Environmental Assessment

Gypsy Moth

Eradication Program

Columbia and Deschutes Counties

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Lead Agency: Oregon Department of Agriculture

Cooperating Agency: USDA, Animal and Plant Health Inspection Service

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A. PURPOSE AND NEED FOR ACTION

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Decisions

The Oregon Department of Agriculture, in cooperation with USDA, Animal and Plant Health Inspection Service (APHIS), proposes to eradicate one Asian gypsy moth infestation in Columbia County, and one European gypsy moth infestation in Deschutes County, Oregon. At this time funding for this program is pending. 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. A supplement to the EIS is currently being prepared and near completion. The supplemental EIS includes new information on additional treatment options and up-to-date risk assessment s for the bacterial insecticide *Bacillus thuringiensis* var. *kurstaki.* Therefore, no new EIS programmatic analysis other than that found in the EIS and its supplements 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 and Asian 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 and its supplement (due to be completed by 2007). 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 infestations 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 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 Illinois 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 referred to simply as gypsy moths in this document. 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 recently become established in Germany and other European countries where they are hybridizing with European gypsy moths.

Asian gypsy moths differ from European and North American gypsy moths because the females can fly long distances. European and North American 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 European and 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. 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 is 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. In 2004, an 183 acre eradication area was treated by air with *B.t.k.* in the south hills area of Eugene, Lane County to eradicate a gypsy moth infestation. Subsequent trapping indicated that the gypsy moth infestation was successfully eradicated from this site.

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 also 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. In 2004, a gypsy moth infestation was found in a commercial nursery in Eagle Creek, Clackamas County because the nursery imported some infested spruce nursery stocks from Ontario, Canada. An aerial spray program using three applications of *B.t.k.* in 2005 over a 268 acre area successfully eradicated this infestation.

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 programs occurred in Oregon in 2002 and 2006.

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 2006. 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 of 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 Columbia and Deschutes counties in 2007 is based on trapping results during 2006. About 16,207 Asian gypsy moth and gypsy moth traps were placed statewide in 2006. Traps are

concentrated in western Oregon where most population centers and potential host plants are located. Other sites at high-risk for introduction such as national parks, public and private campgrounds, and RV parks, are also trapped. 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 up to nine traps/acre.

In 2006, in addition to the gypsy moth traps placed statewide, major ports and waterways at risk from ships carrying Asian gypsy moth egg masses from the Russian Far East and other sources were also trapped. About 2,822 traps targeting Asian gypsy moth were placed. Due to the potential for first instar larvae to balloon off ships coming up the Columbia River from Astoria to Portland (about 90 miles) this area and the port of Coos Bay (Coos County) are trapped at higher densities as part of the Asian gypsy moth port and waterway survey. The port and waterway survey consists of nine traps per square mile for three miles inland, followed by four traps/ mi^2 for another two miles inland.

Sixty-six gypsy moths (including one Asian gypsy moth) were detected in Oregon in 2006, at seven new and two old sites. All moths were submitted to the USDA Otis Pest Survey, Detection and Exclusion Laboratory for genetic analysis to determine if they are Asian or North American strain. One large, pale male moth caught in St. Helens along the Columbia River Hwy within the Asian gypsy moth port and waterway survey area was determined to be Asian gypsy moth. Genetic tests suggested that the probable ancestral source of the Asian gypsy moth was Korea or China. In addition, single gypsy moths were detected at six new sites: in the Kenton Park and the Holman St./Burrage Ave. areas in north Portland and near Council Crest park in southwest Portland (Multnomah County); in Damascus (Clackamas County); and in O'Brien (Josephine County). One moth was caught in the Hawkins Heights area of Eugene (Lane County) near where a single moth was caught in 2003. Two moths, one from each trap, were caught in Shady Cove near where two moths were caught in a single trap in 2005. Finally, 57 gypsy moths were caught in Bend near where a single gypsy moth was caught in 2005.

Two point sources of introduction are possible for the Asian gypsy moth found in St. Helens along the Columbia River Hwy: high-risk ships moving along the Columbia River and containers and/or cargo imported into St. Helens from Asia, probably through Portland. In October 2006, information was exchanged and/or potential source material examined for egg masses at several sites in St. Helens receiving or exposed to cargo or containers from China, but no Asian gypsy moth life stages were found. The year 2006 marks the third time an Asian gypsy moth has been detected in Oregon. Two previous detections were single catches, one each in north Portland in 1991 and in the Forest Park of Portland in 2000. The current USDA Asian Gypsy Moth Policy states that "In recognition of the behavioral differences between Asian and North American gypsy moths, standard programmatic operations used outside of the generally infested area will be modified. Pretreatment delimiting surveys will not be conducted for AGM due to the potential increase in size and scope an AGM population can achieve in a single year. Control measures will commence as soon as possible after confirmation of an Asian introduction based upon the best information available, followed by extensive post-treatment delimiting surveys".

Following multiple catches in the delimitation trapping grid placed in Bend, additional traps were placed in August 2006. Gypsy moth pest alert materials were distributed and information gathered from residents in the area with the greatest numbers of catches. Live female moths, new egg masses and other life stages were found in August on an apple tree of a residential property. The owner had purchased a 1967 Chevy on E-Bay and shipped it from Connecticut to Bend in January 2005. In early October, numerous live and old egg masses and other life stages were found at the residential property on car parts of the 1967 Chevy as well as nearby on the apple tree, under rocks and under metal sheathing connecting two poles. Bitterbrush, a rosaceous shrub, grows with the native junipers in this central Oregon area. Bitterbrush and nearby ornamental plantings likely provide suitable host plants for gypsy moth. The information available so far indicates that the Bend site 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 Asian gypsy moth infestation from St. Helens, Columbia County, and the gypsy moth infestation from Bend, Deschutes County in 2007 in order to avoid the impacts detailed below.

Objective1: Apply the biological insecticide *B.t.k.* to 640 acres centered on the St. Helens site where 1 male Asian gypsy moth was trapped in 2006 near Firway Lane (see the enclosed St. Helens map for eradication area). Apply *B.t.k.* to 533 acres centered on the Bend site where 57 male gypsy moths were trapped near Crooked Rocks Road (see the enclosed Bend map for eradication area). At both sites, *B.t.k.* will be applied three times by air at a rate of 24 billion international units (i.e., 24

billion cabbage looper units, aka, B.I.U.) per acre about 7-14 days apart starting in late April or May; exact timing depends on weather. Ideally, the *B.t.k.* application should target early instar stages 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 gypsy moth infestation has been eradicated. Three years of negative trapping results are required before an Asian gypsy moth infestation can be declared 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). Between 1992 and 2004, the Forest Service estimated direct resource losses for Asian strain gypsy moth 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 two infestations 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 $125 million to the state of Oregon during 2006. Similarly, the $877 million annual sales of production nursery stock grown in Oregon in 2005, 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 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 infestations in Columbia and Deschutes counties are 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 2006 was about $7.9 billion. Oregon ranks the fourth in the nation with regard to number of visitors to state parks and natural recreation areas. A significant portion 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 1.4 million acres were defoliated by gypsy moth in eastern states in 2000, 1.9 million acres in 2001, 408,000 acres in 2002, and 250,000 acres in 2003. 175,000 acres in 2004, 798,000 acres in 2005 and 1.3 million acres in 2006 (GMDigest 2007). 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, or certain 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 the Asian gypsy moth in St. Helens and the gypsy moth in Bend 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, plants, insects, 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 chemical 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 163,000 acres were treated in 2006 (GMDigest 2007).

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 would be affected by the proposed gypsy moth eradication projects. Two public information meeting notices, one for gypsy moth in Bend and the other for Asian gypsy moth in St. Helens, were sent to property residents in the proposed eradication areas and adjacent properties and to Bend and St. Helens city and Columbia and Deschutes county government offices respectively, on February 16, 2007. The public information meeting notices also included information on the gypsy moth situation, ODA's eradication proposal, and the availability of the draft Environmental Assessment. Letters indicating ODA's proposal with an enclosed draft copy of the Environmental Assessment were also mailed to interested individuals and parties on February 16, 2007. Copies of the public information meeting letter, draft environmental assessment and other information were also placed on the ODA website.

ODA scheduled the public information meeting for Bend on February 27, 2007 at the Calvary Chapel, 20225 Cooley Road, Bend, OR 97701, at 7:00 pm. The public information meeting for St. Helens was scheduled on March 1, 2007 at the St. Helens High School, 2375 Gable Road, St Helens, OR 97051, at 7:00 pm. In addition to sending the dates and locations of the two meetings to residents, concerned parties, and individuals in letters, such information was also published three times each in respective local

newspapers before the meetings. Copies of the meeting notices appearing in two local newspapers are included in Appendix A. The comment period on the draft environmental assessment ended on March 19, 2007.

Eleven people from the public including three from the press attended the public information meeting in Bend. Twelve people from the public attended the public information meeting in St. Helens. ODA presented information at both meetings. Representatives from other concerned agencies and organizations were also present. These included: USDA Forest Service, USDA-APHIS, Oregon Department of Human Services – Public Health Division, Oregon State University Extension – Deschutes and Columbia Counties, Columbia Drainage Vector Control, the Columbia Health District – Public Health, and the City of St. Helens.

The following questions were raised by the audiences at the public information meetings. Some of these questions were related to the environmental assessment, but most were not. All questions were answered orally by staff from the ODA or the Oregon Department of Human Services – Public Health Division at the respective meeting. In addition, one email and five telephone calls were received regarding the proposed eradication project. The email and phone calls were concerned about effects of B.t.k. on human health/school children, domestic animals and on outdoor articles including cars. One call was about the spray schedules and notification to the public. Another call from a resident in north Bend concerned about caterpillars on his trees. He would like to know if they were gypsy moth. All inquiries from email and phone calls were responded to by ODA staff via email or phone. No written comments were received regarding the draft EA by the end of the commenting period. All questions relevant to the environmental assessment were addressed in the 1995 EIS or the environmental assessment. None of the questions, from meetings, emails, telephone calls 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 Bend:

- Does the spray residue damage articles that it lands on?
- What is the reasoning for doing three aerial applications?
- Do I have to bring all domestic animals inside during the spray?
- Are you going to be applying over canals in the area and how far downstream will residues go?
- I have many host trees on my property. How can I get burlap bands for my trees?
- I found caterpillars on my red alders. Can I get traps on my property?
- What if we have a thunderstorm after the spraying is done? How long does it take to dry before it can be washes off?
- Do you use detergent to make the *B.t.k.* adhere to the plants?
- Do you have any plans to inform Lowe's or Home Depot about them possibly shipping egg masses on wooden building materials?
- Is it true that gypsy moth larvae can travel 12 miles? How does this relate to your relatively small spray block?
- If the egg masses are located under the rocks, how will the spray get to them.

Questions from the public information meeting in St. Helens:

- Will time and day of *B.t.k.* application be clear in notifications?
- Would you [an ODA employee] expose yourself to *B.t.k.*?
- How long has *B.t.k.* been studied?
- What if I got out and gardened a week after a *B.t.k.* application? Will I have an allergic reaction?
- Why is the re-entry period for *B.t.k.* four hours (for agriculture use)?
- If the Asian gypsy moth was a problem in our area, what would the consequences be?
- When you do the aerial spray, will you focus on particular parts or blanket the entire spray area?
- Is St. Helens a perfect landscape (candyland) for Asian gypsy moth?
- Will the *B.t.k.* kill the moth if it hits the caterpillar?
- Since the compound that is sprayed does not discriminate, will this adversely affect other lepidoptera?
- Can *B.t.k.* persist in the environment?
- Does *B.t.k.* hurt honey bees?

- Are there going to be other public information meetings?
- Has an aerial contractor been determined?
- Are there going to be other methods of communicating with the public? (Audience suggested KOHI 1600 am radio station which begins broadcasting at 6:00 am, and Extension Office phone message or website for posting spray schedule information.)

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. Concerns were expressed about developing an organic formulation of *B.t.k.* product for gypsy moth eradication projects. This may reduce people's anxiety over undisclosed inert ingredients. 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 ponds 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. During the last several years, concerns have been also expressed about how to prevent introduction of the gypsy moth or Asian gypsy moth from infested states or countries through quarantine or other methods, especially when the pathway is known.

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 also 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 infestations 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 and its supplement. Readers are encouraged to consult the 1995 final EIS and the supplemental 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 were summarized and presented to the Director of the Oregon Department of Agriculture for evaluation prior to her decision regarding implementation of the Department's proposal or another alternative. Written comments from concerned parties and individuals on the draft EA would be included in the final EA. However, we received no written comments on draft EA this year. Thus, no written comments were included.

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

St. Helens, Columbia County. The 640-acre eradication area is the area proposed to receive *B.t.k.* treatment sufficient to eradicate the Asian 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.

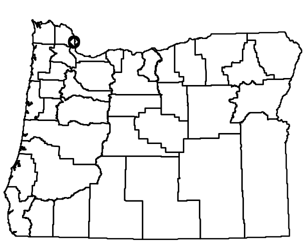
The proposed Asian gypsy moth eradication area is centered around the positive Asian gypsy moth catch at the end of Firway Lane. It includes a residential area west of Highway 30 and the commercial and industrial area east of Highway 30 in the southwest portion of St. Helens, Columbia County. The exact location is on the west side of the Columbia River west of the Boise Cascade mill taking up almost exactly the entirety of section T4N R1W Sec. 8. The boundary begins at the New Way Moving and Storage, 540 Milton Way at N 45.85280, W 122.82640 (GPS readings of the latitude and longitude), approximately 200 feet northeast of the intersection of Milton Way and Port Avenue. It then proceeds due west 5280 feet (one mile) to the edge of a new residential subdivision west of Whitetail Avenue at the end of Stag Street at N 45.85280, W 122.84965. From there it turns 90 degrees south and proceeds about 5280 feet (one mile) to a point west of Morse Road at N 45.83837, W 122.84965. It then turns a 90 degree angle to the east and proceeds about 5280 feet (one mile) to a point in the pasture behind the ranch supply business – Winners Circle Farm Feed and Tack, 58212 Old Portland Road at N 45.83837, W 122.82640. From here, it turns 90 degrees north and proceeds for about 5280 feet (one mile) to the starting point (see attached map for St. Helens).

There are about 400 residential properties, 30 businesses and 10 industrial sites within the 640-acre eradication area. Residential properties are mostly west of Hwy 30 and are single family residences, with the exception of one apartment complex and a retirement facility on Gable Road. Businesses are mainly along the two sides of Hwy 30. Industrial sites are all located in the area between Hwy 30 and the Columbia River. Hwy 30 divides the proposed eradication area into two distinct parts, one part being largely

Proposed 2007 Asian Gypsy Moth Eradication Program
St. Helens, Columbia County

Proposed 640 acre eradication area.

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.



eradication area

2006 positive trap

waterbody

watercourse

railroad

taxlot

city limits

N

0.5 Miles

Data Source(s): Oregon Geospatial Data Clearinghouse, ESRI Street-Map USA, Columbia County, Pacific Northwest Hydrogaphy Framework

Prepared By: kschwarz
Printing Date: February 6, 2007
Projection: Oregon Lambert Coord. Syst.
Datum: NAD 83
File: D:\trapmaps07\Columbia County\AGM07_EA_8x11_B&W.mxd

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residential and the other primarily industrial. A railroad line runs along the east side of Hwy 30 carrying commercial products north and south. The proposed eradication area contains one school (St. Helens High School), four churches, one retirement facility, one mental health clinic and two day care centers. The industrial area is lightly vegetated with oak and fir trees and shrubs with open parking areas and pasture. Most of this industrial area is within St. Helens city limits. However, the southwest portion of the eradication area west of Hwy 30 is outside St. Helens city limits. A riparian habitat with heavy vegetation coverage runs along McNulty Creek, which bisects the proposed spray area running from west to east. Trees present include a mixture of hardwoods and softwoods, primarily oak and Douglas fir. Major trees include: oaks, ashes, maple, Douglas fir, pines, apple, willow, hawthorne, sycamore, sweet gum, European beech, cherry. Common shrubs and low level vegetation in the area include English holly, rhododendron, blackberry, and English ivy. Some conifer trees in private residences and along McNulty Creek may be over 100 feet tall. Terrain in the proposed eradication area is relatively flat with good road access rising only slightly in elevation toward the west away from the Columbia River. Elevation in the area varies between 20 and 164 feet. Many trees and shrubs in private yards and along the creek can serve as good hosts for the Asian gypsy moth.

Bend, Deschutes County. The proposed gypsy moth eradication area is in the rural and forested area in the north part of Bend, Deschutes County. The area boundary lies within T17S R12E Sec. 8, 9, 17, and 16, covering about 533 acres north of the intersection between Hwy 20 and Hwy 97. The exact location of the proposed eradication area covers the positive gypsy moth catches and infestation. The boundary begins at a point on Hwy 20 at N 44.11860, W 121.31645 (GPS readings of latitude and longitude), about 190 feet southeast of the intersection of the Hwy 20 and the Old Bend Redmond Hwy. It then proceeds east for 4959 feet to a point at N 44.11845, W 121.29758, about 305 feet east of Hunnell Road. The boundary then turns 93 degrees south and proceeds for 6534 feet to a point at N 44.10055, W 121.29656 at the railroad tracks. It then turns 88.5 degrees west and proceeds for 2150 feet to Hwy 20 at N 44.10047, W 121.30473, north of the intersection of Hwy 20 and Hwy 97. From there, the west boundary then follows Hwy 20 for 7297 feet to the starting point (see attached map for Bend).

There are about 60 properties within the proposed 533 acre eradication area; Most are single family residences. About 10 shopping centers or businesses and two churches are within the southern portion of the proposed eradication area. No schools, daycare centers, hospitals or other sensitive areas exist within the proposed eradication block. The golf driving range has one tall pole. Trees present include a mixture of softwoods and hardwoods. This is central Oregon's high desert country. Junipers dominate the tree canopy in natural undisturbed areas. However, urban areas and residences often have landscape trees and other vegetations. These trees include ponderosa pines, willow, mountain ash, poplar, birch, beech, apple, peach, plum, lilac, red maple, and red oak. Trees in the area may be as tall as 50 feet. Shrubs in the area include bitterbrush, rabbitbrush and other sagebrush. Various grasses cover the ground in the area as well. Many trees and shrubs at the Bend site can serve as good hosts for the gypsy moth. No natural ponds or lakes are present within the proposed eradication area. Two irrigation canals run through the block and are operational from April 15th through October 15th. In addition, many residences have a holding pond on their property to hold water from the canal for their irrigation or recreation needs. Some residences in the area have horses, sheep, emus, cows, llamas and/or dogs. Wildlife present in the area includes geese, ducks, and deer. Terrain in the proposed eradication area is generally flat. The south portion of the eradication area includes a shopping mall and other retail areas whereas the northern portion is mostly rural and residential and outside the Bend city limit.

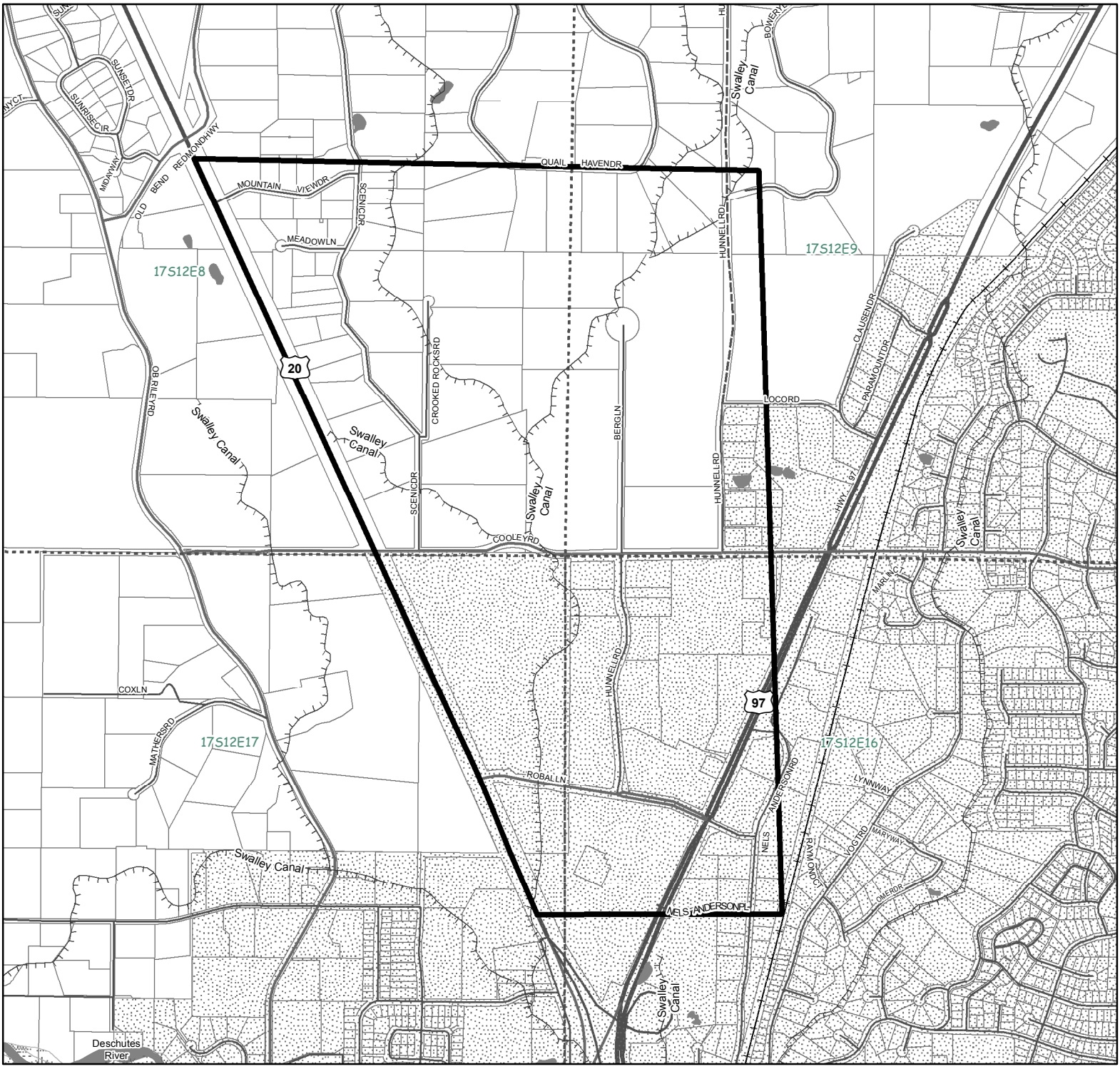
Environmental Factors

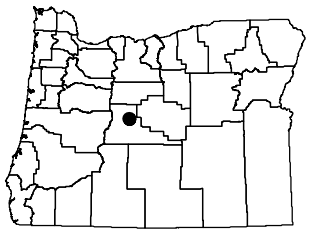
St. Helens, Columbia County. Thirteen threatened or endangered species may occur within or around the proposed Asian gypsy moth eradication area in the St. Helens site. These include one mammal (Columbian white-tailed deer *Odocoileus virginianus leucurus*), two birds (bald eagle *Haliaeetus leucocephalus* and northern spotted owl *Strix occidentalis caurina*), five fish (Chum salmon *Oncorhynchus keta,* coho salmon *Oncorhynchus kisutch,* steelhead *Oncorhynchus mykiss,* sockeye salmon *Oncorhynchus nerka*, and chinook salmon *Oncorhynchus tshawytscha*), and five plants (Golden Indian paintbrush *Castilleja levisecta*, Howellia *Howellia aquatilis*, Bradshaw's lomatium *Lomatium bradshawii*, Kincaid's lupine *Lupinus sulphureus* var. *kincaidii* and Nelson's checker-mallow *Sidalcea nelsoniana*). Two candidate species (yellow-billed cuckoo *Coccyzus americanus* and Oregon spotted frog *Rana pretiosa*) and many species of concern may also be present in the area (Appendix B). Species of concern are those

Proposed 2007 Gypsy Moth Eradication Program
Bend, Deschutes County

Proposed 533 acre eradication area.

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.





eradication area
canal
waterbody
city limits
railroad

N

Miles
0.25

Prepared By: kschwarz
Printing Date: February 8, 2007
Projection: OR Lambert Coordinate System
Datum: NAD 83
File: D:\trapmaps07\Deschutes County\Bend_Erad07_EA_8x11.mxd

Data Source(s): Oregon Geospatial Data Clearinghouse, Deschutes Co., Regional Ecosystem Office.

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taxa whose conservation status is of concern to the US Fish and Wildlife Service, but for which further information is needed.

One deer (Columbian white-tailed deer *Odocoileus virginianus leucurus*), two rodent species (white-footed vole *Arborimus albipes* and camas pocket gopher *Thomomys bulbivorus*) and six bat species may occur in the proposed eradication area. These bats include Pacific western big-eared bat (*Corynorhinus 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*). The deer is an endangered species whereas rodents and bats are species of concern. The deer and rodents can live in the riparian wooded areas along the Columbian River and its tributaries or the mountains and forests in the county. The deer is herbivorous. Its main food source includes annuals, forbs and shrub species. No sighting of the deer is recorded within or nearby the proposed eradication area in St. Helens. The white-footed vole is omnivorous and eats mostly plant seeds and other vegetation materials. It also eats invertebrates sometimes. The camas pocket gopher likes sandy areas and digs tunnels in the soil. Its main food source includes bulbs (such as lilies and onions), roots of trees, carrots, potatoes and grasses. The bats are mostly insectivorous and will forage for moths 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 five 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 any of the bats is affected due to the decline in food supply, the effects will be temporary and localized, with no long-term impact to any bat species.

The bald eagle (*Haliaeetus leucocephalus*) and northern spotted owl (*Strix occidentalis caurina*) can occur in the forested areas inside and around the proposed eradication area because of the suitable habitat. Disturbance and noise by a low flying aircraft are the only potential factors that could impact the nestlings of the eagles. However, ground inspection and consultation with the Oregon Natural Heritage Information Center did not indicate any nesting sites within or close to the proposed eradication area in St. Helens. Two previous bald eagle nests, one about two miles northeast and the other about one mile south of the proposed eradication area, were identified prior to 2003. Both are no longer active. The main food sources for northern spotted owls are rodents including red tree voles and northern flying squirrels in the forest. The owls' critical nesting period is between March and July. The proposed actions using eradication sprays with *B.t.k.* will have no effect on the bald eagle and the northern spotted owl or the designated critical habitat for the northern spotted owl.

One candidate bird species (yellow-billed cuckoo *Coccyzus americanus*) and seven species of concern may also occur in or near the proposed eradication area. These bird species of concern include: band-tailed pigeon *Columba fasciata,* olive-sided flycatcher *Contopus cooperi*, yellow-breasted chat *Icteria virens,* Lewis' woodpecker *Melanerpes lewis*, mountain quail *Oreortyx pictus*, 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 four of these birds are insectivorous and can prey on a variety of insect orders including mosquitoes and Lepidopteran caterpillars. The Oregon vesper sparrow is a grassland bird. It forages usually on the ground for both seeds and insects. The Lewis' woodpecker is an oak woodland species. It forages for acorns, other plant seeds as well as insects. Band-tailed pigeons usually forage on trees whereas mountain quail forages mostly on ground. The food source for both of these birds includes plant seeds (such as berries) and other vegetation materials. These birds eat insects occasionally but insects are not their main food source. However, none of these bird species is actually present in the proposed eradication area. Purple martin is the only bird species that was sighted more than a mile away mostly near the waterways along the Scappoose Bay and Multnomah Channel to the east and south. 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 is small. Any local Lepidopteran species affected are likely to re-invade the area from neighboring habitats.

Three rare frogs (Oregon spotted frog *Rana pretiosa*, tailed frog *Ascaphus truei* and northern red-legged frog *Rana aurora aurora*) and one rare turtle (northwestern pond turtle *Emys marmorata marmorata*) may also occur in the surrounding area. The Oregon spotted frog is a candidate threatened species whereas the other three species are species of concern. The frogs and turtle require aquatic or semi-aquatic habitats and are omnivorous with a preference for invertebrates. Their main food source is probably aquatic insects and other invertebrates in creeks and rivers. Only northern red-legged frogs were sighted previously on Sauvie Island about 1.5 miles southeast of the eradication area. The proposed action should not affect the frogs and turtle because as used in this program, *B.t.k.* will not affect aquatic invertebrates even if they are present in McNulty Creek.

Nine species of fish, Chum salmon *Oncorhynchus keta,* coho salmon *Oncorhynchus kisutch,* steelhead *Oncorhynchus mykiss,* sockeye salmon *Oncorhynchus nerka*, and chinook salmon *Oncorhynchus tshawytscha,* green sturgeon *Acipenser medirostris*, river lamprey *Lampetra ayresi,* Pacific lamprey *Lampetra tridentate,* and coastal cutthroat trout *Oncorhynchus clarki clarki*, may be found in the nearby Columbia River and its tributaries. The first five species of fish are threatened or endangered. The remaining four are species of concern. Columbia River is about one mile east of the proposed eradication area. Its tributaries in the area include McNulty Creek, Scappoose Bay, and Multnomah Channel. The food source for these fish may include aquatic insects and other invertebrates in the river and creek. Because the *B.t.k.* treatment will not affect aquatic invertebrates, the proposed action using *B.t.k.* will have no effect on these fish or the designated critical habitat of sockeye salmon and Chinook salmon.

Rare plants found in the vicinity of the St. Helens eradication area include five endangered or threatened species (Golden Indian paintbrush *Castilleja levisecta*, Howellia *Howellia aquatilis*, Bradshaw's lomatium *Lomatium bradshawii,* kincaid's lupine *Lupinus sulphureus* var. *kincaidii* and Nelson's checker-mallow *Sidalcea nelsoniana*) and three species of concern (pale larkspur *Delphinium leucophaeum*, Willamette Valley larkspur *Delphinium oreganum* and Oregon sullivantia *Sullivantia oregana*). None of these plants are pollinated by Lepidoptera (butterflies and moths) and none occur in the proposed eradicative area. These plants are pollinated by wind, hummingbirds, or bees. Only two species (Howellia and Oregon sullivantia) were recorded from surrounding areas outside the eradication area. The proposed action, therefore, will have no effect on these plants.

Thus, the proposed action will have no effect on threatened or endangered species or their designated critical habitat in the St. Helens area.

Bend, Deschutes County. Four threatened species may occur within or around the proposed gypsy moth eradication area in the Bend site. These include one mammal (Canada lynx *Felis lynx canadensis*), two birds (bald eagle *Haliaeetus leucocephalus* and northern spotted owl *Strix occidentalis caurina*), and one fish (bull trout *Salvelinus confluentus*). Critical habitat has been designated for bull trout in Deschutes County. Three candidate species (Pacific fisher *Martes pennanti pacifica,* yellow-billed cuckoo *Coccyzus americanus,* and Oregon spotted frog *Rana pretiosa*) and many species of concern may also be present in the area (Appendix B). 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.

One lynx (Canada lynx *Felis lynx canadensis*), one fisher (Pacific fisher *Martes pennanti pacifica*), four other mammal species (pygmy rabbit *Brachylagus idahoensis*, Californian wolverine *Gulo gulo luteus*, Californian bighorn *Ovis canadensis californiana,* and Preble's shrew *Sorex preblei*) and six bat species may occur in the proposed eradication area. These bats include pale western big-eared bat (*Corynorhinus townsendii pallescens*), silver-haired bat (*Lasionycteris noctivagans*), small-footed myotis (*Myotis ciliolabrum*), long-eared myotis (*Myotis evotis*), long-legged myotis (*Myotis volans*), and Yuma myotis (*Myotis yumanensis*). The first mammal is a threatened species, the second is a candidate species, and the other 10 are all species of concern. The Canada lynx is a threatened species whose normal range includes Alaska and Canada south into northern continental U.S. It lives in hollow logs, root balls, or other sheltered places in forested areas and swamps. It is a carnivore eating primarily snowshoe hares; also rodents and birds. The fisher is a candidate species and can live in the riparian wooded areas along the Deschutes River and its tributaries. The fisher is carnivorous. Its main food source includes voles, squirrels, mice, etc. The pygmy rabbit and Preble's shrew may be found in sagebrush habitat of central Oregon's high desert country. The former is an herbivore feeding primarily on sagebrush whereas the latter is a carnivore feeding mostly on small invertebrates. Both the wolverine and bighorn sheep may be

found in wilderness, high mountain areas. The wolverine eats mostly carrions and the sheep mostly grasses and shrubs. No sightings of any of the above mammals were recorded in or near the proposed eradication area. The proposed action will have no effect on these mammal species and their food sources.

The pale 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 five 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 will not reach their breeding stage (peak feeding period) until July in central 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 any of the bats is affected due to the decline in food supply, the effects will be temporary and localized, with no long-term impact to any bat species.

The bald eagle (*Haliaeetus leucocephalus*) and northern spotted owl (*Strix occidentalis caurina*) can occur in the forest near the proposed eradication area because of the suitable habitat. Disturbance and noise by a low flying aircraft are the only factors that can impact the eagle. However, ground inspection and consultation with the Oregon Natural Heritage Information Center did not indicate any nesting sites within or close to the proposed eradication area in Bend. One previous sighting of bald eagles in Tumalo State Park, about one mile west of the proposed eradication area, was recorded in 1983. The main food sources for northern spotted owls are rodents including red tree vole and northern flying squirrels in the forest. The owls' critical nesting period is between March and July. The proposed action will not affect the bald eagle, the northern spotted owl, their food sources or the designated critical habitat for northern spotted owl.

One candidate bird species (yellow-billed cuckoo *Coccyzus americanus*) and twelve species of concern may also occur in or near the proposed eradication area. These concerned bird species include: northern goshawk *Accipiter gentilis*, western burrowing owl *Athene cunicularia hypugea,* ferruginous hawk *Buteo regalis,* greater sage-grouse *Centrocercus urophasianus,* black tern *Chlidonias niger,* olive-sided flycatcher *Contopus cooperi*, willow flycatcher *Empidonax trailli adastus,* Harlequin duck *Histrionicus histrionicus,* yellow-breasted chat *Icteria virens,* Lewis' woodpecker *Melanerpes lewis*, mountain quail *Oreortyx pictus*, and white-headed woodpecker *Picoides albolarvatus*. The yellow-billed cuckoo, black tern, flycatchers, and the yellow-breasted chat are all riparian birds that forage in trees. These birds are insectivorous and can prey on a variety of insect orders including mosquitoes and Lepidopteran caterpillars. The woodpeckers are oak woodland species. They forage for acorns and other plant seeds as well as insects. Mountain quail forages mostly on the ground. The food source for the bird includes plant seeds (such as berries) and other vegetation materials. It eats insects occasionally but insects are not its main food source. Of the listed candidate and concern bird species, Lewis' woodpecker is the only one that was previously sighted in and around the proposed eradication area in 1983. None of the other bird species are actually present in the proposed eradication area. 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 is small. Any local Lepidopteran species affected are likely to re-invade the area from neighboring habitats.

Three rare frogs (Oregon spotted frog *Rana pretiosa*, tailed frog *Ascaphus truei,* and cascades frog *Rana cascadae*), one salamander (Oregon slender salamander *Batrachoseps wrighti*), and one lizard (Northern sagebrush lizard) may also occur in the surrounding area. The Oregon spotted frog is a candidate threatened species whereas the remaining four species are species of concern. The frogs, lizard, and salamander require aquatic or semi-aquatic habitats and are omnivorous with a preference for invertebrates. Their main food source is probably aquatic insects and other invertebrates in creeks, rivers, and ponds. None of these species were recorded within or near the proposed eradication area. The proposed action should not affect the frogs, salamander, and lizard because as used in this program, *B.t.k.* will not affect aquatic invertebrates even if they are present in the area.

Three species of fish, bull trout *Salvelinus confluentus*, Pacific lamprey *Lampetra tridentate,* and interior redband trout *Oncorhynchus mykiss gibbsi,* may be found in the Deschutes River and its tributaries, which are about one mile west to the proposed eradication area. The first species of fish is a threatened species whereas the second and third species are species of concern. The food source for these fish may include

aquatic insects and other invertebrates in the river. The *B.t.k.* treatment will not affect aquatic invertebrates. The proposed action using *B.t.k.* will have no effect on these fish and the designated critical habitat for bull trout.

Rare plants found in the vicinity of the Bend eradication area include seven species of concern (Estes' artemisia *Artemisia ludoviciana* ssp*. estesii,* cliff paintbrush *Castilleja rupicola*, Cusick's erigonum *Eriogonum cusickii,* disappearing monkeyflower *Mimulus evanescens* , little mousetail *Myosurus minimus* ssp*. apus ,* Peck's penstemon *Penstemon peckii,* and Howell's theylpody *Thelpodium howellii* ssp*. howellii*). None of these plants are pollinated by Lepidoptera (butterflies and moths) and only two (the first and last) may occur in or near the proposed eradicative area. These plants are pollinated by wind, humming birds, or bees. The proposed action, therefore, will have no effect on these plants.

Thus, the proposed action will have no effect on threatened or endangered species, any candidate species or any designated critical habitat in Bend.

Human Factors

St. Helens, Columbia County. There are relatively few unusual hazards known in the proposed Asian gypsy moth eradication area in St. Helens. One school (St. Helens High School on Gable Road), three churches, a retirement facility, one mental health clinic, and two daycare centers are within the proposed eradication area. School buses travel through the proposed eradication block along Hwy 30, (the main north-south highway) as well as other residential streets to deliver students to and from St. Helens High School in the morning and afternoon. A commercial/industrial area is included within the eradication area. The commercial/industrial area includes about 30 commercial sites and 10 light industrial sites, such as Wal-Mart, Safeway, Honda motorcycle dealer, and small manufacturing businesses. A couple of tall cell phone towers within or near the eradication area may pose a hazard to low flying application aircraft. The sports field in St. Helens High School has several tall light posts that may also pose risks to low flying aircraft. The Columbia River, Multnomah Channel and Scappoose Bay are about one mile east of the proposed Asian gypsy moth eradication area. Foreign and domestic ships often bring goods up the Columbia River to the Port of Portland.

St. Helens serves in part as a bedroom community for the city of Portland because of its proximity (about 30 miles northwest of Portland). Tourism, recreation, lumber/wood products, transportation, and nursery are probably the most important industries affecting humans around St. Helens. Columbia County is predominated by state and private forestry land in the coast range. Some local residents have home orchards, gardens, pastures, or small wood lots. Establishment of gypsy moth would be expected to adversely affect some of these industries. Parks and recreation areas with defoliated trees and shrubs would be less attractive to tourists and locals. Broad leaf trees are important components of the local flora in the city and the forest, and are preferred hosts for gypsy moth. The diminished quality of defoliated trees in forestry land could adversely affect the timber industry in the area. Nursery trade could be disrupted by quarantines; additional pesticide treatment and inspections could be required.

Bend, Deschutes County. The proposed eradication area in Bend has two churches and a shopping center within its boundary. No other unusual hazards are known in the proposed eradication area. There are no schools, daycare centers, or hospitals.

Tourism, recreation, education and forestry are probably among the most important industries affecting humans around Bend. Bend has abundant recreational facilities with the Deschutes National Forest and Newberry National Volcanic Monument nearby. Sunriver, a high desert resort town with largely retired residents, is about 13 miles south. Golf courses, lake and mountain resorts, and other recreation facilities are in or within a short distance of the city. Bend, with the Central Oregon University, is a higher education center for central Oregon. Establishment of gypsy moth would be expected to adversely affect these industries because trees and shrubs in parks, university campuses, national forests, mountains, and other recreation areas can serve as hosts to gypsy moth. Broadleaf trees are important components of residential landscapes and parks in the city and the forest, and are preferred hosts for gypsy moth. Reduction in the quality of life due to gypsy moth defoliation of trees and shrubs could adversely affect the ability of the city to attract high-tech industries and other high paying jobs.

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 St. Helens and Bend sites are analyzed in the 1995 gypsy moth programmatic EIS and its later supplement. 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 Asian gypsy moth and gypsy moth eradication programs 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 *B.t.k.* and mass/intensive trapping. 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 Asian gypsy moth and 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 or near our proposed eradication areas in either St. Helens or Bend. 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 Asian gypsy moth and 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 Asian gypsy moth and gypsy moth eradication programs in the United States. In the past decades, 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 20 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 Asian gypsy moth and 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. Both sites at St. Helens and Bend are suitable for aerial applications because of the large area 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 640 acre eradication area in St. Helens and 533 acre eradication area in Bend in 2007. The three treatments will start in late April in St. Helens and mid May in Bend, 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 both areas. Trap densities in the core areas may be up to 3 to 9 traps per acre.

E. ENVIRONMENTAL CONSEQUENCES

This section will address the effects of the preferred action alternative on the affected environment for the proposed eradication sites. Two areas of effects, human health and environment, were analyzed in detail

in the 1995 gypsy moth programmatic EIS and its later supplement 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 an Asian gypsy moth or 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. A more recent, extensive review was submitted by Syracuse Environmental Research Associates, Inc. (2004) to USDA Forest Service. This review, "Control/Eradication Agents for the Gypsy Moth – Human Health and Ecological Risk Assessment for *Bacillus thuringiensis* var. *kurstaki* (*B.t.k.*) Final Report," concluded that "Sensitive terrestrial insects are the only organisms likely to be seriously affected by exposure to *B.t.k.* or its formulations. All sensitive terrestrial insects are lepidoptera and include some species of butterfly, like the endangered Karner blue and some swallowtail butterflies and promethea moths. At the application rates used to control gypsy moth populations, mortality rates among sensitive terrestrial insects are likely to range from approximately 80% to 94% or more. The risk characterization for other wildlife species is unambiguous: under foreseeable conditions of exposure, adverse effects are unlikely to be observed." It further concluded "In terms of potential human health effects, formulations of *B.t.k.* are likely to cause irritation to the skin, eyes, and respiratory tract; however, serious adverse health effects are implausible. For members of the general public, exposure levels are estimated to be below the functional human NOAEL for serious adverse effects by factors of about 28,000 to 4,000,000 [4 million]. At the extreme upper range of exposure in ground workers, exposure levels are estimated to be below the functional human NOAEL for serious effects by a factor of 25. This assessment is based on reasonably good monitoring data, conservative exposure assumptions, and an aggressive and protective use of the available toxicity data."

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 areas 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 mosquitoes and 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). McNulty Creek transects the Asian gypsy moth eradication area in St. Helens and flows east into Scappoose Bay about one mile east of the eradication area. Swalley Canal runs through the gypsy moth eradication area in Bend. Deschutes River is about a mile to the southwest of the eradication area in Bend. When *B.t.k.* is used for Asian gypsy moth or gypsy moth suppression or eradication in blocks with open water, fish and other animals dependent on aquatic insects for food will 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 were not 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 both St. Helens and Bend 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 areas are relatively small, the opportunity for recolonization from the surrounding areas is great. Another possible cumulative impact at both sites will be if the treatment needs to be conducted again in 2008 due to the spread of Asian gypsy moth or gypsy moth to areas larger than

expected. For example, if the gypsy moth infestation spread to areas larger than the 2007 eradication area, i.e., larger than 533 acres in Bend, then an enlarged area may be sprayed in 2008. 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 and three years of negative trapping results indicate the gypsy moth and Asian gypsy moth infestations respectively have been eradicated. Pheromone traps will be used to monitor the infestations and to determine the success of the eradication programs at both sites. This type of programmatic monitoring following *B.t.k.* treatment has been conducted in Oregon during the last two decades 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 both sites, 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, Public Health Division, 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 areas.

-- 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^{O} F or is less than 38^{O} 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 a helicopter or fixed wing aircraft 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 Asian gypsy moth infestation in St. Helens and the gypsy moth infestation in Bend 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 Foray® 48B (Appendix C). This aqueous formulation has 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 billion international units (i.e., 24 billion cabbage looper units) per acre in a 640 acre eradication area in St. Helens and a 533 acre eradication area in Bend. The three treatments will begin in late April in St. Helens and mid May in Bend, about 7-14 days apart at each site. Exact timing depends on weather. Mitigation measures described in the 2007 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, 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 either St. Helens or Bend. Trap densities in both areas will be 3 to 9 traps per acre. If more moths are caught, additional egg mass searches and treatments will be considered for 2008. Two years of negative trapping results following the treatments would indicate the infestations have been eradicated. Three years of negative trapping results are required before an Asian gypsy moth can be declared 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.*) and mass/intensive trapping, will have no significant 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 blocks from the surrounding untreated area. 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.) Thirteen federally listed threatened or endangered species may occur near the proposed Asian gypsy moth eradication area in St. Helens and another four near proposed gypsy moth eradication area in Bend. None of these listed species occur within the proposed eradication areas except perhaps some fish species in the McNulty Creek in St. Helens. The proposed action will have no effect on threatened or endangered species or their designated critical habitats within or near the eradication areas.

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 (Michael Tehan) 525 NE Oregon Street, Suite 500 Portland, OR 97232 (503) 231-6894	For information on threatened and endangered fish species
Oregon Natural Heritage Information Center Oregon State University (Sue Vrilakas, Cliff Alton) 1322 SE Morrison Street Portland, OR 97214 (503) 731-3070 ext 103	For information on threatened 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 (Elliot Zais) 2020 SW 4th Ave., Suite 400 Portland, OR 97201 (503) 229-5292 or 229-5263	For review and comment.
Oregon Dept. of Environmental Quality (Mike Kortenhof) 750 Front St. Suite 120 Salem, OR 97301 (503) 378-8240 ext 267	For review and comment.
Oregon Department of Forestry (Rob Flowers) 2600 State St. Salem, OR 97301 (503) 945-7396	For review and comment.
Oregon Department of Human Services, Health Services (Michael Heumann, Kenneth Kauffman) 800 NE Oregon Street, Suite 827 Portland, OR 97232-2162 (503) 731-4573	For assistance on measures to safeguard human health, and for review and comment.
Oregon Environmental Council (John Charles)	For review and comment.

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For assistance on measures to safeguard human health, and for review and comment.

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For information on threatened or endangered Lepidoptera.

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For site specific information in Bend and review, comment.

U.S. Fish & Wildlife Service
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For information on threatened and endangered species, and to ensure compliance with the Endangered Species Act.

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