other insects and diseases that may kill them. Heavy defoliation alters wildlife habitat, changes water quality, reduces property and esthetic values, and reduces the recreation value of forested areas. When present in large numbers, gypsy moth caterpillars can be a nuisance, as well as a hazard to health and safety (USDA 1995, EIS pp. 1-4).

Gypsy moths are notorious hitchhikers. Egg masses and pupae can be attached to nursery stock and Christmas trees, and vehicles, camping equipment, and outdoor household articles that people bring with them when they come to Oregon. A wide host range would allow gypsy moth to establish throughout western Oregon and where hosts occur in eastern Oregon. Gypsy moths were first detected in Oregon in 1979 and have been detected every year since in many different isolated locations, primarily in western Oregon.

Two strains of gypsy moth and possibly their hybrids now threaten Oregon. Gypsy moths introduced into Oregon from eastern North America are sometimes referred to as North American gypsy moths. Asian gypsy moths are a strain of the same species that comes from eastern Russia and Asia. Asian gypsy moths have arrived in Oregon as egg masses on ships. Containers and products coming from East Asia pose a consistent risk as trade with these areas expands. Asian gypsy moths could also reach Oregon via Europe. They have become established in Germany and other European countries where they are hybridizing with European gypsy moths.

Asian gypsy moths differ from gypsy moths (from North America and Europe) because the females can fly long distances. Gypsy moth females have fully developed wings but they cannot fly. Asian gypsy moths also feed on a wider range of host trees, including some such as larch that are not favored by North

American gypsy moths. Asian gypsy moth caterpillars also develop more quickly and grow somewhat larger.

The two strains of gypsy moths look very similar; they can not be reliably separated by visual examination. Scientists developed genetic tests to distinguish one strain from the other. There are now several of these tests available. One challenge has been that Asian gene markers used in these tests are present at low frequencies in established gypsy moth populations in eastern North America (Prasher and Mastro 1994). Since the two strains are known to interbreed, these results may indicate that hybridization has occurred.

A sobering example of how easily these pests can be introduced took place in 1993 in North Carolina. A ship carrying military cargo from Germany was found to be infested with large numbers of gypsy moths, including flying female moths typical of the Asian strain. The ship was sent back out to sea and the cargo was fumigated, but not before large numbers of moths were seen headed for shore. Hundreds of male moths were trapped near the port facilities, along the shore and up to 25 miles inland. Genetic testing indicated that both European and Asian strain moths were present as well as some which were apparently hybrids (N.C. Dept. of Agric. 1994).

The Oregon Department of Agriculture and the U.S. Department of Agriculture cooperate to eradicate gypsy moth infestations whenever they are detected in Oregon. A brief history of the major infestations and eradication programs follows.

History of Gypsy Moth Infestations in Oregon

The first gypsy moth in Oregon was trapped in 1979 in Lake Oswego. Follow-up trapping indicated that the infestation did not become established. In the early 1980's, however, detection programs revealed several established infestations of gypsy moth located in Salem, Corvallis, Portland, and Gresham. Effective eradication programs were implemented using various insecticides [acephate, carbaryl and *Bacillus thuringiensis* (*B.t.k.*)].

The largest infestation ever found in the western United States was discovered in the mid-1980's in Lane County. In the summer of 1984, traps in Eugene and Lowell caught large numbers of male moths. Trapping patterns were then expanded and over 19,000 male gypsy moths were collected from an area of 355 square miles. In the spring of 1985, 226,405 acres of Lane County were sprayed with *B.t.k.* in the first phase of an eradication program. In 1986, 189,011 acres were sprayed; 7,135 acres were treated in 1987 and 2,995 in 1988 -- all with *B.t.k.* applied three times by air per year. Following the 1988 treatment, delimitation trapping collected only 1 moth. The total cost of detection, eradication and trapping for Lane County from 1984 to 1989 was estimated to be $18 million.

After the last eradicative sprays in 1988 in Lane County, two moths were caught in the Eugene/Springfield area in both 1989 and 1990 and one moth was caught in 1991. Follow-up delimitation trapping indicated these were new introductions that did not become established. No gypsy moths at all were caught in Lane County in 1992. No eradicative treatments were made in Lane County from 1989 through 1994. In 1995, however, an 80-acre aerial spray program using *B.t.k.* was conducted to eradicate a breeding population of gypsy moths at Veneta, Lane County. The program was a success. At another site near Dorena Lake/Schwarz Park, Lane Co., three moths were trapped in 1995 and 34 in 1996. This resulted in the smallest gypsy moth aerial spray program ever conducted in Oregon. In the spring of 1997, 70 acres were sprayed aerially with *B.t.k.* at the Dorena Lake/Schwarz Park site. Delimitation trapping afterwards indicated the infestation had been eradicated.

Several eradication programs have been conducted in the Portland metropolitan area. An infestation of gypsy moths was detected in east Portland in 1985. In 1986 a new eradication technique developed by USDA-APHIS (Induced Inherited Sterility Technique) was implemented to flood the area with sterile insects and disrupt normal mating. Results of post-release monitoring indicated that the program was unsuccessful; a residual gypsy moth population remained. Treatment with *B.t.k.* eliminated the infestation in 1988. In both 1989 and 1991 small 4-acre areas in Lake Oswego were treated with ground applications of *B.t.k.* No eradication treatments were made in 1990.

The fourth largest eradication program in the state was completed in 1992 on 8,388 acres in North Portland. *B.t.k.*, applied by helicopter, was used to eradicate an infestation of Asian gypsy moth that arrived on ships that had previously visited Russian ports. A second Asian gypsy moth infestation was eradicated in 2001 in Portland's Forest Park by aerial application of *B.t.k.* over 910 acres.

Eradication programs were carried out at eight sites in 1993, 1994, 1996, 1998 and 1999 in the Portland metropolitan area. The 1996 eradication program was conducted on a 10-acre area in Gresham/SE Portland. In 1998, two eradication programs were conducted in suburbs of Portland, one in Beaverton on a 22-acre area and the other in Lake Oswego on a 13-acre area. The Beaverton site was retreated in 1999 although the eradication boundary was shifted slightly. This was because 19 gypsy moths were trapped on both sides of the eastern spray treatment boundary after the eradication effort there in the spring of 1998. All these programs combined use of *B.t.k.* treatments with mass trapping. Because of the small eradication blocks and good accessibility, *B.t.k.* sprays were applied from the ground.

Elsewhere in the state, small infestations in Josephine County were eradicated in 1988 and 1992. *B.t.k.* was applied by helicopter to rural residential areas of Philomath (Benton County, 440 acres) in 1993, Carver (Clackamas County, 270 acres) in 1994 and Fisher (Lincoln County, 706 acres) in 2003 to eradicate infestations at these three sites. A small infestation was ground sprayed using *B.t.k.* in Jackson County in 1995. The latest eradication in Jackson County occurred in 2001 when *B.t.k.* was applied by air over 160 acres in Ashland to control a North American gypsy moth infestation. No gypsy moth eradication program occurred in Oregon in 2002.

For a review of gypsy moth detection and eradication programs in Oregon through 1988, see Oregon Dept. of Agriculture (1989) and annual reports for 1989 through 2003. Hitchhiking gypsy moths will continue to arrive in Oregon and other non-infested states. At some time in the future, gypsy moths may become permanently established in the West and if that happens, gypsy moths will spread naturally into Oregon. Until that happens, it is expected that eradication of all isolated infestations that result from accidental introductions will continue to be the goal of the U.S. Department of Agriculture, Oregon Department of Agriculture and comparable agencies in non-infested states.

2. Proposed Action

Proposed Action: Eradication

The proposed action is eradication, which conforms to the EIS recommendation to eradicate isolated infestations found in the western United States. Under the EIS, geography determines the proposed actions from among eradication, slow-the-spread, suppression, and no action.

The following is a description of geography in U.S. with regard to gypsy moth. The area of the United States where the European strain of the gypsy moth is established is called the **generally infested area**. Next to this area is a band 50 to 100 miles wide, called the **transition area**, where the gypsy moth is spreading from the generally infested area. The area where the gypsy moth is not established, is called the **uninfested area**. Isolated infestations resulting from accidental spread of the gypsy moth by people are found in this area. Different management strategies apply in these areas: suppression in the generally infested area, slow the spread in the transition area, and eradication of isolated infestations of the European strain in the uninfested area. In addition, the Asian strain may be eradicated wherever possible, including the generally infested area.

Our proposed action for Lane County in 2004 is based on trapping results during 2003. About 16,837 gypsy moth traps were placed statewide in 2003. Traps were concentrated in western Oregon where most population centers and gypsy moth host plants are located. However, all cities and towns statewide are considered at risk and are trapped each year. The standard detection trap density is two to four traps/mi^2 in cities and one to two traps/mi^2 in rural areas. Special high-risk sites such as national parks, public and private campgrounds and RV parks are trapped each year. Traps were also placed around major ports and waterways at risk of travel by ships carrying Asian gypsy moth egg masses. Major ports including the ports of Portland, Astoria and Coos Bay in Oregon, were trapped at a high density for a radius of five miles. Along the Columbia River in Clatsop and Columbia counties, the trapping density was 16 traps/ mi.^{2} for three miles inland, followed by 4 traps/ mi.^{2} for another two miles inland. In the Portland metro area

(Clackamas, Multnomah and Washington counties), the trapping density was 4-9 traps/ mi.^{2}. Coos Bay (Coos Co) had a trap density of 9/mi.^{2}. At sites where gypsy moths are caught, delimitation traps are placed at densities of 16-49 traps for five or more square miles for two years following detection. Delimitation traps are placed as soon as possible following initial detection to delimit new infestations the same year if possible. Delimitation traps are also placed to monitor the success of eradication programs. The core of an eradication area may be mass-trapped at densities of 3-9 traps/acre.

In 2003 no moths were caught in or near the 2003 Fisher eradication area in southeastern Lincoln County where three gypsy moths were caught in a single trap in 2002. Twenty-eight gypsy moths were detected in Oregon in 2003 at nine new and one old site. All 28 moths were confirmed as North American gypsy moths by the USDA Otis Methods Development Lab using DNA tests. Two moths (Riddle, Douglas Co. and NE Portland, Multnomah Co.) bore a North American FS1 and an A1 mitochondrial DNA haplotype. The A1 mitochondrial DNA haplotype is common in Europe and central Russia and is also found at a low percentage in North American gypsy moth populations. Three gypsy moths were caught in a trap placed near Sandy (Bull Run & Camp Namanu Rds.). Two moths were found in traps in a parking lot of an industrial site in Gresham, an area where two moths were captured in 2002 and three in 2001. The rest of the moths caught in 2003 were from single-catch sites except those in Eugene. Seventeen male gypsy moths were found in 11 traps in the south hills area of Eugene (16 moths at the Crest Drive site and one at the Hawkins Heights site). The gypsy moths originally detected at the Crest Drive site in 2003 were near the edge of a delimitation grid placed around the single Eugene (Brookside St.) catch in 2002. Distribution of a Gypsy Moth Alert flyer, and information gathering regarding move-ins from the generally infested eastern U.S. were conducted in the vicinity of the Crest Drive site. Searches found old and live egg masses, live females laying eggs, and larval and pupal skins at the home of a move-in (February 2002) from Connecticut at the Eugene, Crest Drive site. The information available so far indicates that the Crest Drive area in south Eugene, Lane County now has a breeding population of gypsy moths.

Alternatives Considered

Six alternatives were considered in detail in the 1995 EIS:

1) No action. The U.S. Department of Agriculture would do nothing to reduce the adverse effects of the gypsy moth in the United States. No suppression, no eradication and no slow-the-spread would occur.
2) Suppression. The U.S. Department of Agriculture would reduce the adverse effects of the gypsy moth only in the generally infested area.
3) Eradication. The U.S. Department of Agriculture would reduce the potential adverse effects of the gypsy moth only in the uninfested area, and of the Asian strain anywhere in the United States.
4) Suppression and Eradication. This combines alternatives 2 and 3. The U.S. Department of Agriculture would reduce the potential adverse effects of the gypsy moth in both the generally infested and uninfested areas, and of the Asian strain anywhere in the United States.
5) Eradication and Slow the Spread. The U.S. Department of Agriculture would reduce the potential adverse effects of the gypsy moth in both the uninfested and transition areas, and of the Asian strain anywhere in the United States.
6) Suppression, Eradication, and Slow the Spread. The U.S. Department of Agriculture would fully pursue its goal of reducing adverse effects of the gypsy moth (including the Asian strain) anywhere in the United States. A full range of strategies would be available nationwide to manage affected ecosystems. This is the preferred alternative.

Treatment Options

Treatment options available under the 1995 EIS are:

1) *B.t.k*. This biological insecticide contains a bacterium, *Bacillus thuringiensis* var. *kurstaki*. The insecticide is specifically effective against caterpillars of many species of moths and butterflies, and is without significant risk to healthy humans, wildlife and the environment.
2) Diflubenzuron (Dimilin). This insect growth regulator interferes with the growth of some immature insects.

3) Gypsy moth virus. The nucleopolyhedrosis virus, which occurs naturally, is specific to the gypsy moth. Gypchek is an insecticide product made from the gypsy moth nucleopolyhedrosis virus.
4) Mass trapping. Large numbers of pheromone traps are used to attract male gypsy moths and prevent them from mating with females, thereby causing a population reduction. Density of traps is nine or more traps per acre.
5) Mating disruption. Aerially-applied tiny plastic flakes or beads contain synthetic gypsy moth sex pheromone. The pheromone may confuse male moths and prevent them from locating and mating with females.
6) Sterile insect releases. Large numbers of radiation-sterilized gypsy moth eggs or pupae are released in a treatment area and develop into adults. The sterile adults mate with fertile adults but viable offspring are not produced. If successful, the effect is population reduction and eventual elimination of the infestation.

The preferred option proposed for this eradication project is option 1) *B.t.k.* Option 4) Intensive/ Mass trapping at a density of up to 3-9 traps/acre will be employed after the eradication to determine the effectiveness of the *B.t.k.* treatment. Intensive/Mass trapping can also remove any remnant populations of gypsy moths that were not killed by the *B.t.k.* treatment.

3. Need For Action

Goals and Objectives

Goal: Eradicate the gypsy moth infestation from Eugene, Lane County in 2004 in order to avoid the impacts detailed below.

Objective 1: Apply the biological insecticide *B.t.k.* to 183 acre eradication area centered near the intersection of Crest Dr. and Courtney Place in the south hills area of Eugene where sixteen male gypsy moths were trapped and several egg masses were found (see the enclosed Eugene map for eradication area). *B.t.k.* will be applied three times by air at a rate of 24 B.I.U. per acre about 7-14 days apart in late April and early May; exact timing depends on weather. Ideally, the *B.t.k.* application should target early instars of gypsy moth. It is likely that a small buffer area surrounding the eradication area will receive some *B.t.k.* but in quantities much less than in the eradication area.

Objective 2: Delimit and intensively trap treated and surrounding areas using gypsy moth pheromone traps to determine the effectiveness of the *B.t.k.* treatment and to pinpoint any remnant populations of gypsy moths. This targets the adult stage of the gypsy moth. Trap densities in the core area will be 3 to 9 traps per acre. If more moths are caught, additional egg mass searches and treatments will be considered. Two years of negative trapping results following the *B.t.k.* treatments would indicate the infestation has been eradicated.

Need for Action

Gypsy moth has been a non-native destructive insect pest of trees and shrubs in the eastern United States and its native Eurasia for many years. Overwintering eggs hatch from their egg masses during spring. Larvae feed on leaves of more than 500 species of trees and shrubs in forest, agriculture and urban plantings. On average, about four million acres are defoliated in the eastern United States annually (EIS 1995). In Oregon, larvae in new infestations pupate and emerge as adults, typically from mid July through August. Detection and delimitation trapping is conducted during these peak flight times. Adults mate and females lay overwintering egg masses each containing up to 1000 eggs. Host plants in Oregon include major forestry, agricultural and urban species of trees and shrubs. Oregon's economy, natural resources, environmental quality and human health would be negatively affected by the establishment of gypsy moths. Details follow.

Economic Impacts

An established population of any gypsy moth strain in Oregon would have very serious economic impacts for some residents and industries in the State. Because their females are strong flyers, the Asian strain

would be expected to spread much more quickly than the North American strain. In addition, their ability to survive well on a broader range of host trees puts additional Oregon natural resources at increased risk.

The potential impacts of Asian gypsy moth on the Pacific Northwest were summarized by USDA Forest Service (1992). The Forest Service estimated direct resource losses for Asian gypsy moth for the time period between 1992 and 2040 as follows: commercial timber, (larch only) $0.8 - 1.4 billion, (hardwood) $0.7-$1.2 billion; recreation, travel, and tourism, $2 billion. Suppression costs were estimated to be: developed commercial, residential, and recreation properties, $735 million; commercial timber, $77 million; and Christmas tree plantations, $9 million. Full impact of gypsy moth establishment in the West would be expected to be more delayed than for Asian gypsy moth. However, impacts of quarantines resulting from a non-suppressed gypsy moth population are expected to be immediate as discussed below.

Quarantines. Eradication of gypsy moth infestations in Oregon is essential to the health of agricultural, horticultural and forestry enterprises of the State. These Oregon industries are economically viable only when their products can be marketed in other states and countries. As an exporter of plant products, Oregon must comply with plant pest and disease regulations of market states and countries.

In 1984, the first response of Oregon's most important market state, California, to the discovery of the Lane County gypsy moth infestation was to place an embargo on all forest products and live plant material originating from all of Lane County. While this embargo was soon replaced with a more reasonable USDA "high hazard" gypsy moth quarantine, the disruption of normal marketing relationships caused by the embargo remained. Those Christmas tree growers near the heavier infestation sites were subject to loss of export markets due to quarantine fumigation requirements for interstate movement of the trees. Individual growers claimed losses as high as 80 percent to the fumigation process with some loss claims as high as $200,000. Until 1989, all Christmas tree growers inside the quarantine area were required to apply chemical insecticides to obtain certification for interstate movement, thus, increasing their production costs and pesticide usage in the area. Failure to eradicate the current infestation would have had a progressively greater adverse impact on the Christmas tree industry, which exports 90% of its production and claimed an annual value of more than $160 million to the state of Oregon during 2002. Similarly, the $714 million annual sales of production nursery stock grown in Oregon in 2002 are generated almost entirely from export markets in other states and countries. Our most lucrative markets are those located closest to Oregon in states not yet infested with gypsy moth, and from which we can expect serious quarantine restrictions on nursery stock originating from infested areas.

State and federal quarantines imposed on wood products industries during the mid 1980's Lane County infestation did not seriously affect these businesses. Nevertheless, their product movements and handling procedures were subject to limitations imposed by compliance agreements with the Oregon Department of Agriculture. If the new gypsy moth infestation in Lane County were allowed to spread, similar embargoes and quarantines would be implemented and would become increasingly restrictive and expensive to comply with. Greenhouse and nursery products have been Oregon's largest agricultural industry (with highest cash value) since 1994. The Christmas tree industry has also increased steadily during the last several years.

The potential impact of gypsy moth quarantines on Oregon would be similar to those outlined in a Risk Assessment for British Columbia (Carlson et. al. 1994). It concludes: "The commitment by western States to preserve their export markets by excluding gypsy moth compels B.C. to follow suit. If B.C. were to allow gypsy moth to become established, trade and quarantine sanctions would be imposed by all the western States." "...costs [of trade sanctions] would likely exceed the current detection and eradication strategy costs by a factor of at least ten to one." "The threat of trade barriers through quarantine restrictions in the western States ... presents a significant incentive for continued detection and eradication. B.C. could conceivably be denied access to its most important markets. The social and economic impacts resulting from these barriers to trade would likely be unacceptable for most British Columbians." In fact, both the USDA and Canadian Food Inspection Agency erected a quarantine in response to a large gypsy moth infestation in Vancouver Island in B.C. in 1998-1999. Oregonians would also face disruptive and expensive trade barriers if gypsy moth became established in Oregon.

Reforestation. The immediate threat to forest products industries is quarantine, but the long term impact of gypsy moth infestations on reforestation of major timber species may be just as important. Douglas-fir and western hemlock have proven to be good hosts for gypsy moth caterpillars in laboratory studies. Some defoliation of Douglas-fir was observed in heavily infested areas of Lane County in 1984. In places where there is a favorable mix of broadleaf and conifer hosts of gypsy moth, defoliation of young conifers may result in serious growth loss or tree mortality of important timber species. Hardwood hosts of gypsy moth, not now considered economic timber species, are receiving greater scrutiny from researchers and foresters. The continued presence of gypsy moth infestations in Oregon would decrease the economic potential of this undeveloped resource, which presently covers some 2-3 million acres in western Oregon. In fact, hardwoods are becoming economically valuable in the western US. There are some companies that deal specifically with hardwoods.

Tourism. While the native hardwood species are not now important economic wood product species, they are very important components of the watershed species complex and contribute significantly to the scenic beauty of the Oregon environment. If the gypsy moth defoliates these species as it does similar hardwood species in the Northeast, Oregon would lose full use of parks, campgrounds and residential yards during the larval stage of the insect. This, along with the loss of watershed value and scenic beauty, could have a serious impact on the environment and tourist use of facilities located in gypsy moth-affected areas. May and June are important tourism months in Oregon. The value of tourism to Oregon in 2002 was $6.2 billion. A significant proportion of the tourists comes from states, which would be expected to impose serious limitations on the return of recreational vehicles into their states from a gypsy moth-infested Oregon.

Ecological Impacts

Eradication of gypsy moth infestations in Oregon is also essential to protect Oregon from the adverse ecological effects of gypsy moth establishment. These ecological effects are expected to be similar to those of Asian gypsy moth, which were examined by the Forest Service (1992). Oaks, alder, willow, hazelnut and other deciduous hosts are especially preferred by gypsy moths. About 50,000 acres were defoliated by gypsy moth in eastern states in 1997, 362,210 acres defoliated in 1998, 475,153 acres defoliated in 1999, 1.4 million acres in 2000, 1.9 million acres in 2001 and 242,239 acres in 2003 (GMDigest 2003). The reduction of gypsy moth defoliation in mid 1990's was at least partially due to the dramatic increase of the pathogenic fungus, *Entomophaga maimaiga* in the field (Schneeberger 1996). The worst year on record was 1981 when over twelve million acres (18,750 square miles) were defoliated.

Gypsy moth feeding can lead to changes in forest stand composition. Oak trees in the East have been killed by repeated defoliation and are usually replaced by other vegetation. If this occurred in Oregon, animals feeding on acorns would be directly affected. Nesting sites and cover would be reduced. Defoliation of riparian areas would cause increased short-term, but reduced long-term water output and increased air and water temperatures. Salmon, trout, and other aquatic species might leave affected areas or die. A study of stream water quality in gypsy moth-defoliated watersheds in the East found increased nitrate levels and decreased acid neutralizing capacity; thus, gypsy moth defoliation of trees and shrubs in riparian areas could exacerbate the effects of acid rain (Downey 1991). Defoliation of riparian, watershed, and other critical areas and of specific plant species could jeopardize concerned, threatened or endangered species (plant, insect, fish or other wildlife species). Sample *et al*. (1993) found that gypsy moth defoliation reduced both the abundance and species richness of Lepidoptera (butterflies and moths) in the affected area. In short, the ecological effects of gypsy moth becoming established in the West are expected to be substantial.

Specifically, defoliation of riparian, watershed, and other critical areas by gypsy moth in the Eugene area could expose watershed to direct sunlight and can increase the water temperature, which negatively impacts the threatened salmon and other fish species in the area. Other concerned, threatened or endangered species (birds, reptiles, mammals, plant, insect and others) may also be impacted due to gypsy moth defoliation and its resulting habitat modification.

Environmental quality. While the extent of environmental damage, which the gypsy moth can do by way of host plant defoliation, is difficult to predict, the increased use of pesticides associated with living with gypsy moth is not. Even at relatively low levels of infestation, pressure is increased for use of che-

mical sprays to certify certain plant products, including Christmas trees, for interstate marketing. This would apply to nursery stock and forest products at mill storage areas. These application sites would likely receive more pesticide treatments, as would residential sites within urban and suburban settings. Natural areas, such as parks and campgrounds, would also require treatments to make forested areas fully usable. Every year, thousands of acres of trees are treated to control gypsy moth in the East; over 103,000 acres were treated in 2003 (GMDigest 2003).

Human health. Some people are allergic to the tiny hairs on gypsy moth caterpillars (Tuthill et al. 1984). These people could suffer minor allergic reactions, primarily rashes, if gypsy moths were allowed to become established in Oregon. During outbreaks, gypsy moth caterpillars crawl over sidewalks, patios, lawn furniture, etc. They may even invade houses. In heavily infested areas, large numbers of caterpillars limit some people's enjoyment of the outdoors.

4. Authorizing Laws And Policies

The US Department of Agriculture has broad discretionary statutory authority to conduct gypsy moth management activities. The following is a list of authorizing laws and policies.

Federal

The Plant Protection Act of 2000 (7 CFR 401-442) and *Cooperative Forestry Assistance Act of 1978 as amended (16 USC 2101-2105)*. These statutes authorize, among other things, the development of USDA activities for the regulation of the artificial spread of the gypsy moth from the quarantined area, and the eradication of isolated gypsy moth infestations outside this area.

7CFR 301.45. This regulation establishes a federal gypsy moth quarantine covering infested areas of the US.

1988 Memorandum of Understanding between the USDA Forest Service and USDA Animal and Plant Health Inspection Service for Management of the Gypsy Moth.

State

ORS 570.305. This statute gives broad enabling authority to eradicate dangerous insect pests and plant diseases. It states that "the director [State Department of Agriculture], and the chief of the division of plant industry, are authorized and directed to use such methods as may be necessary to prevent the introduction into the state of dangerous insect pests and plant diseases, and to apply methods necessary to prevent the spread, and to establish control and accomplish the eradication of such pests and diseases, which may seriously endanger agricultural and horticultural interests of the state, which may be established or may be introduced, whenever in their opinion such control or eradication is possible and practicable."

ORS 634.655. This law requires that state agencies with pest control responsibilities follow the principles of integrated pest management (IPM). IPM is defined as "a coordinated decision-making and action process that uses the most appropriate pest control methods and strategy in an environmentally and economically sound manner to meet agency pest management objectives."

ORS 634, *State Pesticide Control Act.* This law regulates the formulation, distribution, storage, transportation, application and use of pesticides in Oregon.

5. Environmental Laws And Their Relationship To This Analysis

Federal Insecticide, Fungicide, and Rodenticide Act of 1947 (7 USC 136). This Act requires that all insecticides used in suppression or eradication projects be registered with the Environmental Protection Agency and that application requirements be followed.

National Environmental Policy Act of 1969 (P. L. 91-190 42 USC 4321 et. seq.). This Act requires detailed and documented environmental analysis of proposed federal actions that may affect the quality of

the human environment. The courts regard as federal actions any state actions for which federal funds are granted.

Endangered Species Act of 1973 (16 USC 1531 et. seq.). This Act prohibits federal actions from jeopardizing the existence of federally listed threatened or endangered species or adversely affecting designated critical habitat. Federal agencies must consult with the U.S. Fish and Wildlife Service to determine the potential for adverse effects from any federal action. Federal agencies are also responsible for improving the status of listed species.

B. PUBLIC INVOLVEMENT AND ISSUES

Efforts were made to obtain and address issues and concerns among individuals and organizations that will be affected by the proposed gypsy moth eradication project. At the invitation of the Crest Drive Elementary School, ODA provided information and answered questions on the gypsy moth, the local infestation and the proposed eradication actions for school parents and members of the Crest Drive Citizens group just prior to their scheduled meetings at the school on January 20, 2004. Parents were invited to the presentation by the school principal in a newsletter and insert sent home with students. The neighborhood group president sent an email to his constituency earlier in January 2004. Health officials from the Oregon Health Services and the Lane County Public Health Department were also present to answer questions.

A public information meeting was scheduled by ODA for 7 to 9 pm on January 26, 2004 at the Crest Drive Elementary School, 1155 Crest Drive, Eugene, OR 97405. Notices were prepared and sent by ODA to property residents and landowners within and adjacent to the proposed eradication area, and to Lane County and Eugene city government offices in mid-January 2004. Notices of the meeting were also published in the Eugene Register-Guard newspaper before the meeting (Appendix A). A news release announcing the public information meeting was also distributed on Friday, January 16, 2004. Copies of the public information meeting notice were also provided to Crest Drive Elementary School to distribute to its students and their parents. The public information meeting notice included information on the gypsy moth situation, ODA's eradication proposal, and the availability of the draft Environmental Assessment. Letters indicating ODA's proposal and enclosing a draft copy of the Environmental Assessment were also mailed to interested individuals and organizations in late January 2004.

About 60 people from the public and 13 people from various government agencies attended the public information meeting at the Crest Drive Elementary School on January 26, 2004. ODA presented the information at the meeting. Lane County Public Health officials presented information on *B.t.k.* with regard to its potential health effect. Representatives from other agencies and organizations present at the meeting included: USDA APHIS, Lane County Public Health, city of Eugene - Parks and Open Space, Northwest Coalition for Alternatives to Pesticides and the Eugene Register-Guard newspaper.

The following questions were raised by the audience at the public information meeting. Some of these questions were related to the environmental assessment, but some were not. All questions were addressed orally by staff from ODA or from Lane County Public Health at the meeting. In addition, about three electronic mails were received regarding the proposed eradication project; some were related to the environmental assessment (Appendix C). All were responded to by ODA staff via emails. All questions relevant to the environmental assessment were addressed in the 1995 EIS or the environmental assessment. None of the questions, from the meeting or emails, raised issues that were not addressed in the 1995 EIS or the environmental assessment. Readers are recommended to consult both documents.

Questions from the public information meeting in Eugene:

- What was the density of traps in the Hawkins Heights area in 2003?
- How long will it take to spray each day?
- Will the spray hang in the air? How long?
- How far will the spray drift?
- Who should I contact if I find gypsy moth life stages on my property?
- How will the spray affect my garden?

- What outdoor activities will be affected by the spray?
- What density of gypsy moths does last summer's trapping indicate?
- Comments from a resident who used to live in a gypsy moth infested area in the northeastern United States; Five acres of deciduous trees defoliated on her property in one summer. Trees looked like wooden sticks in the field. She remembered shoveling dead gypsy moth caterpillars and frass from her driveway and porch. Her son suffered severe allergic reaction to gypsy moth caterpillar hairs.
- What if we declared our property a no spray zone?
- Did you consider other eradication methods such as mating disruption?
- Is it inevitable that the gypsy moth will become established in the western U.S.?
- How long is *B.t.* viable on sprayed outdoor articles?
- How long does it take other Lepidopteran species to recover from the *B.t.* spray?
- A resident is concerned because of bad experience with the Mediterranean fly sprays in California.
- Can you spot-spray around positive trap sites?
- Is the gypsy moth present in Europe?
- What effect does *B.t.* have on the spotted owl and red tailed hawk?
- What is the effect of *B.t.* on goats, sheep, and chickens?
- Can you spray during weekends when there is no school?
- Broken limbs and branches as a result of ice storm damage have been removed from the area. Could that be a problem if gypsy moth egg masses were present on the material removed from the area?
- Why was the original positive trap on Crest Drive placed in that location?
- Comments from a resident of Hawkins Height area about the 1985 *B.t.* spray that he experienced. Did not find that the spray residue was a problem.

General concerns that have been brought up in previous gypsy moth eradication programs in Oregon include:

1. Human Health. Concern has been expressed about direct or indirect human exposure to insecticides (especially for children, pregnant women, and people with severe immune disorders). Monitoring of human health during the application process is an additional concern. Concerns have been expressed regarding the aerial application of biological insecticides (*B.t.k.*) to urban and rural areas, especially in relation to direct or indirect contamination of drinking water, watersheds, wells, garden crops and organic produce certification. That inert ingredients are not disclosed to the public has caused concern. Some of the inert ingredients are approved for use in foods. Concern has also been expressed about human allergic reactions to caterpillars if gypsy moth infestations are not eradicated.

2. Public Education. A need for increased public education about the gypsy moth problem and a need for public education on the possible effects of eradication measures have been expressed.

3. Public Involvement and Notification. Concern has been expressed about adequate public involvement in the decision-making process concerning eradication procedures and methods, and about adequate notification of treatment dates, areas, cancellation and reschedule dates and plans to ensure public safety.

4. Environmental Effects. Concern has been expressed about the possible effects of insecticides, including biological insecticides, on non-target organisms, such as gypsy moths' natural enemies, wildlife, honeybees, locally farmed livestock, pets, fish pond on private properties, aquatic insects and other Lepidoptera (moths and butterflies). Concern has also been expressed about the possible adverse effects of gypsy moth defoliation on wildlife, water quality, timber value and other forest resources in affected areas.

5. Alternatives to Eradication Programs. Concern has been expressed about a need for research on the behavior of the gypsy moth in Oregon to determine which natural enemies might maintain populations at low levels. Concern has been expressed about the viability of an eradication approach and the need for long range planning and research for an integrated pest management approach to suppression.

6. Gypsy Moth Quarantine. During the earlier Lane County infestation, a need was expressed for a rapid reduction in the population of gypsy moths to reduce or eliminate the gypsy moth quarantines imposed on the infested portions of that county.

7. Economic Effect. Concern has been expressed about the possible negative impact of the gypsy moth on the forest and nursery industries if infestations are allowed to expand unchecked. Concern has been expressed by Christmas tree growers in particular about the negative impact of the gypsy moth on their markets. Concern has been expressed by land owners about the possible negative effects of a continued gypsy moth infestation on property values.

8. Compliance with State Law. Concern has been expressed about ODA's authority in eradicating gypsy moth. State laws (ORS 570.305 & ORS 634.655) apply to gypsy moth eradication projects (see previous section A 4).

Similar concerns were documented in the 1995 final EIS Appendix C, page C4-C10, All of these issues and concerns were considered when reviewing the range of treatment options available to accomplish the goal of eradication of the current gypsy moth infestation in Oregon. The 1995 EIS addressed three principal issues in detail:

1) How does the presence of gypsy moth affect people and the environment?
2) How do insecticidal treatments applied affect people and the environment?
3) How do noninsecticidal treatments applied affect people and the environment?

Most of the concerns and issues raised in gypsy moth eradication programs in Oregon falls into one of the three categories addressed in the 1995 EIS. Readers are encouraged to consult the 1995 final EIS for details.

Citizens and organizations were urged to write to the Insect Pest Prevention and Management Program Supervisor of the Plant Division of the Oregon Department of Agriculture, with their concerns about the gypsy moth problems and the proposal to employ an eradicative IPM program. Postal address, email address and telephone numbers were provided to the public and concerned parties and individuals in all mailings. Areas of concern expressed will be summarized and presented to the Director of the Oregon Department of Agriculture for evaluation prior to her decision regarding implementation of the proposal or another alternative. Written comments from concerned parties and individuals on the draft EA are included in Appendix C.

C. AFFECTED ENVIRONMENT

An extensive general description of the physical and biological environment was prepared for the 1986 Oregon Environmental Assessment Gypsy Moth Eradication Spray Program: Lane and Douglas Counties. Much of the information is applicable to western Oregon and is therefore incorporated by reference in this environmental assessment.

Location

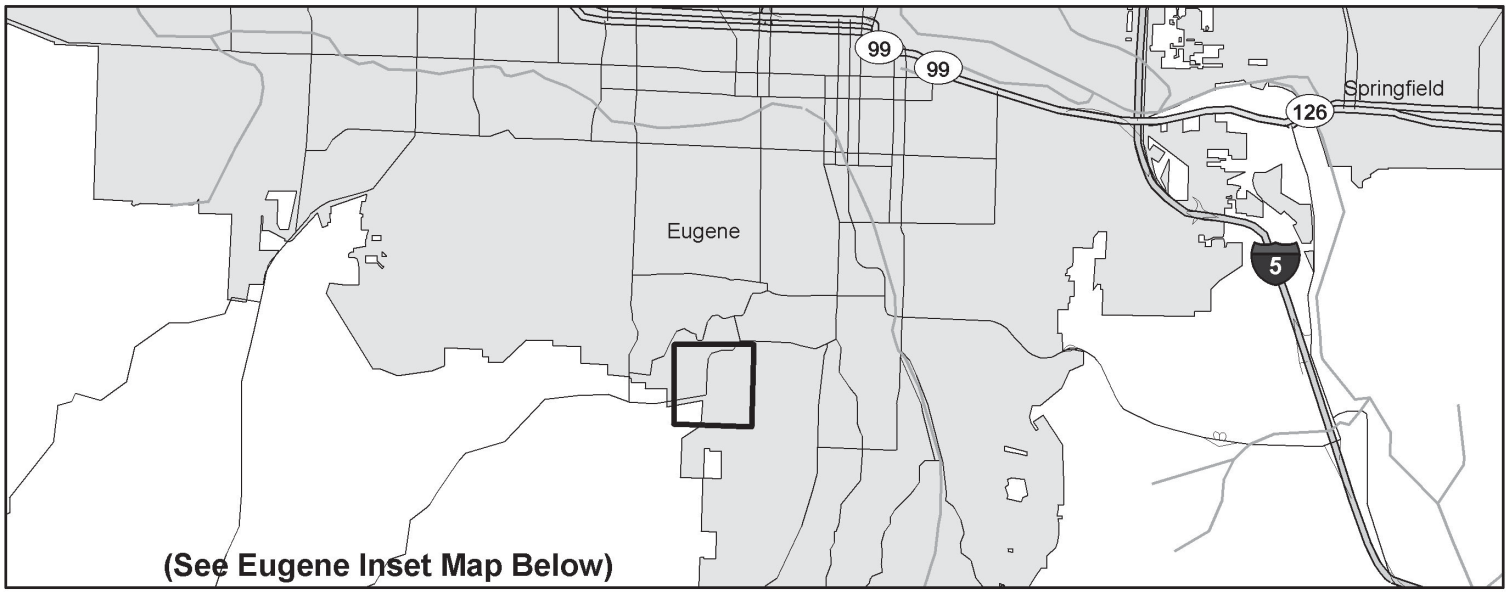
Eugene, Lane County. The 183 acre eradication area (2004) is the area proposed to receive *B.t.k.* treatment sufficient to eradicate the gypsy moth. It is likely that a small buffer area surrounding the eradication area will receive some *B.t.k.* but in quantities much less than inside the eradication area. Movement of B.t.k. beyond the eradication area is likely to be affected by conditions such as temperature, humidity, wind direction, wind speed and terrain. Standard buffer areas used around control areas in gypsy moth suppression programs in the eastern U.S. are typically 200 to 500 feet.

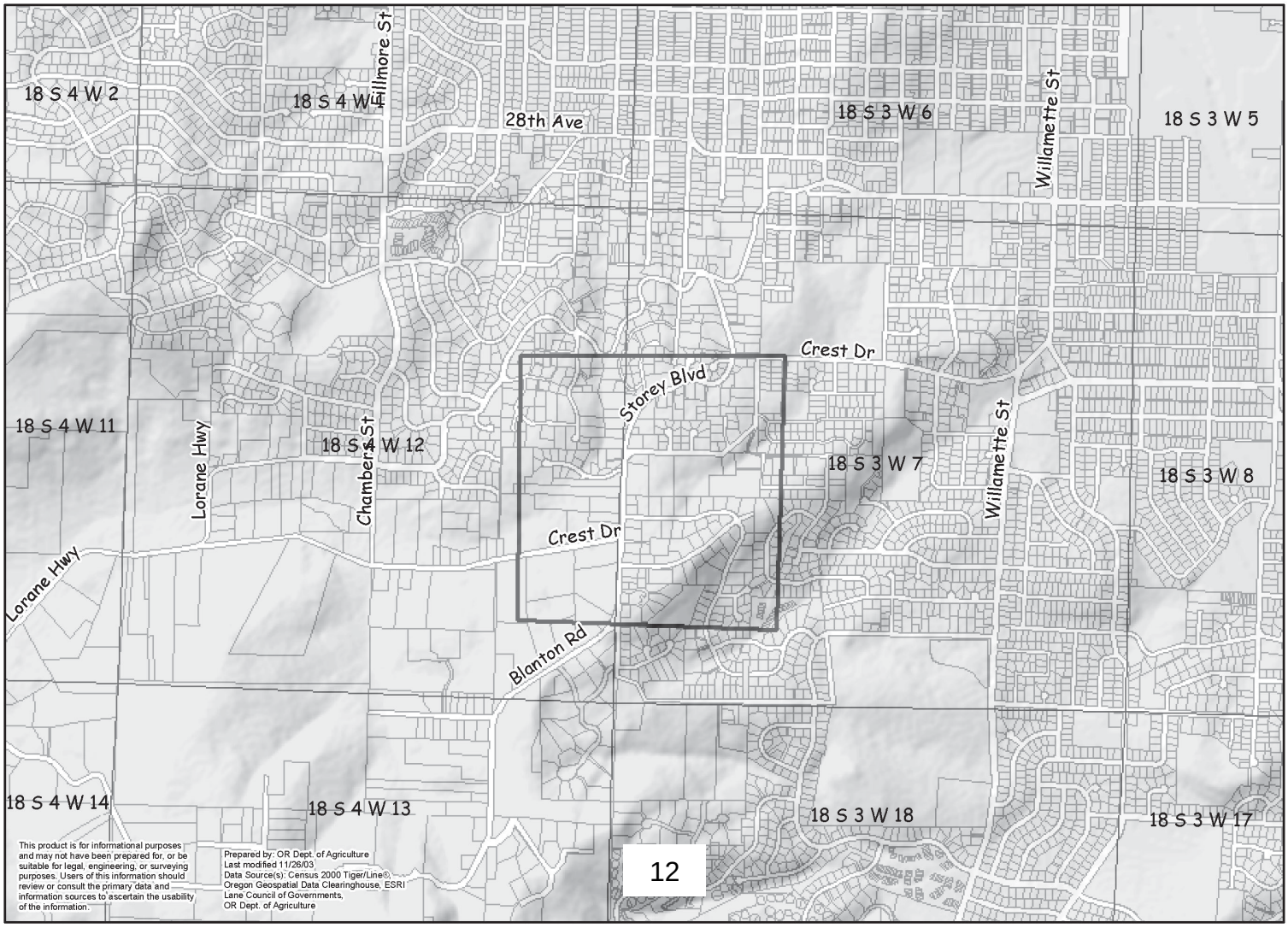
The proposed eradication area (183 acres) is in a residential and forested area mostly within the southern boundary of the city of Eugene. The southwest corner of the eradication area, south of Crest Drive and west of Blanton Road, is outside the city limits and is under Lane County jurisdiction. The exact location of the proposed eradication area is centered near the intersection of Crest Drive and Courtney Place within T18S R4W Sec.12 and T18S R3W Sec. 7. The boundary begins at a point at the northeast corner of the junction of Crest Drive and Arden Place at N 44.0214, W 123.1014 (GPS readings of latitude and longitude), then proceeds south for 2920 feet to a point at N 44.0134, W123.1014 located at the backyard of 3981 Monroe Street. It then turns west and proceeds for 2759 feet to a point at N 44.0135, W123.1119 located at the backyard of 1238 Crest Drive. From here it turns north and proceeds for 2818

Proposed 2004 Gypsy Moth Eradication Program
Eugene, Lane County

Proposed 183 acre eradication area (solid line)

It is likely that a small buffer area surrounding the eradication area will receive some B.t.k. but in quantities much less than inside the eradication area.





Proposed 2004 Gypsy Moth Eradication Program
Eugene, Lane County

Proposed 183 acre eradication area (solid line)

It is likely that a small buffer area surrounding the eradication area will receive some B.t.k. but in quantities much less than inside the eradication area.

feet to a point at N 44.0212, W123.1121 located on the property of 1200 Fir Lane. It then turns east and proceeds for 2812 feet to the starting point (see attached map).

This is the south hills area of Eugene. The area is forested and densely covered with trees, shrubs and weeds. Trees present include a mixture of hardwoods and softwoods, primarily oak, birch, poplar, maple, apple, cherry, walnut, sycamore, dogwood, filbert, horse chestnut, willow, Douglas fir, pine, spruce and cedar. These trees are grown mostly in residential front or back yards although some are street trees. A variety of low level vegetation and shrubs, mostly landscape plants including photinia, English laurel, rhododendron, lilac, sumac, aucuba, grapes, holly, blackberry and salal grow around different properties. Some poplar, cedar and Douglas fir trees in the area may be over 100 feet tall. No natural ponds, lakes or permanent streams are present in the eradication area. One small artificial pond is in a resident's backyard within the eradication area. At their closest points, the Willamette and McKenzie rivers are two and five miles away, respectively, to the north of the eradication area. Amazon Creek is over a mile away east of the eradication area. Spencer Creek is over a 1/4 mile west of the eradication area . Several storm drainage systems carry water during period of heavy precipitation. Terrain in the proposed eradication area is generally hilly with varied aspects. Elevation varies from 650 feet near the northeast corner to 950 feet near the south central boundary of the block. A large ridge in the southeast quarter of the block trends northeast between Monroe Street and 38th Avenue. There is a steep forested draw in the northwest quarter of the block between Storey Blvd. and Van Buren Street that trends north - south. There are no high power lines or towers in or near the block that would present an unusual flight risk but the hilly nature of the block with variable aspects and tall trees will require extra caution during application.

Environmental Factors

Ten threatened or endangered species may occur within or around the proposed eradication area in Eugene, Lane County. These include one bird (bald eagle *Haliaeetus leucocephalus*), three fish (Chinook salmon *Oncorhynchus tshawytscha,* Oregon chub *Oregonichthys crameri* and steelhead *Oncorhynchus mykiss*), one invertebrate (Fender's blue butterfly *Icaricia icarioides fenderi*) and five plants (Golden Indian paintbrush *Castilleja levisecta*, Willamette valley daisy *Erigeron decumbens* var. *decumbens,* Howellia *Howellia aquatilis*, Bradshaw's lomatium *Lomatium bradshawii* and Kincaid's lupine *Lupinus sulphureus* ssp. *kincaidii*). Three candidate species (yellow-billed cuckoo *Coccyzus americanus*, streaked horned lark *Eremophila alpestris strigata* and Taylor's checkerspot *Euphydryas editha taylori*) and many species of concern may also be present in the area (Appendix D). Species of concern are those taxa whose conservation status is of concern to the US Fish and Wildlife Service, but for which further information is needed.

The bald eagle (*Haliaeetus leucocephalus*) can occur in the area surrounding the proposed eradication area. However, ground inspection did not indicate any nesting sites within or close by the proposed eradication area in Eugene. Disturbance and noise by a low flying helicopter are the only factors that can impact the eagle if any is around. Eradication sprays with *B.t.k.* are unlikely to affect the eagle or its food sources.

Two candidate bird species and seven species of concern may also occur near the eradication area. The candidate species include yellow-billed cuckoo *Coccyzus americanus* and streaked horned lark *Eremophila alpestris strigata.* The species of concern include band-tailed pigeon *Columba fasciata,* olive-sided flycatcher *Contopus cooperi (=borealis)*, yellow-breasted chat *Icteria virens,* acorn woodpecker *Melanerpes formicivorus,* Lewis' woodpecker *Melanerpes lewis,* Oregon vesper sparrow *Pooecetes gramineus affinis* and purple martin *Progne subis*. The yellow-billed cuckoo and the yellow-breasted chat are both riparian birds that forage in cottonwood forests. Similarly, flycatchers and purple martins are more frequently found in riparian habitats as well. All these four birds are insectivorous and can prey on a variety of insect orders including mosquitoes and Lepidopteran caterpillars. The streaked horned lark and Oregon vesper sparrow are grassland birds. They forage usually on the ground for both seeds and insects. The acorn woodpecker and Lewis' woodpecker are oak woodland species. Both birds forage for acorns, other plant seeds as well as insects. Band-tailed pigeons usually forage on trees. The food source for the bird includes plant seeds (such as berries) and other vegetation materials. The bird eats insects occasionally but insects are not its main food source. The literature indicates that many insectivorous birds can prey on other insects if a particular diet group is not available (e.g., Gaddis 1987). The eradication area

(especially the 2004 eradication area) is small. Any local Lepidopteran species affected are likely to re-invade the area from neighboring habitats.

Three species of fish, Oregon chub *Oregonichthys crameri*, steelhead *Oncorhynchus mykiss* and Chinook salmon *Oncorhynchus tshawytscha,* may be found in the Willamette River or McKenzie River about two and five miles north respectively of the proposed eradication area. All three fish species are listed as threatened or endangered. Another two concerned fish species – the Pacific lamprey *Lampetra tridentata* and coastal cutthroat trout *Oncorhynchus clarki clarki,* may also be found in the same rivers above. The main food sources of these fish include aquatic invertebrates or other fish species. The proposed eradication treatment using *B.t.k.* should not have a detectable effect on these fish or their food sources. Because the rivers where these fish are found occur more than two miles away from the proposed eradication area, the habitat of these fish is effectively buffered. Even if these fish species were found in Amazon Creek or Spencer Creek which are closer to the eradication area or if the fish habitat were inside the proposed eradication area, *B.t.k.* as used in this program will not affect aquatic invertebrates or these fish species.

An endangered invertebrate species, Fender's blue butterfly (*Icaricia icarioides fenderi*), may exist near the proposed eradication area. Both the butterfly and its host, the Kincaid's lupine *Lupinus sulphureus* ssp. *kincaidii* , a threatened plant species, were documented in a native prairie in the Willow Creek Preserve, about 2-3 miles northwest of the proposed eradication area. However, no Fender's blue butterfly, its host plants or habitat was found within or adjacent to the proposed eradication area. Thus, the Fender's blue butterfly is not expected to be adversely affected by the proposed *B.t.k.* eradication treatment. A candidate invertebrate species - Taylor's checkerspot (*Euphydryas editha taylori*) butterfly and a concerned invertebrate – Oregon giant earthworm (*Driloleirus macelfreshi*), may also be present in the area. However, no records indicate that the checkerspot butterfly occurred inside or adjacent to the proposed eradication area. The earthworm lives in the soil and should not be affected by the proposed *B.t.k.* eradication treatment.

Two sensitive rodents (white-footed vole *Arborimus albipes* and camas pocket gopher *Thomomys bulbivorus*) and seven sensitive species of bats may occur in the proposed eradication area. These bats include Pacific pallid bat (*Antrozous pallidus pacificus*), Pacific western big-eared bat (*Corynorhinus (=Plecotus) townsendii townsendii*), silver-haired bat (*Lasionycteris noctivagans*), long-eared myotis (*Myotis evotis*), fringed myotis (*Myotis thysanodes*), long-legged myotis (*Myotis volans*) and Yuma myotis (*Myotis yumanensis*). All nine are species of concern. The two rodents are omnivorous and eat mostly plant seeds and other vegetation materials. They also eat invertebrates sometimes. The bats are mostly insectivorous and will forage for moths, beetles and other insects at night. The Pacific western big-eared bat is a cave dweller. Its main diet is moths. However, this species is not expected to be present in or near the proposed eradication area because there are no caves nearby. The remaining six bat species are tree dwellers, and can possibly be present in or near the proposed eradication area. These bats eat mostly other species of insects (non-moths) and forage a much larger area. Females won't reach their breeding stage (peak feeding period) until June or July in Oregon. The eradication area is relatively small and is not expected to have a significant impact on the food supply of these bats. Furthermore, moths and butterflies are expected to move back into the treated area from surrounding areas. If the bats are affected due to the decline in food supply, the effects will be temporary and localized, with no long-term impact to any bat species.

One rare turtle (northwestern pond turtle *Emys marmorata marmorata*) and one rare frog (northern red-legged frog *Rana aurora aurora*) may also occur in the surrounding area. Both are species of concern. The turtle and frog require aquatic or semiaquatic habitats and are omnivorous with a preference for invertebrates. Their main food source is probably aquatic insects and other invertebrates in streams or ponds. One very small artificial pond, but no natural ponds are present in the proposed eradication area. The intermittent stream may not have water during the month (May) when the proposed B.t.k. spray occurs. Even if there is water in the creek or nearby, the proposed action should not affect the turtle and frog because as used in this program, *B.t.k.* will not affect aquatic invertebrates.

Rare plants found in the vicinity of the Eugene eradication area include five endangered or threatened species (Golden Indian paintbrush *Castilleja levisecta*, Willamette valley daisy *Erigeron decumbens* var. *decumbens,* Howellia *Howellia aquatilis*, Bradshaw's lomatium *Lomatium bradshawii* and kincaid's lupine

Lupinus sulphureus ssp. *kincaidii*) and five species of concern (white top aster *Aster curtus,* wayside aster *Aster vialis*, Shaggy horkelia *Horkelia congesta* ssp. *congesta*, thin-leaved peavine *Lathyrus holochlorus*, and Hitchcock's blue-eyed grass *Sisyrinchium hitchcockii*). Many of these plants are pollinated by bees, honeybees, bumblebees, wasps, flies, beetles or butterflies and moths. But none is exclusively pollinated by Lepidopterans (butterflies and moths). Only one species, wayside aster, actually occurs adjacent to the north eradication area boundary. The rest occur outside a minimum of one-mile radius of the proposed eradication block. The proposed action, therefore, should not adversely affect these plants.

The proposed project and no-action alternative are not expected to affect federally listed or sensitive plants. The no-action alternative may increase the spread of noxious and undesirable weeds as tree canopies become defoliated.

The proposed action is not expected to have any significant impact on threatened or endangered species, or on any candidate species or species of concern in Eugene area. The no-action alternative, however, may adversely affect the Oregon chub, Chinook salmon and steelhead, and other threatened or sensitive species due to tree defoliation and subsequent modification to the habitat in the area.

Human Factors

No unusual hazards are known in the proposed eradication area. There are about 310 properties within the proposed 183-acre eradication area; most are single family residences. No churches, hospitals, or day care centers exist within the proposed eradication area. However, one school – the Crest Drive Elementary School, lies within the proposed eradication area near the west boundary. Several school bus routes serving both the Crest Drive Elementary School and Thomas Jefferson Middle School, travel through the proposed 2004 eradication area. These school buses travel mostly along Blanton Rd., Crest Drive and Storey Blvd. During the morning school buses start at about 7:50 am and in the afternoon finish at about 3:00 pm. A Lane Transit District bus route (#22 Crest Drive) serves the Crest Drive area Monday through Friday. The bus travels and picks up passengers in the block on Crest Drive and Storey Blvd. between approximately 7:13 am and 7:30 am and between 3:48 pm and 5:36 pm. Property lots in the area are relatively large with dense vegetation coverage, especially trees. A couple of city parks in the vicinity are used by the public for walking, playing or family leisure activities.

Tourism, recreation, education, forestry and agriculture are probably among the most important industries affecting humans around Eugene. Eugene is located in the south end of the Willamette Valley where the Willamette River runs through the city. This provides good opportunities for recreation and tourism. Eugene, with the University of Oregon, is also a higher education center for the southern Willamette valley. Some local residents have home orchards, gardens or small wood lots. Lane County ranked 11th, with a total value of $106 million, in agriculture production in Oregon during 2002. Establishment of gypsy moth would be expected to affect adversely these industries because trees and shrubs in private wood lots, university campus, city streets and parks, and other recreation areas can serve as hosts to gypsy moth. Broadleaf trees are important components of the local flora, especially along the rivers and streams, and are preferred hosts by gypsy moth. Parks and recreation areas with defoliated trees and shrubs would be less attractive to tourists and local citizens.

Effects of alternatives on the human environment (including minority and low-income populations) are expected to be similar for all human populations regardless of nationality, gender, race, or income. No disproportionately high and adverse human health or environmental effects on minority populations and low-income populations are expected as a result of implementing actions described for the preferred alternative.

D. ALTERNATIVES

Pesticide application: ground vs. air. If a chosen alternative includes pesticide sprays, the pesticide can be applied from either ground (i.e., truck or trailer mounted sprayers) or air (i.e., helicopter or airplane mounted sprayers). Ground sprays are preferred for small eradication areas if the road system is adequate to allow access to all parts of the block. If access is restricted or if the area is large, then aerial sprays are usually more practical, less disruptive to residents and wildlife, and more economical.

1. Treatment Options Under the 1995 EIS

The treatment alternatives for the proposed eradication program at the Eugene site are analyzed in the 1995 gypsy moth programmatic EIS. These alternatives were considered as treatment options for any gypsy moth eradication programs in the USA. Six alternatives are available to carry out an eradication program:

1) *Bacillus thuringiensis* var. *kurstaki*
2) Diflubenzuron (Dimilin)
3) Gypsy moth virus
4) Mass trapping
5) Mating disruption
6) Sterile insect release.

2. Alternatives Not Considered In Detail

Alternatives not considered for use in the proposed eradication program this year are

2) Diflubenzuron. This insect growth regulator has a broader non-target host range than *B.t.k.* and can kill many other insects beside larvae of moths and butterflies. Its use may adversely affect populations of other insects including beneficial ones.
3) Gypsy moth virus. Gypchek is very host specific but is not widely available in the market and is still somewhat experimental for eradication programs. Results with gypcheck have been variable.
5) Mating disruption. This method is still experimental and its effect on gypsy moth infestations is variable. This alternative has been used more frequently in recent years in slow –the-spread programs in eastern states but has not been used for eradication in western states.
6) Sterile insect releases. This method is also experimental and its effect on gypsy moth infestations is variable.

These alternatives were not considered in detail because the probability that they would achieve the program goal of eradication was judged to be too low or could not be determined.

3. Alternatives Considered in Detail

Proposed Action

Options considered for use under the proposed action's eradication program are <u>*B.t.k.* and mass/intensive trapping</u>. The two options meet state and federal gypsy moth program goals and adhere to USDA's EIS guidelines. In our opinion, *B.t.k.* is the best option for gypsy moth control because it has proven effective as an eradication treatment. Application of *B.t.k.* poses little risk to human health or the environment. *B.t.k.*'s host range is limited to caterpillars of Lepidoptera (moth and butterflies). There are no threatened or endangered species of Lepidoptera in our proposed eradication area in Eugene. Mass trapping removes male moths from the environment, thus reducing the chance of females attracting mates. It can be an effective control tool when the gypsy moth infestation is low. However, its effectiveness as a control tool varies, and largely depends on gypsy moth populations. Mass/intensive trapping can be an excellent monitoring tool to detect presence of gypsy moth adult males, and is best used to determine the effectiveness of *B.t.k.* applications after an eradication program.

B.t.k. - The biological pesticide, *B.t.k.*, is now commonly the material of choice for gypsy moth eradication programs in the United States. In the past decade, improved formulations and more concentrated applications of *B.t.k.* have increased gypsy moth larval mortality and have provided more consistent foliage protection where it has been used. Aqueous *B.t.k.* formulations do not affect aquatic organisms and can be applied over open water. *B.t.k.* is relatively expensive because three applications (two in ground programs) are usually required to ensure eradication.

Oregon has had over 17 years of experience with the use of *B.t.k.* as an eradicant for the gypsy moth. Two applications of *B.t.k.* by ground or three applications by air during late April and May have proven effective in eradicating many gypsy moth infestations in Oregon. Other western states, including California, Idaho,

Utah, and Washington, have experienced similar success with the use of *B.t.k.* in their eradication programs (USDA APHIS1994). A review of eradication options for British Columbia also supports the use of *B.t.k.*; it concludes: "multiple applications of *Bacillus thuringiensis* var. *kurstaki* (*B.T.K*) should be the primary choice for eradication (Surgeoner 1994).

Trapping - Mass/intensive trapping involves setting gypsy moth pheromone traps at very high densities (up to 9 traps/acre). These traps attract male gypsy moths and are the same ones used for annual state-wide detection surveys. Mass trapping has been attempted as an eradication tool, but results have been unreliable. This technique, however, is very useful when used in combination with other techniques. Any captured male moths are removed from the breeding population. More importantly, the number and pattern of catches help evaluate treatments and pin-point any residual populations.

No Action

The no-action alternative is required by Council of Environmental Quality regulations (40 CFR 1502.14(d)). The no-action alternative forms the basis for a comparison between meeting the project needs and not meeting the project needs. This alternative provides baseline information for understanding changes associated with the action alternative and expected environmental responses to an introduced species. Selecting this alternative would allow existing environmental conditions, including those associated with an established gypsy moth population, to continue on a natural course.

4. Preferred Action Alternative

The preferred alternative is to use the biological pesticide *B.t.k.* in conjunction with mass/intensive trapping. The Eugene site is suitable for aerial applications because of the large areas and limited accessibility. Three aerial applications of *B.t.k.* at a rate of 24 B.I.U.s per acre would be applied to a 183 acre eradication area in 2004. The three treatments will occur in late April or early May, about 7-14 days apart. Exact timing depends on weather. It is likely that a small buffer area surrounding the eradication area will receive some *B.t.k.* but in quantities much less than in the eradication area.

Following *B.t.k.* treatments, intensive/mass trapping programs will be used to monitor the effectiveness of the *B.t.k.* applications and to pinpoint the location of any remaining populations in the area. Trap densities in the core areas may be up to 3 to 9 traps per acre.

E. ENVIRONMENTAL CONSEQUENCES

This section will address effects of the preferred action alternative on the affected environment for the proposed eradication site. Two areas of effects, human health and environment, were analyzed in detail in the 1995 gypsy moth programmatic EIS and are hereby incorporated by reference.

Bacillus thuringiensis var. *kurstaki*

B.t.k. is a naturally occurring soil bacterium. When sprayed on foliage and ingested, it is toxic to most caterpillars (larvae of butterflies and moths). Other insects and vertebrates are not affected by this bacterium. Human health risks from use of *B.t.k.* in a gypsy moth eradication program are believed to be extremely low. Modern aqueous formulations of *B.t.k.* contain no organic solvents. None of the inert ingredients in these formulations are on EPA list 1 (Inerts of Toxicological Concern) or list 2 (Potentially Toxic Inerts). In addition, all of the inert ingredients are FDA approved for use in foods or in food processing. *B.t.k.* products are designated by EPA as exempt from residue tolerances. This means that no limitations on the amount of material are allowed on food items. *B.t.k.* can be used on food crops up to and including the day these products are harvested, as well as on stored food products. Some genetically modified crops such as corns now have *B.t.k.* genes permanently incorporated in them. The World Health Organization (WHO) reviewed and established environmental health criteria for *Bacillus thuringiensis* and published a book on the topic (WHO, 1999). The book concluded “owing to their specific mode of action, *Bt* products are unlikely to pose any hazard to humans or other vertebrates or to the great majority of non-target invertebrates.” Glare & O’Callaghan (2000) did an exhaustive world literature review on *Bt* and authored a book – *Bacillus thuringiensis*: Biology, Ecology and Safety. After examining the literature, they

concluded " the wealth of data currently available and experience of many years of broad-scale applications would suggest that *Bt* is one of the safest pesticides currently available…… We view *Bt*-based products used at recommended field rates as safe to use, in terms of minimal non-target impacts, little residual activity and lack of mammalian toxicity." A review of the environmental impacts of the *Bacillus thuringiensis* by Canadian scientists (Joung & Cote, 2000) produced similar conclusions.

B.t.k. and Human Health

If directly exposed to *B.t.k.* spray, some individuals (most likely project workers) may develop minor irritation of the skin, eyes, or respiratory tract. These effects are relatively mild and transient. Pathogenic effects are not likely, even in individuals with impaired immune systems. Allergic responses to *B.t.k.* are conceivable, but have not been documented. The most thorough human health studies of *B.t.k.* applications in populated areas have been reported by Green *et al*. (1990), Noble *et. al*. (1992), USDA (1993), Aer'aqua Medicine Limited (2000) and Capital Health Region (1999). All five studies were carried out during large-scale gypsy moth eradication programs. No significant health effects attributable to the *B.t.k.* treatments were found. Table 9-4 and figure 9-1 from appendix F of the 1995 EIS (USDA, 1995) clearly and concisely show human risks due to gypsy moth and all treatment alternatives including *B.t.k.*.

Green *et al*. (1990) monitored human health in Lane County, Oregon in 1985 & 86 when *B.t.k.* was sprayed by helicopter over areas with a population of approximately 120,000 people. Three applications of Dipel® 8L were made in 1985. In 1986, three applications of either Dipel® 8L or Dipel® 6AF were used. Their conclusions were:

1. Telephone complaints to the Lane County Health Department from members of the public did not reveal any pattern of predominance of any one symptom complex or of involvement of any single organ system. Symptoms were those common to any community, e.g., nausea, headache/dysphoria, rash, angioedema.

2. Fifty-five cultures from patients, obtained for routine clinical purposes, were positive for *B.t.k.* Of these, 52 were assessed to be probable contaminants. The other three patients had preexisting medical problems, but *B.t.k.* could neither be ruled in nor out as a pathogen.

3. The level of risk for *B.t.k.* and other existing or future microbial pesticides in immunocompromised hosts deserves further study.

Noble *et al*. (1992) studied the human health effects of a 44,478 acre Asian gypsy moth eradication program using *B.t.k.* in Vancouver, British Columbia. Three applications of Foray® 48B were made with large airplanes, helicopters, and trucks. They found no significant effect of *B.t.k.* on human health.

USDA (1993) reported on health monitoring programs in Washington and Oregon during large *B.t.k.* eradications for Asian gypsy moth in 1992. Combined, these eradications covered approximately 124,000 acres; mostly urban residential neighborhoods of Tacoma, Washington and Portland, Oregon. Between the two states over 300 complaints of human illness were received mostly via telephone "hotlines". No cases of infection were confirmed though many people did report symptoms including allergic rhinitis ("hayfever"), viral gastroenteritis ("intestinal flu"), and skin rashes. The occurrence, frequency and type of symptoms were indistinguishable from background illnesses, which occurred in both *B.t.k.*-treated and non-treated areas.

Aer'aqua Medicine Ltd (2000) reported on methods and results of a health surveillance program during a two year eradication spray program against the white-spotted tussock moth (*Orgyia thyellina*) in Auckland, New Zealand. The eradication program in which *B.t.k.* was sprayed aerially and by ground, was carried out in the eastern suburbs of Auckland. The report concluded that there was no evidence of a causal association between *B.t.k.* spray and health effects or significant health problems that occurred among the population of the sprayed area during or following sprays.

In 1999, The Capital Health Region of Victoria, British Columbia, coordinated a human health study of possible short term health effects of aerial spraying of the biological pesticide, Foray ®48B, on

southern Vancouver Island. The study was performed as a condition necessary for the spraying to take place under a provincial order-in-council. The study included a survey of the health of asthmatic children in the region; a survey of the general health of the population; monitoring and analysis of visits to doctors' offices and hospital emergency departments; laboratory surveillance of clinical samples which contained *B.t.k.*; measurement of environmental levels of *B.t.k.*; and a review of self-reported complaints of health symptoms made to telephone information and support hotlines. The study's conclusions were:

"The results of this project did not show a relationship between aerial spraying of Foray 48B and short-term human health effects. Although some people self-reported health problems that they attributed to the spray program, the research and surveillance methods used in this project did not detect any change in health status that could be linked to the spray program. Our results showed that many of the health complaints people reported during the spray were as common in people before the spray as they were shortly after the spray. This conclusion is consistent with those of previous studies of the possible health effects of *B.t.k.*–based pesticide spray programs."

Due to advances in scientific knowledge, the law requires that pesticides registered before November 1, 1984 be reregistered to ensure that they meet current standards. In 1998 the United States Environmental Protection Agency (EPA) published Reregistration Eligibility Decision *Bacillus thuringiensis* (EPA 1998) in which the agency concluded:

"Based on the reviews of the generic data for the active ingredient *Bacillus thuringiensis*, the Agency has sufficient information on the health effects of *Bacillus thuringiensis* and on its potential for causing adverse effects in fish and wildlife and the environment. The Agency has determined *that Bacillus thuringiensis* products, manufactured, labeled and used as specified in this Reregistration Eligibility Decision, will not pose unreasonable risks or adverse effects to humans or the environment. Therefore, the Agency concludes that products containing *Bacillus thuringiensis* for all uses are eligible for reregistration".

The Oregon Health Services (2003) has developed its recommendations for people impacted by the proposed spray program. These recommendations are:

> "Even though the spray is considered safe for humans, we recommend that people stay indoors during spraying, unless it is essential to be outdoors. You should be advised in advance by the Department of Agriculture when spraying will occur, so you may plan accordingly. This is general advice for the public. If you or someone in your home has a medical problem that they believe may be made worse by the spraying, talk to your health care provider.
>
> If your drinking water source is from open surface water (e.g., creeks, streams, springs) and you are concerned about potential exposure, you may wish to shut off the intake during the spray and until you are satisfied that any water exposed to the spray has moved downstream of your intake. Alternative water sources in the interim might include previously stored and covered water on site, bottled water, or water from a neighbor outside the sprayed area.
>
> To avoid exposure, we recommend:
>
> - Staying indoors during and for at least 30 minutes after spraying to allow droplets to settle.
> - Waiting until the spray has dried before touching grass or shrubs. Cover playground equipment, sandboxes, benches, and lawn chairs before the spray or hose them off afterward.
> - Washing exposed skin with soap and water if direct contact with the spray droplets occurs. If the material should get into your eyes, flush with water for 15 minutes.
>
> Although we don't have evidence that *B.t.k.* will affect any given group of people, individuals with leukemia, AIDS, or any other physician-diagnosed causes of severe immune disorders, may consider leaving the spray area during the actual spraying. If you or someone in your home has

one of these conditions, ask your doctor for advice about avoiding exposure before the spray project begins.

The *B.t.k.* product contains residues of grains and other foods used to help the bacteria grow. If you have serious allergies to foods or food preservatives, your health care provider may consult with the manufacturer of Foray® 48B, about the exact ingredients (Valent Biosciences: 847-968-4700, after hours 877-315-9819).

This information will be sent to residents in the proposed eradication area in spray notices. Included in the spray notices are two Oregon Poison Center phone numbers for residents who are exposed to *B.t.k* and have health-related questions. A phone number for Oregon Health Services is also provided for physicians with questions about specific patients. Oregon State University's National Pesticide Information Center website address and toll-free phone numbers are also listed. Oregon Health Services will be available to consult with physicians about *B.t.k.*, inert ingredients, and any possible health effects.

B.t.k. and Environment

***B.t.k.* and non-target Lepidoptera.** Some non-target Lepidoptera larvae (caterpillars) present in the proposed spray area would likely be killed by the application of *B.t.k.* In turn, those animals dependent on caterpillars for food theoretically may be affected. Sometimes, even nontarget lepidoterans near the treatment area will be impacted due to drift (Whaley *et. al.* 1998). However, depressions in caterpillar populations are expected to be temporary due to recolonization from adjacent areas and the high reproductive capacity of most insects. There have been several studies conducted to examine these impacts.

During the 1986-87 gypsy moth program in Oregon, a study assessed the direct impact of *B.t.k.* on non-target Lepidoptera larvae in the canopy of Oregon white oak. The study found a significant reduction in the number of caterpillars collected in *B.t.k.* treated areas in the spring and early summer following treatment. By mid-August, no significant differences in numbers of caterpillars could be detected, but species richness was reduced in the treated blocks. Sampling conducted in the study areas a year after application (1987) revealed that Lepidoptera populations were continuing to recover. Two years after the spray (1988), there were no significant differences between the number of caterpillars collected in treated and untreated plots and the number of species collected in treated blocks was not significantly different from prespray levels in those blocks. A comparison of treated and untreated plots, however, indicated that the number of species was still significantly less in treated plots (Miller 1990). Recovery of non-target Lepidoptera populations begins the same season after *B.t.k.* application, but some effects may linger for at least three years. Another study (Severns 2002) on the effects of *B.t.k.* on non-target butterfly community in western Oregon showed similar impacts. The species richness and density was negatively impacted during the first two years following the *B.t.k.* sprays of a gypsy moth eradication program. However, in the third year, both indexes rebounded to the pre-spray levels.

Results from a study in West Virginia confirm that *B.t.k.*'s immediate effects are limited to immature Lepidoptera. Other insects, including most beneficial types, are not affected by *B.t.k.* applications (Sample *et al.* 1992). While the effects of *B.t.k.* application are most evident among larval Lepidoptera in the same year as the treatment, some effects on adults may not be observed until the year following treatment. Lepidopteran species with early season larvae experience the greatest impacts (Sample *et al.* 1993).

***B.t.k.* and aquatic insects.** Some aquatic insects are susceptible to other strains of *B.t.* (e.g., *B.t.* var. *israelensis* is used to control black flies), but *B.t.* var. *kurstaki* , the strain used for gypsy moth control, is harmless to aquatic insects at concentrations that would be expected to result from aerial sprays (Edit 1985, Kreutzweiser *et. al.* 1992). There are no lakes, natural ponds or rivers in the proposed 2004 eradication area in Eugene but an intermittent,underground creek may be present near the southeast corner of the eradication area. When *B.t.k.* is used for gypsy moth suppression in blocks with open water, fish and other animals dependent on aquatic insects for food should not be affected by the *B.t.k.* treatments.

***B.t.k.* and birds.** A study from Oregon examined the indirect effect of *B.t.k.* on the reproductive success of insectivorous birds through a possible reduction in food supply for their nestlings. The study reported no significant differences between treated and untreated areas in numbers of eggs hatched and in nestling growth and development. When caterpillars weren't available, the birds switched to other available prey (Gaddis and Corkran 1986, Gaddis 1987). Preliminary results from a study in Arkansas are similar: *B.t.k.* treatments did not have a significant effect on the breeding success of the Hooded Warbler (Lih *et. al.* 1994).

***B.t.k.* and bats.** Some bats, including those species of concern listed in the section of Environmental Factors, feed primarily on moths. These bats might be affected by a decrease in available food in *B.t.k.* treated areas. Perkins and Peterson (1994), however, failed to find any significant differences in total bat activity or species diversity at *B.t.k.*-treated sites within a small aerial spray block when compared to non-treated control sites.

***B.t.k.* and natural enemies.** Field studies suggest that the predominant effect of *B.t.k.* on gypsy moth parasitoids is indirect, through effects on its host species. At least two parasitoid species, *Cotesia melanoscelus* and *Rogas lymantriae*, have increased rates of parasitism in areas sprayed with *B.t.k.* (Wallner *et .al.* 1983, Webb *et. al.* 1989). Field studies on insects other than lepidopterans and their parasitoids and predators have found few other species or groups that are affected.

***B.t.k.* and water quality, soil condition and microclimate.** Water quality and soil condition should not be directly affected by *B.t.k.* as *B.t.k.* is not likely to affect most aquatic organisms and is naturally present in soils worldwide. *B.t.k.* reduces the amount of defoliation by leaf-eating caterpillars. Therefore, changes in microclimate due to defoliation are not expected after *B.t.k.* application.

***B.t.k.* and recreation and agriculture**. Potential positive effects on tourism, recreation, forestry and agriculture are expected because *B.t.k.* as applied in the proposed action will eradicate the gypsy moth infestation and eliminate the negative effects due to gypsy moth defoliation.

***B.t.k.* and domestic/farm animals**. Domestic animals such as dogs, cats and farm animals such as cattle and horses, are not expected to be affected by the *B.t.k.* applications as proposed in this program. Although there are no known studies of the effect of direct exposure of these animals to *B.t.k.*, other studies where *B.t.k.* were injected or ingested by laboratory or wild animals including mice, rabbit, sheep, rodents and shrew, indicated that *B.t.k.* did not affect these animals more than the untreated checks (WHO 1999).

Intensive/mass Trapping Using Disparlure

Disparlure is a chemical sex attractant that attracts male gypsy moths. Intensive/mass trapping involves use of large numbers of disparlure-baited pheromone traps -- up to nine traps per acre. Section 5 from appendix G of the 1995 EIS thoroughly discussed the ecological effects of disparlure, *B.t.k.* and other treatment options on the environment.

Disparlure and Human Health

Data are not sufficient for a quantitative risk assessment. By analogy to other insect pheromones, risks of toxic effects, if any, are likely to be slight for the general public and workers. Disparlure is very persistent on and in the body. Individuals exposed to disparlure may attract adult male moths for prolonged periods of time (up to 2-3 years). This may be a considerable nuisance in gypsy moth infested areas such as the eastern United States. In uninfested Oregon, however, no impact is expected. The level of exposure required to cause the attractant effect cannot be characterized, although the likelihood of this effect would seem greater for workers than for the general public.

Disparlure and Environment

In acute toxicity tests, disparlure was not toxic to mammals (IBT 1972), birds (USDI Fish & Wildlife Service 1975), or fish (USDI Fish & Wildlife Service 1972). One field study showed no effect of disparlure applications on the degree the wasp *Ooencyrtus kuvanae* parasitizes gypsy moth eggs (Brown &

Cameron 1979). No studies were found in the published literature on the effects, if any, of disparlure on aquatic ecosystems. Pheromone traps do catch small numbers of non-target organisms. These incidental catches are unlikely to have significant environmental consequences.

Cumulative Impacts

Cumulative impacts are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agencies (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR 1508.7, p. 28). Cumulative impacts resulting from an eradication program can be caused by 1) multiple treatments of the same area in the same season (e.g., three applications of *B.t.k.* in this program), 2) combining treatment types (e.g., *B.t.k.* and disparlure in this program) within the same project area and 3) retreatment of the same project area in the following season. Cumulative impacts may be additive resulting in a greater effect than the sum of the individual effects. The cumulative impacts in the proposed program in south Eugene may be the three *B.t.k.* applications, which extend the time of potential exposure and risk to a greater number of non-target lepidopterans. However, because the proposed eradication area is relatively small, the opportunity for recolonization from the surrounding areas is great. Another possible cumulative impact at the Eugene site will be if the treatment needs to be conducted again in 2005 due to the spread of gypsy moth to areas larger than expected. For example, if the gypsy moth infestation spread to areas larger than the 2004 eradication area, i.e., larger than 183 acres, then an enlarged area may be sprayed in 2005. If that happens, the cumulative impacts may be the *B.t.k.* applications over two consecutive years which extend the time of potential exposure and risk to a greater number of non-target lepidopterans.

Mass trapping and delimitation using disparlure pose little or no risk to non-target organisms and do not produce cumulative effects. The risk of cumulative impacts from using disparlure after *B.t.k.* treatment is none to minimal. Little or no effects on water quality, microclimate and soil productivity are likely due to use of *B.t.k.* or disparlure, and the risk of cumulative effects is none to minimal.

Summary

ALTERNATIVE	PREFERRED	HUMAN EFFECT	ENVIRONMENTAL EFFECT	PROGRAM OBJECTIVES
B.t.k	Yes	Short term minor effects are possible, but no long term cumulative effects are anticipated.	Short term effects are likely to nontarget caterpillars. Cumulative effects to nontarget species are not anticipated due to recolonization. No effects to water quality or forest and soil health.	Yes
Gypchek®	No	No effect.	No effect.	No
Diflubenzuron	No	No long or short term effects anticipated at low exposure	Effects are anticipated to nontarget insects and possibly to aquatic arthropods. may affect soil health through impacts on arthropods that alter soil composition and structure	No
Mass Trapping	Yes	No effects.	No effects.	Yes
Mating Disruption	No	No effects.	No effects.	No
Sterile Insect Release	No	No effects.	No effects	No

Monitoring

Programmatic monitoring following the eradication program will be conducted until two years of negative trapping results indicate the gypsy moth infestation has been eradicated. Pheromone traps will be used to monitor the infestation and to determine the success of the eradication program at the Eugene site. This type of programmatic monitoring following *B.t.k.* treatment has been conducted in Oregon during the last 19 years for all the eradication programs.

Mitigation

The following standard operating procedures will be observed to safeguard human health and minimize effects on the environment. Procedures pertaining to both ground and aerial treatments are listed. Because we are proposing an aerial eradication project in the Eugene site, the procedures for aerial treatments are applicable to this year's project.

Ground & Aerial Treatments

-- Oregon Department of Agriculture will work with the Department of Human Services, Health Services, on measures that may be required to safeguard human health. They will provide the public with accurate information on potential risks from *B.t.k.* applications and any recommended personal protection measures.

-- The *B.t.k.* insecticide will be applied according to label instructions.

-- The public and other selected groups or organizations will be notified by project officials by letter, radio, television, newspaper, or other means of spray dates and places, as appropriate.

-- Special emphasis will be placed on avoiding the spraying of areas outside designated eradication area.

-- Transportation of the *B.t.k.* insecticide will be supervised by project personnel to, within, and from the project areas.

-- A safety, spill, and emergency response plan will be prepared.

-- Concerned species and areas may be buffered as needed.

Aerial Treatments

-- No *B.t.k.* will be applied aerially when:

- Wind velocity is zero or exceeds 10 miles per hour.
- Air temperature exceeds 80° F or is less than 38° F.
- Rain is predicted (>50% probability) to occur before adequate drying time has elapsed, i.e., within 6 hours of application.
- Foliage is wet such that drops of water are present on needle or leaf ends or can be shaken from branches. *B.t.k.* will be applied only when the target foliage has dried sufficiently.
- There is fog or poor visibility on the spray block or helispot.
- Relative humidity is less that 50%.
- The air turbulence (thermal updrafts, etc.) is so great as to affect normal application seriously.
- Temperature inversions are present with no air movement sufficient to interrupt the proper settling and penetration of material through the canopy.

-- Aerial *B.t.k.* application will be suspended whenever the *B.t.k.* does not appear to be settling in the target area.

-- Aerial *B.t.k.* applications (using a rotary atomizer as a spray device) will be made by helicopter flying at or in excess of 50 feet above the tree canopy. The project pilots and aircraft will adhere to all FAA requirements.

-- In order to control aerial *B.t.k.* application in large blocks, application aircraft may be accompanied by observation aircraft staffed with a fully qualified observer. Observers and application pilots will fly each spray block for familiarization prior to spraying. Small aerial projects may not require an observation aircraft.

-- Helispot managers and other contract administrators can exercise shutdown authority when they observe aircraft safety or application violations.

-- Spray deposition cards will be utilized to monitor droplet size and coverage.

-- To prevent accidental release of insecticide due to faulty emergency release mechanisms, spray systems will be inspected to ensure that a positive locking mechanism is in place which will not trip accidentally, but only in response to pilot activation during an emergency. Application equipment will be monitored for leaks and equipment failures.

-- School bus routes will not be directly sprayed when children are present.

F. RECOMMENDATION OF THE OREGON DEPARTMENT OF AGRICULTURE

The Oregon Department of Agriculture, Insect Pest Prevention & Management Section recommends that the gypsy moth infestation in the Eugene area be eradicated. The recommended strategy is to use the biological pesticide *Bacillus thuringiensis* var. *kurstaki* (*B.t.k.*) in conjunction with mass/intensive trapping. The *B.t.k.* product used would be either Foray® 48B or Dipel® 6AF. Both are aqueous formulations that have been used in previous gypsy moth eradication and control programs in rural and urban areas of Oregon and other states. We propose three aerial applications of *B.t.k.* at a rate of 24 B.I.U.s per acre (183 acre eradication area in 2004). The three treatments will occur in late April or early May, about 7-14 days

apart. Exact timing depends on weather. Mitigation measures described in the 2004 Environmental Assessment for aerial applications will be followed. It is likely that a small buffer area surrounding the eradication will receive some *B.t.k.* but in quantities much less than inside the eradication area.

Following *B.t.k.* treatments, an intensive/mass trapping program will be used to monitor the effectiveness of the *B.t.k.* applications and to pinpoint the location of any remaining populations in the Eugene area. Trap densities in the core area may be up to 3 to 9 traps per acre. If more moths are caught, additional egg mass searches and treatments will be considered for 2005. Two years of negative trapping results following the treatments would indicate the infestation has been eradicated.

G. CONCLUSION

The environmental analysis conducted by ODA has determined that the proposed gypsy moth eradication program using the bacterial insecticide, *Bacillus thuringiensis* var. *kurstaki* (*B.t.k.*), followed by mass/intensive trapping, will have minimal impact on humans and the environment. This finding is based on the following facts.

1.) *B.t.k.* is a naturally occurring soil bacterium. *B.t.k.* has been used extensively for gypsy moth suppression and eradication programs throughout the United States. In Oregon, *B.t.k.* has been used in gypsy moth eradication programs since 1984.

2.) *B.t.k.* is not harmful to healthy humans, pets, domestic animals, birds, wildlife, or aquatic organisms. Beneficial insects including predators, parasites, and honeybees are not harmed by *B.t.k.* Some non-target butterfly and moth larvae (caterpillars) will be killed by the proposed eradication, but these species should recolonize the eradication block from the surrounding untreated areas. No long-term, irreversible effects to non-target butterflies or moths are expected.

3.) Human health studies during five large eradication programs using *B.t.k.* in populated areas have found no significant health problems attributable to the treatments.

4.) Aqueous formulations of *B.t.k.* contain no organic solvents. None of the inert ingredients of the formulations being considered are on EPA list 1 (Inerts of Toxicological Concern) or list 2 (Potentially Toxic Inerts). The inert ingredients in the *B.t.k.* products being considered have been reviewed by State health professionals and do not present a health risk as used in this program.

5.) There are ten federally listed threatened or endangered species near the proposed eradication area in Eugene but none occurs within the proposed eradication area. Only one concerned plant species –wayside aster, is adjacent to the north boundary of the proposed eradication block. All threatened, endangered or otherwise concerned species occur outside a minimum of one-mile radius of the proposed eradication area, and therefore, should not be adversely affected by the proposed actions.

H. AGENCIES AND PERSONS CONSULTED

Audubon Society of Portland (Bob Salinger) 5151 NW Cornell Rd. Portland, OR 97210 (503) 292-9501 ext 122	For information on sensitive bird species.
National Marine Fisheries Service (Ben Meyer) 525 NE Oregon Street, Suite 500 Portland, OR 97232 (503) 230-5425	For information on threatened and endangered fish species
Oregon Natural Heritage Information Center	For information on threatened

Oregon State University (Sue Vrilakas, Cliff Alton) 1322 SE Morrison Street Portland, OR 97214 (503) 731-3070 ext 103	and endangered species.
Northwest Coalition for Alternatives to Pesticides (Caroline Cox) P.O. Box 1393 Eugene, OR 97440 (541) 344-5044	For review and comment.
Oregon Dept. of Agriculture (Bob Meinke) 635 Capitol St. NE Salem, OR 97301 (541) 737-2317	For information on concerned plant species.
Oregon Dept. of Environmental Quality (Ranei Nomura, Mike Kortenhof) 811 SW 6th Ave. Portland, OR 97204 (503) 229-6035 or 229-5263	For review and comment.
Oregon Dept .of Fish and Wildlife (Holly Michael) 17330 S. E. Evelyn St. Clackamas, OR 97015 (503) 657-2000 X 230	For assistance on threatened and endangered species. For review and comment.
Oregon Department of Forestry (Dave Overhulser) 2600 State St. Salem, OR 97310 (503) 945-7396	For review and comment.
Oregon Department of Human Resources, Health Services (Michael Heumann, Catherine Thomsen) 800 NE Oregon Street, Suite 827 Portland, OR 97232-2162 (503) 731-4025	For assistance on measures to safeguard human health, and for review and comment.
Lane Co. Public Health (Sarah Hendrickson, M.D.; Jeff Lang) 125 E. 8th Ave Eugene, OR 97401 (541) 682-4480	For assistance on measures to safeguard human health, and for review and comment.
Oregon Environmental Council (John Charles) 520 SW 6th Ave., Suite 940 Portland, OR 97204 (503) 222-1963	For review and comment.
Oregon Health Sciences University/Oregon Poison Center (Zane Horowitz, M.D.) Mail Code CB550 3181 SW Sam Jackson Park Rd.	For assistance on measures to safeguard human health, and for review and comment.

Portland, OR 97201 (503) 494-8968	
Oregon State University (Paul Jepson) Integrated Plant Protection Center, Cordley Hall Corvallis, OR 97331	For review and comment.
Paul Hammond 2435 E. Applegate Philomath, OR 97370 (541) 929-3894	For information on threatened or endangered Lepidoptera.
U.S.D.A. Forest Service (Dave Bridgwater, Iral Ragenovich) P.O. Box 3623 333 SW First Ave Portland, OR 97208 (503) 808-2666	For review and comment.
U.S. Fish & Wildlife Service 2600 S.E. 98th Ave., Suite 100 Portland, OR 97266 (503) 231-6179	For information on threatened and endangered species, and to ensure compliance with the Endangered Species Act.

I. LIST OF PREPARERS & REVIEWERS

Preparers: Barry Bai and Kathleen Johnson, Oregon Department of Agriculture, Salem, OR 97301.
Reviewers: Dan Hilburn and Alan Mudge, Oregon Department of Agriculture, Salem, OR 97301.
Charles Divan and Charles Bare, USDA, APHIS, 4700 River Road, Riverdale, MD 20737.

J. REFERENCES

Allen-Reid, D. 1995. Gypsy moth status report. Gypsy Moth News. USDA, Forest Service, Northeastern Area, State and Private Forestry. Jan. 1995. 37:1-2.

Aer'aqua Medicine Limited 2000. Health surveillance following operation ever green: a program to eradicate the white-spotted tussock moth from the eastern suburbs of Auckland; report to the Ministry of Agriculture and Forestry. 60pp.

Brown, M.W. and E.A. Cameron. 1979. Effects of disparlure and egg mass size on parasitism by the gypsy moth egg parasite, *Ooencyrtus kuwanai*. Environmental Entomology. 8: 77-80.

Capital Health Region 1999. Human health surveillance during the aerial spraying for control of north American gypsy moth on southern Vancouver Island, British Columbia, 1999 – a report to the administrator, Pesticide Control Act, Ministry of Environment, Lands and Parks, Province of British Columbia. 36 pp.

Carlson, J., M. Stemeroff, S. Lindgren, A. Hunter, G. Cushon, R. Setter, L. Charleson, and R. Hawe. 1994. A Risk Assessment of European Gypsy Moth in British Columbia. Phero Tech Inc. and Deloitte & Touche Management Consultants. Available from: Agriculture Canada, #202 - 620 Royal Ave., P.O. Box 2523, New Westminster, B.C., Canada V3L 5A8. 73 pp.

Downey, D.M. 1991. Do gypsy moths impact stream water chemistry? Demonstration Project News. Appalachian Integrated Pest Management Project. Vol. 4 (9): 1-3.

Edit, D.C. 1985. Toxicity of *Bacillus thuringiensis* var. *kurstaki* to aquatic insects. Canadian Entomologist. 117:829-837.

Forest Service. 1994. Gypsy Moth News. USDA, Forest Service, Northeastern Area, State and Private Forestry. June, 1994. 35:1-2.

Gaddis, P.K. and C.C. Corkran. 1986. Secondary effects of *B.t.k.* spray on avian predators; the reproductive success of chestnut-backed chickadees. Final Report, on file: Oregon Department of Agriculture, Plant Division, Salem, Oregon. 20 pp.

Gaddis, P.K. 1987. Secondary effects of *B.t.k.* spray on avian predators; the reproductive success of chickadees. Final report, on file: Oregon Department of Agriculture, Plant Division, Salem, Oregon. 21 pp.

Glare, T. R. and O'Callaghan M. 2000. *Bacillus thuringiensis*: Biology, Ecology and Safety. John Wiley & Sons, Ltd, Chichester, UK. 350 pp.

GMDigest. 2002. an historical database containing information (acres and dollars) associated with the USDA cooperative gypsy moth suppression, eradication, and defoliation surveys. On line web page address: http://fhpr8.srs.fs.fed.us/wv/gmdigest/gmdigest.html.

Green, M., M. Heumann, R. Sokolow, L.R. Foster, R. Bryant, M. Skeels. 1990. Public health implications of the microbial pesticide, *Bacillus thuringiensis*: an epidemiological study, Oregon, 1985--86. American Journal of Public Health. 80(7):848-852.

IBT (Industrial Bio-Test Laboratories, Inc). 1972. Acute toxicity studies with Disparlure. IBT No. A 1958. Northbrook, IL; 26p.

Joung, K.B. and J.C. Cote. 2000. A review of the environmental impacts of the microbial insecticide *Bacillus thuringiensis*. Technical Bulletin No. 29, Horticultural Research and Development Center, Agriculture and Agri-Food Canada , QP, Canada. 16 pp.

Kreutzweiser, D.P., S.B. Holmes, S.S. Capell, and D.C. Eichenberg. 1992. Lethal and sublethal effects of *Bacillus thuringiensis* var. *kurstaki* on aquatic insects in laboratory bioassays and outdoor stream channels. Bulletin of Environmental Contamination and Toxicology. 49:252-258.

Lih, M.P., F.M. Stephen, K.G. Smith, L.R. Nagy, and G.W. Wallis. 1995. Effects of a gypsy moth eradication program on nontarget forest canopy insects and their bird predators. pgs 193-198 in Proceedings of the 1994 Annual Gypsy Moth Review. 1994 October 30 - November 2; Portland, OR. National Gypsy Moth Management Board. 375 pp.

Miller, J.C. 1990. Field Assessment of the Effects of a Microbial Pest Control Agent on Nontarget Lepidoptera. American Entomologist. 37:135-139.

Miller, J.C. 1990. Effects of a microbial insecticide, Bacillus thuringiensis kurstaki, on nontarget Lepidoptera in a spruce budworm-infested forest. Journal of Research on the Lepidoptera. 29(4):267-276.

Noble, M.A., P.D. Riben, and G.J. Cook. 1992. Microbiological and epidemiological surveillance programme to monitor the health effects of Foray 48B *B.t.k* spray. Report Submitted to: The Ministry of Forests, Province of British Columbia, Sept. 30, 1992.

North Carolina Department of Agriculture. 1994. Environmental Assessment for Bladen, Brunswick, Columbus, New Hanover, and Pender Counties, Gypsy Moth Eradication Project 1994. North Carolina Department of Agriculture, Raleigh, N.C.

Oregon Department of Agriculture. 1986. Environmental Assessment, Gypsy Moth Eradication Spray Program: Lane and Douglas Counties, April 1986. Oregon Department of Agriculture, Plant Division, Salem, Oregon.

Oregon Department of Agriculture. 1989. The Gypsy Moth in Oregon. Oregon Department of Agriculture, Plant Division, Salem, Oregon. 17 pp.

Oregon Health Services. 2003. Questions and Answers about Gypsy Moth Spraying and Your Health – Oregon Health Services 2003 *B.t.k.* Fact Sheet. March 10, 2003. Oregon Health Services, Portland, Oregon. 5 pp.

Perkins, M. and J. R. Peterson. 1994. Impacts of Bacillus thuringiensis on resident bat populations, Carver, Oregon. Final report, on file: Oregon Department of Agriculture, Plant Division, Salem, Oregon. 13 pp.

Reardon, R., N. Dubois, and W. McLane. 1994. *Bacillus thuringiensis* for Managing Gypsy Moth: A Review. USDA Forest Service, National Center of Forest Health Management, FHM-NC-01-94, 32 pp.

Sample, B.E., L. Butler, R.C. Whitmore. 1992. The impacts of *Bacillus thuringiensis* applications on non-target arthropods: preliminary results. Appalachian Gypsy Moth Integrated Pest Management Demonstration Project News. 5(7):1-4.

Sample, B.E., L. Butler, C. Zivkovich, and R.C. Whitmore. 1993. Evaluation of *Bacillus thuringiensis* and defoliation effects on native Lepidoptera. USDA, Forest Service. AIPM Technology Transfer, NA-TP-10-93. 12 pp.

Schneeberger, N. F. 1996 Gypsy moth populations plummet in 1996 while "the fungus" skyrockets. Gypsy Moth News. 42:1-2.

Severns, P. 2002 Evidence for the negative effects of BT (*Bacillus thuringiensis* var. *kurstaki*) on a non-target butterfly community in western Oregon, USA. Journal of the Lepidopterists' Society. 56:166-170.

Surgeoner, G.A. 1994. Eradication Options for the European Strain of Gypsy Moth in British Columbia. Department of Environmental Biology, University of Guelph, Guelph, Ontario N1G 2W1. 78 pp.

Tuthill, R.W., A.T. Canada, K. Wilcock, P.H. Etkind, T.M. O'Dell, and S.K. Shama. 1984. An epidemiologic study of gypsy moth rash. American Journal of Public Health. 74(8):799-803.

U.S. Department of Agriculture. 1993. Environmental Monitoring Report, Asian Gypsy Moth Eradication Project: 1992. Animal and Plant Health Inspection Service, Biotechnology, Biologics and Environmental Protection, Technical and Scientific Services. 40 pp.

U.S. Department of Agriculture. 1995. Gypsy Moth Management in the United States, A Cooperative Approach. Final Environmental Impact Statement. USDA Forest Service, Northeastern Area State and Private Forestry, Radnor, PA.

U.S. Department of Agriculture, Animal and Plant Health Inspection Service.1994. Gypsy Moth Eradication Database, maintained at Plant Protection and Quarantine, Riverdale, MD.

[USDA FS] USDA Forest Service. 1990. Land and resource management plan (as amended by the 1994 Northwest Forest Plan). Corvallis, OR: Siuslaw National Forest.

U.S. Department Agriculture - Forest Service. 1992. Potential Impacts of Asian Gypsy Moth in the Western United States. Forest Pest Management, State and Private Forestry, P.O. Box 96090, Washington, D.C. or P.O. Box 3623, Portland, OR.

[USDA FS] USDA Forest Service. 1995. Assessment report: Federal lands in and adjacent to Oregon Coast Province. Two volumes. 200 p. Corvallis, OR: Siuslaw National Forest.

[USDA FS] USDA Forest Service. 1997. Lobster-Five Rivers watershed analysis. Corvallis, OR: Siuslaw National Forest.

[USDA FS] USDA Forest Service. 2002. Final environmental impact statement, Five Rivers landscape management project. Corvallis, OR: Siuslaw National Forest. 113 p. plus appendices.

[USDA, USDI] USDA Forest Service, USDI Bureau of Land Management. 1994. Final supplemental environmental impact statement on management of habitat for late-successional and old-growth species within the range of the northern spotted owl. Volume 1. Portland, OR.

U.S. Environmental Protection Agency. 1998. Reregistration Eligibility Decision (RED) *Bacillus thuringiensis* EPA738-R-98-004, March 1998. 151pp.

U.S. Department of Interior, Fish and Wildlife Service. 1972. Results of four-day static fish toxicity studies of rainbow trout and bluegills. Report submitted to USDA.

U.S. Department of Interior, Fish and Wildlife Service. 1975. Report on the study to determine the LC50 of disparlure for mallards and bobwhite quail. Report submitted to USDA, APHIS, PPQ.

Wallner, W. E., N.R. Dubois and P.S. Grinberg. 1983. Alteration of parasitism by *Rogas lymantriae* (Hymenoptera: Braconidae) in *Bacillus thuringiensis*-stressed gypsy moth (Lepidoptera: Lymantriidae) hosts. Journal of Economic Entomology. 76:275-277.

Webb, R.E., M. Shapiro, J.D. Podgwaite, R.C. Reardon, K.M. Tatman, L. Venables and D.M. Kolodny-Hirsch.1989. Effects of aerial spraying with Dimilin, Dipel, or Gypcheck on two natural enemies of the gypsy moth (Lepidoptera: Lymantriidae). Journal of Economic Entomology. 82: 1695-1701.

Whaley, W. H., J. Anhold and G.B. Schaalje. 1998. Canyon drift and dispersion of *Bacillus thuringiensis* and its effects on select nontarget lepidopterans in Utah. Environmental Entomology. 27:539-548.

World Health Organization. 1999. Environmental Health Criteria 217 *Bacillus thuringiensis.* WHO, Geneva 105 pp.