Washington State Department of Health
Division of Environmental Health
Office of Environmental Health Assessments

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European Gypsy Moth Fact Sheet

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The European gypsy moth has been a serious pest of forest, fruit, and shade trees in the eastern United States for about 100 years. Occasional local infestations have been detected in Washington State since 1974. The Washington State Department of Agriculture (WSDA) has successfully eradicated each infestation. Communities and citizens often want to understand the health risks associated with the WSDA eradication efforts and learn more about gypsy moth control options. On the following pages, the Washington State Department of Health (DOH) outlines information on gypsy moth and health considerations associated with gypsy moth control options.

What is the European Gypsy Moth?

The gypsy moth is not native to the U.S. and is considered an invasive species. Like most invasive species it lacks its native predators (i.e., birds, parasitic wasps) and diseases (i.e., viruses, bacteria, and fungi) to keep its population in balance with the rest of the ecosystem. Gypsy moths are prone to overwhelming population outbreaks and spectacular crashes in areas where they have become established. The caterpillars can eat the leaves of over 500 different species of plants and trees and have done extensive defoliating where they have become well established. Isolated pockets of gypsy moths have been detected in West coast states but so far have been eradicated.

Gypsy moths hatch out of eggs usually laid on the bark of trees in late April or May. They emerge as small caterpillars and begin to eat foliage. They disperse themselves to other trees by climbing to a high point, spinning long silks, and then “ballooning” on the wind. They continue to feed and grow until they spin a silk cradle and change from a caterpillar into a moth. Seven to 14 days later they emerge as moths. They mate and the female lays her eggs. The eggs are enclosed in a hardy egg case and can survive severe weather conditions. The life cycle repeats the following spring.

Female gypsy moth on egg case. Photo by Ronald Kelley, Vermont Department of Forests, Parks, and Recreation

Gypsy Moths defoliating an oak. Photo: Tim Tigner, Virginia Department of Forestry

Why are gypsy moths a problem?

Gypsy moths infestations cause environmental damage by defoliating trees. Outbreaks of gypsy moth have defoliated large forests. Defoliation stresses trees, reduces food and habitat for other animals, and can reduce shade over creeks that is vital to fish and other aquatic organisms. Gypsy moth infestations are annoying to people. Shreds of wasted leaves, the caterpillars' strands of silk, their fecal droppings, their cast skins, and their very bodies make homes, yards, parks, and playing areas unattractive.

Gypsy moth fecal material, caterpillar debris, and leaf litter on a park picnic table. Photo: John H. Ghent, US Forest Service.

Gypsy moth infestations are associated with health complaints. During outbreaks of gypsy moths, skin reactions (wheals, rashes, and itching) are commonly reported by people in the infested area. This may be due to natural histamine produced by the caterpillar and present in fine hair-like structures on the exterior of the caterpillar.

Because of the numerous complaints from residents during outbreaks of gypsy moth, local governments in infested states often spray pesticides to suppress populations below the outbreak level. This does not solve the problem long-term and they may have to repeat their control efforts year after year.

How do gypsy moths arrive in Washington State?

Gypsy moths can come into Washington when people move here from infested states and accidentally transport egg masses attached to their vehicles, outdoor furniture, or other outdoor items. Washington maintains a comprehensive grid of over 20,000 pheromone traps to detect new introductions of gypsy moth. Trapping allows for early detection and monitoring of introduced gypsy moths. Once a moth is caught, a high-density grid of traps is installed and egg mass searches are done to determine if an introduction becomes established (i.e., begins to breed and spread). Many introductions die out spontaneously. A detailed report of Washington trapping results is available from the WSDA at:

http://agr.wa.gov/PlantsInsects/InsectPests/GypsyMoth/

Prevention in Western States: "Nip it in the bud"

Once a breeding population of gypsy moth is established it is very difficult to get rid of. In the 19 Northeastern states where European Gypsy Moth has become established, several millions acres of forestland have been aerially sprayed with pesticides in order to suppress outbreaks of gypsy moth. Many additional acres in urban and suburban areas have been treated with pesticides by local landowners, residents, and local governments. In the West, eradication efforts aim to pinpoint and eliminate gypsy moth populations before they become widespread. The goal is to prevent the need for repeated large-scale control efforts to suppress outbreaks and prevent increased use of pesticides by individual homeowners to kill caterpillars.

Gypsy moth control (Integrated Pest Management)

In the past, chemical pesticides were used extensively to control gypsy moth in the Northeastern U.S. Pesticides such as DDT, and more recently organophosphates such as carbaryl (Sevin) and acephate (Orthene), were used to control gypsy moth. Because of the human health and environmental impacts of these pesticides, they have been phased out. Today, many wide-scale control efforts use an IPM (integrated pest management) approach to control gypsy moth. In Washington, IPM for gypsy moth eradication includes extensive monitoring with pheromone traps, visual inspection for egg masses to determine where a breeding population is located, manual destruction of egg masses, targeted control for caterpillars with the least toxic methods effective for the site, and follow-up trapping to evaluate success of eradication. The following options are currently considered for gypsy moth controls:

- Btk (a microbe that is a natural disease agent of caterpillars),
- nucleopolyhedrosis virus (a virus that is natural disease agent in gypsy moth caterpillars),
- diflubenzuron (a chemical that is an insect growth regulator),
- mass trapping with pheromone baited traps,
- mating disruption with the pheromone disparlure, and
- release of sterile male gypsy moths.

U.S. Historical Information of gypsy moth control
http://www.entomology.wisc.edu/mbcn/fea308.html

Health information regarding various products/methods

Bacillus thuringiensis kurstaki **(Btk)** is the most commonly used product for gypsy moth control. Btk is a natural soil organism that is produced commercially in large fermentation batches and then sprayed on foliage. It was first discovered when scientists isolated it as a natural disease agent in caterpillars. It does not cause toxicity unless the caterpillar ingests it. When caterpillars eat sprayed leaves, they stop eating and die. There is extensive human health information on Btk products used for caterpillar control. Its toxicity is specific to caterpillars and it has been shown to have very little toxicity to mammals, birds, or fish.

Many years of experience with Btk products have shown that the vast majority of persons living in sprayed areas report no symptoms. Some members of the general public have complained of mild skin reactions; eyes nose, and throat irritation; and worsening of asthma or allergies after aerial spraying. It is not clear whether this is due to the spray or dust and pollens disturbed during the spray operation. DOH recommends that people in the sprayed area remain inside for 30 minutes after spraying to minimize exposure.

Although it is a bacterial species, Btk is not considered a human pathogen. Human infections of Btk have been looked for but not seen in several large studies of people who lived in sprayed areas. Btk is used extensively in organic agriculture and is available in many home gardening products. The Btk product commonly used in Washington is called Foray 48B. When applied with ground equipment, it is diluted with water so that 99 percent of the spray is water. A small amount of another agent is usually added (0.125% of the spray) to help the Btk stick to leaves.

Health information is summarized in these fact sheets:

- The National Pesticides Information Center http://ace.orst.edu/info/npic/factsheets/BTgen.pdf
- Btk information from Health Canada http://www.for.gov.bc.ca/hfp/gypsymoth/chr.htm
- Summary of Health Monitoring – British Columbia, Canada http://www.viha.ca/NR/rdonlyres/AE510FFC-CBCD-44BF-A925-3A67BA67F1CE/0/btk_health_surveillance_report_1999_btk.pdf
- New Zealand with a summary of New Zealand health monitoring http://www.biosecurity.govt.nz/pests-diseases/forests/white-spotted-tussock-moth/about-btk.htm
- U.S. Environmental Protection Agency (EPA) Office of Pesticide Programs on approval for Bt registration http://www.epa.gov/oppsrrd1/REDs/factsheets/0247fact.pdf
- Ohio State University Cooperative Extension fact sheet on controlling gypsy moth with Bt http://ohioline.osu.edu/hyg-fact/2000/2174.html

Gypsy moth nucleopolyhedrosis virus (NVP). There is less information about the possible human health impacts of a commercial version of a natural gypsy moth virus (called Gypchek). This virus was discovered to be a cause for the natural collapse of gypsy moth populations after large outbreaks. It was isolated and developed for use by the U.S. Forest Service and has been used mostly in undeveloped forestland. It is specific to gypsy moth caterpillars. It is not commercially available but is sometimes available to state governments. It is a possible skin, eye, and respiratory irritant probably due to the ground up caterpillar parts that comprise 80 percent of the product. This product has been tested in animals and appears to have little to no toxicity to mammals, birds, or fish. This product, however, has not been used in populated areas and the possible impact to human health as an allergen and irritant is uncertain.

For more information, please visit:
U.S. Forest Service information on NVP
http://www.fs.fed.us/ne/morgantown/4557/gmoth/manag/gypchek.html

EPA fact sheet on NVP
http://www.epa.gov/pesticides/biopesticides/ingredients/factsheets/factsheet_107300.htm

Diflubenzuron is an insect growth regulator in a product called Dimilin. It does not kill caterpillars on contact. Instead, caterpillars and other vulnerable organisms continue to grow and feed after exposure but die when they begin to molt. By disrupting the normal molting process, diflubenzuron prevents insects and other invertebrates from becoming adults and breeding. Animal testing shows that diflubenzuron has a very low toxicity to mammals at the levels used in caterpillar control; however, at very high levels it can affect the blood's ability to carry oxygen. A minor breakdown product of this chemical is considered a probable human carcinogen although lifetime studies in test animals have not shown the chemical to cause cancer. Dimilin may have broader ecosystem effects than the more selective Btk and NVP products. Because of toxicity to crab, shrimp, and other aquatic invertebrates, Dimilin is a restricted pesticide and the label warns of hazards to aquatic invertebrates. The National Park Service does not allow the use of Dimilin in national parks because of its non-target and other environmental impacts.

For more information:

EPA fact sheet on diflubenzuron
http://www.epa.gov/oppsrrd1/REDs/factsheets/0144fact.pdf

University Cooperative – Extension Toxicology Network fact sheet
http://ace.orst.edu/info/extoxnet/pips/difluben.htm

Chemical fact sheet on Dimlin from Cornell University
http://pmep.cce.cornell.edu/profiles/insect-mite/ddt-famphur/diflubenzuron/insect-prof-diflubenzuron.html

Mass trapping with pheromone traps. Mass trapping uses a pheromone (an insect hormone) to lure male gypsy moths onto a sticky board in a trap. Mass trapping does not pose a health risk to people. Mass trapping is very effective for pinpointing an introduction. This helps inspectors find and manually destroying egg masses. It also helps target control efforts to the smallest possible area. It has been used in some areas, with mixed success, in lieu of spraying. One problem with trapping as an eradication tool is that only the males are captured in the traps. Any mated female moths will continue to reproduce.

Release of adult sterile males moths. Large numbers of sterile male gypsy moths can be reared and released into the infested area to mate with females. Control is achieved when the sterile males mate with females to produce infertile eggs. This breaks the gypsy moth life cycle and suppresses the population. Release of sterile male does not pose any risk to human health. This technique requires very large numbers of sterile moths. A supply of sterile male gypsy moth is not always available.

History of sterile male research
http://history.nasa.gov/SP-401/ch17.htm

Mating disruption with the gypsy moth pheromone disparlure. Gypsy moth mating disruption can be achieved by flooding the air in the infested area with a pheromone specific to gypsy moths. This prevents the male moths from locating the pheromone trail produced by the female moth. If mating does not occur, the population dies out. Currently the pheromone is available in white sticky flakes that release the pheromone slowly over time. In standard animal testing, disparlure was practically nontoxic to mammals and birds. Toxicity testing has not been extensive. Disparlure apparently does not break down easily in human bodies. Disparlure persists in humans for long periods of time after skin exposure. Persons who have come in contact with disparlure have attracted male gypsy moths for several years. Application should be done in such a way that children and others do not touch or handle the flakes. The sticky flakes can also damage the finish on cars and hard surfaces.

For more information:

EPA fact sheet on pheromones and pesticides
http://www.epa.gov/pesticides/biopesticides/ingredients/factsheets/factsheet_lep_pheromones.htm

USDA website on using pheromones for control of moths
http://www.ars.usda.gov/is/AR/archive/dec97/moth1297.htm

US Forest Service information on disparlure
http://fubyss.ento.vt.edu/vagm/documents/Gypsy_Moth_Mating_Disruption.pdf

Environmental Impact Statement

In 2008, Federal agencies issued a draft national Environmental Impact Statement (EIS) that evaluates and compares the different options for gypsy moth control.

- It is co-authored by the US Department of Agriculture, US Forest Service, and the Animal and Plant Health Inspection Service.
- An EIS is available online at: http://agr.wa.gov/PlantsInsects/InsectPests/GypsyMoth/default.htm

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