

GYPSY MOTH MANAGEMENT PLAN

Fredericksburg and Spotsylvania
National Military Park

1992

Environmental Assessment

I. PURPOSE AND NEED FOR ACTION

A. Introduction

The gypsy moth was inadvertently introduced into New England over a century ago.

The spread of this alien species has been slowly moving south and west since that time. The gypsy moth has been found in localized infestations throughout the United States with the heaviest populations concentrated in the northeast.

The advancing front of the moth is now in north-central Virginia and eastern West Virginia. The progression southward continues at a rate of approximately ten miles per year. Since this pest is often carried by wind or vehicles into non-infested areas, any location with suitable habitat is subject to defoliation.

The high degree of vehicular visitation coupled with abundant habitat puts Fredericksburg and Spotsylvania National Military Park at an especially high risk.

The National Park Service (NPS) in conjunction with the U.S. Forest Service (USFS) and the Animal and Plant Health Inspection Service (APHIS) began a trapping program the park in 1982. Populations remained relatively low until 1988 when a dramatic increase was noted. Egg mass surveys did not result in any positive finds until 1987 and by 1990 infestations exceeding 20,000/acre were found at Ellwood in Wilderness Battlefield.

To attenuate adverse effects and in response to National Park Service policy, the park has undertaken an integrated pest management program for the gypsy moth in cooperation with the U.S. Forest Service. This program emphasizes population monitoring to identify critical action thresholds, for which appropriate management activities can be made most effective. Natural controls are to be maximized with environmentally acceptable insecticides being used only when appropriate. Control efforts proposed for 1991 include two aerial applications of biological controls to 235 acres of the 6,000 acres in the park ownership.

At the present time the primary need for the proposed project is to reduce the impact of the gypsy moth in park development zones. Developed zones include Visitor Centers and grounds, picnic areas, interpretive waysides, and areas of concentrated visitor use. Defoliation of the forest canopy would result in increased mortality in these trees, predominantly oaks, already subjected to recreation related stress. Increased mortality and trees with poor vigor resulting from defoliation would increase hazards to public safety.

B. Decision Making

This document has been prepared by the U.S. Department of the Interior, National Park Service. The responsible official is:

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Pockets of gypsy moth populations have reached densities sufficient to cause forest defoliation within the park. The immediate decision to be made is whether or not to suppress the gypsy moth in the park and if so, by what means. Currently, the areas identified for treatment are not in wetlands (except for a small riparian area adjacent to a stream) or floodplains and are in the developed zone or other

critical protection areas. The growth in gypsy moth populations is expected to be sufficient to cause defoliation throughout the 6,000-acre park in the coming years. The management strategy will be to suppress these populations to protect the historic landscape as described in the park's Gypsy Moth Management Plan.

C. Relationship to Other Decisions

The U.S. Forest Service issued a Final Environmental Impact Statement (FEIS) in 1984, for its "Gypsy Moth Suppression and Eradication Project." This was modified by an addendum in 1985. The FEIS documents the decision by the USDA to provide federal assistance to state of federal agencies attempting to control the gypsy moth.

The preferred alternatives for suppression called for integrated pest management procedures to be used to control the moth population when site-specific analyses indicated a need for action.

This Environmental Assessment is linked to the FEIS, as modified, and documents the site-specific analysis for Fredericksburg and Spotsylvania National Military Park.

D. Project Objectives

The primary objectives of the proposed suppression are to:

1. Mitigate defoliation impacts in identified critical protection areas. These are the areas that contain prime historic scenes, park developments, are the most visible to the visitor, and/or would create a safety hazard if left untreated.
2. To minimize impacts to all cultural and natural resources where defoliation would significantly change species composition or cause irreparable damage.
3. Reduce risks to public health and visitor safety.
4. Develop a cooperative atmosphere with park neighbors and local governments to reduce spread of gypsy moth to uninfested areas in or out of the park.

E. Biological Evaluations

Monitoring data collected in 1990 served as the basis for identifying treatment areas. These activities included larval band surveys, male moth trapping, and intensive egg mass surveys. Egg mass surveys in fall are the most accurate method for evaluating the potential for defoliation in the following year. These surveys were performed in conjunction with the U.S. Forest Service. Methods used included both five-minute walks and 1/40-acre surveys.

According to the literature, foliage reduction occurs in areas which exceed 500 egg mass/acre. Treatment was considered where this threshold was reached and forest habitat was favorable for the moth.

Approximately 235 acres of woodland in and around Chancellorsville Visitor Center would be treated with a double aerial application of the biological control agent, Bacillus thuringensis (Bt) as indicated on the maps in Appendix I. The application rate for each treatment would be 16-18 Billion International Units (BIU) per acre. It is anticipated that these treatments would take place in early May, about one week apart, but this is subject to changes due to gypsy moth caterpillar life stage, weather, or degree of leaf emergence.

Bt's efficacy is dependent upon appropriate application and timing, as well as weather. The proposed timeframe is targeted for the first and second instar of the larvae and when leaf expansion of host trees is 30 to 50 percent. It has been reported that two applications are generally needed for population reduction in moderate to high infestations. (See the Gypsy Moth Management Plan for details of Gypsy Moth Biology.)

In addition to this spray block, individual trees with high egg mass counts in the fall of 1990 will also be treated with ground applications of Bt. These are located at Fredericksburg Visitor Center and the entrance to Lee Drive (Lafayette Boulevard) in Fredericksburg Battlefield. Other spot treatments will be necessary at the Bloody Angle in Spotsylvania Battlefield and at the Widow Tapp Farm, Ellwood, and the Wilderness Battlefield Exhibit Shelter.

Other treatments to be preformed in 1991 include burlap banding of larvae, and release of predators and parasites, as outlined in the park's Gypsy Moth Management Plan.

II. ALTERNATIVES

A. Formulation of Alternatives

Alternatives for gypsy moth suppression were established in accordance with the management objective set for the project. Site-specific information on human habitation; ecologically sensitive areas; rare, threatened or endangered species; location of wetlands and floodplains; and forest composition is available from the Resource Management Branch of the park. National Park Service guidelines and policy for Integrated Pest Management determine the options available for treatment of the gypsy moth.

B. Eliminated Alternatives

Some alternatives were not considered due to their failure to meet the objective outlined in the park's Gypsy Moth Management Plan, because they were unfeasible, and/or because they were not permitted under NPS policy. The eliminated alternatives were:

1. To treat all threatened park properties with broad spectrum insecticides.
This approach would be in direct conflict with NPS policy and more importantly have a negative effect on non-target species.
2. Limit treatment of all park properties to techniques such as sterile insects release, mating disruption, male moth trapping, and mechanical intervention.
These treatment are effective at low population levels, but fail the feasibility requirements when moths exceed 250 egg masses/acre.

3. Extensive use of ground application of biological insecticides, such as Bt. Aerial applications are far more cost effective if significant tracts of land are involved.
4. To limit treatment solely to developed zones and the forested park boundary. Treatment is warranted throughout the forested areas of the park, because of its significance as an historic landscape. In addition, the often linear configuration of the park would make treatment of these selected areas unnecessarily complex.

C. Considered Alternatives

Alternative 1:

No action. The NPS would not make any attempt to suppress gypsy moth population at this unit. This would allow "natural" forces to operate without intervention.

An equilibrium would be allowed to be achieved between the gypsy moth and its preferred hosts. This alternative recognizes that all insecticides currently available do not permanently remove the threat to forest ecosystems. Any insecticidal treatment would have to be repeated at some time in the future. The specific interval between treatments varies depending on the insecticide being used.

Alternative 2 :

Single application of Bacillus thuringensis (Bt). Treatment blocks based on population surveys would be treated once with Bt. This would be applied aerially at a rate of 16-18 BIU/acre. This would represent a relatively inexpensive option and contractors are available under the umbrella of a National Capital Region (NCR) project. This treatment would provide minimal foliage protection because single application of Bt results in less than 90% mortality which is required for effective population control. Egg mass counts would probably continue to increase within the treatment area. The effectiveness of the Bt could be improved by releasing parasites in the treatment block. Spot infestations would be treated from the ground.

Alternative 3 (Preferred Alternative) :

Double application of Bt. Treatment blocks identified through population surveys would be treated aerially, twice with Bt, 3-7 days apart, at a rate of 16-18 BIU/acre. Approximately 235 acres would be treated in this manner in 1990. This would provide adequate foliage protection to all but the highest population densities. Egg mass counts would probably decrease or remain constant in the following year. Contractors are also available from a NCR contract. The cost would be higher due to the second application. Spot infestations would be treated with a single application from the ground.

Alternative 4 :

Treatment blocks based on egg mass surveys would be treated with diflubenzuron (Dimilin). Approximately 150 acres would be treated. This would provide effective foliage protection and population control. The cost to the government would be lower than using Bt. The time interval between treatments would be longer.

Dimilin has a direct impact on most aquatic invertebrate. Negative impacts may be mitigated only by providing a buffer along water courses. A stream passes through the proposed treatment block.

Alternative 5 :

Treatment blocks on egg mass surveys with extremely high counts would be treated with the Nucleopolyhedrosis virus ("Gyp-chek" or NPV). Two applications would be made 7-10 days apart. If successful, NPV would reduce population for the following year. Approximately 100 acres would require treatment in 1991. NPV is still a somewhat experimental pesticide. There has been repeated difficulty in developing a mixture that may be applied from an aerial boom. To date, most mixtures result in clogging of nozzle and uneven application. It is effective only at reducing populations at their peak.

Alternative 6 (Preferred Alternative) :

Continued use of Integrated Pest Management. Low populations have a wider variety of option that may be used. Monitoring would continue as outlined in the park's Gypsy Moth Management Plan. Mating disruption, mechanical scraping, release of parasites, public education and enhancement of predator habitat would be utilized.

These strategies can be applied on a limited level when populations are low. This alternative, used alone, would not provide effective foliage protection.

III. AFFECTED ENVIRONMENT

A. Host Vegetation

Forest vegetation within the identified treatment areas are mixed hardwoods predominated by white oak. The forest vegetation would be effectively protected by alternatives 2, 3, 4, and 5.

Alternative 1 would result in extensive canopy defoliation and mortality would increase with each successive year. Eventually there would be a shift in species composition favoring the less preferred trees. Historic specimen trees, dating to the Civil War, could be lost. Areas, such as New England, in which resident moth populations have existed for several decades now witness population peaks at 7 to 10 year intervals. These, however, are usually not as severe as initial outbreaks.

Alternative 5, used alone, would not protect foliage during high population levels, but it would contribute to establishing natural controls.

B. Geography

Fredericksburg and Spotsylvania National Military Park is a 6,000-acre historic unit of the National Park Service located 55-miles equidistant between Washington, D.C. and Richmond, VA. The three western units, Wilderness, Spotsylvania, and Chancellorsville are located in the Piedmont biotic province, while Fredericksburg is located on the fall line between the Piedmont and the Coastal Plain. Numerous streams cross the four battlefields. Floodplains exist along Wilderness Run in Wilderness, along the Po River in Spotsylvania, and along the Rappahannock River near headquarters at Chatham Manor. None of these floodplains are included in the proposed spray block in 1991. A small amount of riparian community, however, exists within the spray block at Chancellorsville Battlefield.

C. Land Use

Approximately 5,000 of the park's 6,000 acres is forested. All lands within the authorized boundary and in federal ownership have been zoned for management purposes as either historic or developed zones. NPS policy requires that an IPM approach be based on the management objective for the various management zones within a National Park. No decisions are made prior to a survey of a park area and a period of monitoring. In wilderness or natural zones the gypsy moth is generally not actively managed unless a significant resource would be lost due to inaction. However, in historic and park development zones, where trees are treated as historic objects or protection of foliage is needed in high-use public areas, a more aggressive approach is permitted to control the insect's population.

The primary purpose of the park is to educate the public about the events that transpired on the four battlefields, as well as commemorating the loss of life that resulted. The land is also used by park visitors in such non-consumptive forms of recreation as hiking, biking, picnicking, jogging, and nature appreciation. Until the 1980's the adjacent land was primarily rural and agricultural. The area has since experienced a population boom for commuters to the Washington, D.C. metropolitan area. Undeveloped private lands are rapidly becoming extensive and relatively expensive residential and/or industrial communities. State Planning Unit 16, the area in which the majority of the park is located, is one of the fastest growing units in the state.

Alternatives 1 and 6 would result in defoliation of the forest canopy. Park visitors would find the condition of forest and the presence of gypsy moth caterpillars during peak levels very unappealing. Caterpillars are most active in late May to early June which coincides with peak visitation.

Alternatives 2, 3, 4, and 5 would leave little or no impact on visitor use and adjacent lands.

D. Human Population Density

Visits to the park exceed 1.7 million annually with the use concentrated in the summer months. Residential communities abut the park in several locations. Fredericksburg Battlefield has the highest population density while Spotsylvania Battlefield remains the most rural. Residences within the park are limited to park employees and their families which consist of eight (8) residences. Only three quarters are present within the proposal spray block with only three occupants during the proposed timeframe.

Alternatives 1 and 6 would result in the condition described above (section C.)

Alternatives 2, 3, 4, and 5 would mitigate the impact of the gypsy moth on park resources and reduce what is perceived as damage to the forest.

E. Rare, Threatened, or Endangered Species

No threatened or endangered species are known to exist within the park, however, small whorled pogonia (*Isotria medeoloides*), a federally listed endangered plant, has been found in nearby Prince William and Caroline Counties and the potential exists for its presence on the extensive forest lands within the park. A plant listed as "imperiled" due to rarity by the state, Crested coral-root (*Hexalectris spicata*) has been found on park lands. Exhaustive surveys of the park for rare, threatened, and endangered species have not been undertaken, although a cursory field survey was completed in 1990 by the State Heritage Program.

No effects would be expected from the preferred alternatives (1 and 6). Defoliation due to the gypsy moth could have a deleterious effect on undiscovered populations.

F. Wetlands

A small riparian area is associated with the stream within the proposed spray block. Alternative 4 would require a 200-foot buffer strip bordering the creek. The other alternatives would have little or no impact on this area.

G. Cost/Benefit Analysis

Benefits are both tangible and intangible. The primary tangible benefit would be the reduction of tree mortality in developed zones that would otherwise result in an increase in hazard trees. This would increase the cost of hazard tree removal and increase the park's liability resulting from personal injury or damage to private property.

The intangible benefits include protection of the historic scene, the integrity of the historic landscape, and aesthetic values in public areas.

IV. ENVIRONMENTAL CONSEQUENCES

A. Mitigation - All Alternatives

It is the goal of the NPS to conduct the safest possible program. Efforts will be made to minimize and mitigate non-target effects.

Accuracy of aerial application will be achieved by several means. Topographic maps will be provided to each pilot. Blocks planned for treatment will be identified with man-made features, such as roads. Helium balloons will be placed along less easily identified boundaries by field personnel. Personnel familiar with the park will be on-site to guide the operation and coordinate radio communication between the aircraft and ground crew.

Applications will be closely monitored. If necessary, helicopter landings will be only in open park areas where visitation is limited or at a site outside the park. All mixing and loading of spray material will be observed by NPS or USFS personnel.

Information regarding the actual dates of the spray operation will be shared with the media and the public. All adjacent landowners will be notified by mail. Any other area residents requesting additional information will be kept apprised of developments as time progresses.

B. Biological/Physical Consequences

Alternatives 2, 3, 4, and 5 require the use of insecticides. They are selected with their potential for meeting management objectives, environmental compatibility, and safety kept in mind.

1. Bacillus thuringensis (Bt) is a spore forming member of the bacterial genus Bacillus. When eaten by gypsy moth larvae, protein crystals dissolve in the digestive tract, causing damage to its stomach lining. This causes it to stop feeding. A combination of infection and starvation usually causes the death of the larvae in 7-10 days.

Studies in which Bt was fed to various fish, bird, and mammals, including humans, resulted in no adverse effects being found. Bt will kill other leaf chewing Lepidoptera if they are feeding in the tree canopy during or shortly after the time of spraying. Bt will not effect other beneficial insects such as gypsy moth parasites and honey bees.

2. Gyp-check is a formulation of the Nucleopolyhedrosis Virus (NPV) which is species specific to gypsy moth. It is a stomach virus that attacks internal tissues and organs of the larva when eaten with tree leaves. It causes death within 10-14 days depending on air temperature. There are no known effects of NPV on fish, birds, mammals, or insects other than the gypsy moth.
3. Diflubenzuron (Dimilin) is a chemical insecticide that functions as a growth regulator by inhibiting the synthesis of chitin. It is effective in reducing gypsy moth population at low concentrations. However, it is fatal to other Lepidoptera that come into contact with it. It is a restricted use pesticide and may not be used over bodies of water because of its high toxicity to aquatic invertebrates. It binds rapidly with foliage or soil and reportedly does not produce a secondary runoff into watersheds. It breaks down in the soil in about 3-4 days from microbial action.

Some of the negative effects of Dimilin on aquatic systems could be mitigated by leaving a buffer around bodies of water for 500 feet with fixed-wing aircraft and 200 feet for helicopter. Dimilin persists in water for only 48 hours.

4. Biological and Physical Consequences by Alternatives

Alternative 1: This would not prevent tree defoliation. According to the USFS biological evaluation, the oaks around Chancellorsville Visitor Center would be completely defoliated. Some historic specimen trees would be affected.

The defoliation of the tree canopies would result in a number of impacts to natural resources. Preferred host species, which are abundant, would have an increase in mortality rates producing a long-range change in overall species composition. This alternative does not introduce any intervention into natural processes, so it would contribute to the development of a host-pest equilibrium over the long-term.

Alternatives 2 & 3: Consequences are discussed above. Small spray blocks will produce minimal impacts in non-target Lepidoptera.

Alternative 4: Dimilin is not being considered in 1991. It has the capability of providing canopy foliage protection and population reduction. Buffer zones would have to be established around bodies of water. Little is known about the long-term impacts of its repeated use on forested ecosystems.

Alternative 5: NPV would prevent defoliation and reduce high level populations if it was applied adequately. However, there continues to be problems with its application. Little or no effects would be found on aquatic or terrestrial ecosystems.

Alternative 6: If used alone the effects described in Alternative 1 would generally apply to Alternative 6. This method uses IPM procedures to treat the moth at low population levels. Alternative 6 is labor intensive and is appropriate only in small areas prior to populations reaching outbreak levels.

C. Risks to Human Health

Both Bt and Gyp-chek are considered to pose no threat to human health. Reference has been made to human infection by Bt when individuals were splashed in the face and cut with an infected needle. Both injuries responded to conventional treatment.

Gyp-chek has shown no adverse effects on humans. The possibility that the Gypsy Moth NPV may be related serologically to the viruses which affect man has been investigated. In studies carried out in 1974-74 at Yale University, all of these viruses were found to bear no serologic relation to the NPV of the Gypsy Moth.

Other viruses such as Herpes were also found to be serologically unrelated to the Gypsy Moth NPV.

Dimilin is a stomach poison which acts by interfering with the synthesis of chitin, a substance found in the body wall of insects. Chitin synthesis does not occur in higher organisms, therefore, diflubenzuron has very low mammalian and nonmammalian toxicity exclusive of insects and some aquatic organisms.

Dimilin is nonmutagenic and noncarcinogenic. However, there is some uncertainty about the carcinogenic potential of one of its metabolites, 4 - chloraniline.

This metabolite is formed in the liver of animals that ingest diflubenzuron. Any risk is related to eating meat, particularly fish, that contains it. The cancer risk associated with eating meat containing 4-chloraniline has been studied and no carcinogenic effect was found. The lifetime cancer risk to an individual exposed to diflubenzuron is estimated to be 1×10^{-9} or 1 in a billion. This risk level is 1,000 times lower than the risk of developing cancer after smoking only two cigarettes in an entire lifetime.

Despite the low toxicity of these insecticides precautionary measures will be taken to protect the public and reduce risk from exposure. These include application during times when little activity occurs within the treatment areas (early morning), establishing necessary buffer zones, and through notification of the media and public.

V. List of Persons Consulted

Dean Cumbia, Area Forester, Virginia Division of Forestry, Spotsylvania, Virginia.

Cheri Gilcrest, Gypsy Moth Coordinator, Stafford County, Virginia

Christine Haggerty, Forest Pest Management Specialist, Center for Urban Ecology, National Park Service, Washington, D.C.

Gary Johnston, IPM Coordinator (WASO), National Park Service, Washington, D.C.

Ginny Paci, IPM Coordinator, National Park Service, Mid-Atlantic Region, Philadelphia, Pennsylvania.

Ray Simms, VPI Cooperative Extension Agent, Spotsylvania County, Virginia.

J. Denny Ward, Entomologist, Forest Pest Management, U.S. Forest Service, Asheville, North Carolina.

Henry Snyder, Resource Management Specialist, National Park Service, George Washington Memorial Parkway, McLean, Virginia.

Douglas Wallner, Fire Management Specialist, National Park Service, Mid-Atlantic Region, Philadelphia, Pennsylvania.

L. Kimball Payne, County Administrator, Spotsylvania County, Virginia.

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