



National Park Service

Draft Environmental Assessment for the 2009 Gypsy Moth Suppression Program Harpers Ferry National Historical Park

March, 2009

This document is available for public review pursuant to 40 CFR § 1506.6 (b). Comments will be accepted until April 14, 2009. The document is available on the park's web site (<http://www.nps.gov/hafe>). Copies can be obtained from the park by writing to:

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Copies can also be obtained by calling the park's Natural Resource Specialist at 304-535-6770

If you have any comments, please provide them in writing to the above address. To insure that your comments are considered, please make sure they are received at the park by April 14.

Draft Environmental Assessment
Gypsy Moth Suppression Program, 2009

Harpers Ferry National Historical Park
National Park Service
U.S. Department of the Interior

March 2009

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1. PURPOSE AND NEED FOR ACTION

1.1 Summary of Proposed Action

The natural, cultural, recreational and scenic values of Harpers Ferry National Historical Park are at risk due to gypsy moth defoliation. This Environmental Assessment examines management options for suppression of the gypsy moth populations in spring 2009. Any proposed suppression activities in subsequent years will be evaluated in a separate Environmental Assessment that will be made available for public review.

1.2 Park Purpose and Significance

Congress created Harpers Ferry National Historical Park (HAFE) in 1944 as "a national public memorial commemorating historical events at or near Harpers Ferry" (U.S. Congress, 1944). HAFE is a unit of the National Park System encompassing 3,645 acres of mostly undeveloped land in West Virginia, Virginia, and Maryland. The resources of HAFE are protected under the authorities of the National Park Service Organic Act of 1916, and Public laws enacted to authorize and expand the park.

1.3 Park Management Objectives

Guidance on overall management objectives and management policies for HAFE is provided in the National Park Service's Management Policies (National Park Service, 2006) and Natural Resources Management Guideline (National Park Service, 1991). The guidance relates directly to the management of exotic (non-native) species. All cited policies are in accordance with Executive Order 13112 which requires federal agencies, in part, to prevent the introduction of invasive species and provide for their control.

The following is from National Park Service, 2006 Management Policies, Chapter 4, section 4.4.4.2 Removal of Exotic Species Already Present in the Park: "All exotic plant and animal species that are not maintained to meet an identified park purpose will be managed up to and including eradication if (1) control is prudent and feasible, and (2) the exotic species:

- ☐ Interferes with natural processes and the perpetuation of natural features, native species or natural habitats; or
- ☐ Disrupts the genetic integrity of native species; or
- ☐ Disrupts the accurate presentation of a cultural landscape; or
- ☐ Damages cultural resources; or
- ☐ Significantly hampers the management of park or adjacent lands; or

- ❑ Poses a public health hazard as advised by the U.S. Public Health Service (which includes the Centers for Disease Control and the NPS Public Health Program); or
- ❑ Creates a hazard to public safety.

High priority will be given to managing exotic species that have, or potentially could have, a substantial impact on park resources, and that can reasonably be expected to be successfully controllable. Lower priority will be given to exotic species that have almost no impact on park resources or that probably cannot be successfully controlled."

In accordance with NPS 77 Natural Resource Management Guidelines, Chapter 2, page 289, parks are advised that "control or eradication will be undertaken, where feasible, if exotic species threatened to alter natural ecosystems; seriously restrict prey on or compete with native populations; present a hazard to human health or safety; cause a major scenic or aesthetic intrusion ... or threaten resources or cause a health hazard outside the park."

Park objectives directly related to the control of an exotic species such as gypsy moth include:

- ❑ Maintain a natural resources management program that complies with environmental laws and executive orders, Departmental Policies, and NPS Management Policies, Director's Orders and Reference Manuals.
- ❑ Protect natural resources and related values by assuring that special park uses and internal management actions are compatible with the protection, restoration and maintenance of the resources.

Gypsy moth is an exotic species that has the potential to adversely affect healthy functioning ecosystems, cause a major scenic or aesthetic intrusion and presents a health hazard to HAFE visitors and other park users.

Parks are advised that for widespread exotic species, control programs may need to take a regional approach that may involve other landowners (National Park Service 1991). Issues such as the gypsy moth infestation cross ownership and political boundaries and underscore the need for cooperative approaches.

Efforts to suppress or control the gypsy moth in isolation will be less effective because gypsy moth caterpillars can migrate into treatment areas from adjacent untreated areas.

1.4 Project Objectives

The Park's project management objectives include:

- Reduce the long-term impacts of defoliation to the forest ecosystem and its components.
- Protect the recreational and scenic values of developed visitor use areas and trails from the impacts of defoliation.
- Cooperate with federal, state and local agencies on the suppression of gypsy moths on the lands in and adjacent to HAFE.
- Provide for the health and safety of visitors, residents and employees.
- Preserve natural controls of gypsy moths whenever feasible.
- Implement pest management strategies which are effective and present the lowest risk to people, park resources and the environment.

1.5 Authorizing Law and Policies

The following laws and policies provide the legal framework authorizing funding and specifying procedures for conducting gypsy moth management activities on federal lands.

The Cooperative Forestry Assistance Act of 1978 provides the authority for federal (U.S. Department of Agriculture) and other agency cooperation in management of forest insects and diseases.

The Federal Insecticide, Fungicide, and Rodenticide Act of 1947 require that all insecticides used in suppression and eradication projects be registered with the U.S. Environmental Protection Agency and follow application requirements.

The National Environmental Policy Act of 1969, as amended, requires detailed and documented environmental analysis of proposed federal actions that may affect the quality of the human environment

The Endangered Species Act of 1972, as amended, 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. Federal agencies are also responsible for improving the status of listed species.

The National Historic Preservation Act of 1966, as amended, recommends that federal agencies proposing action consult with the State Historic Preservation Officer regarding the existence and significance of cultural and historical resource sites.

Executive Orders 11988 and 11990 require that federal agencies shall attempt to avoid adversely impacting wetlands or floodplains in meeting objectives. Federal agencies adversely impacting wetlands or floodplains based on an environmental assessment and finding of no significant impact (FONSI) shall release the FONSI for public review (Usually 30 days) prior to implementation of proposed actions.

Executive Order 13112 requires that federal agencies act to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause.

Decisions regarding gypsy moth management are made in full consideration of other relevant policies and procedures, including the 1995 Environmental Impact Statement (FEIS) prepared by the U.S. Department of Agriculture (USDA). The USDA has determined through the FEIS and the Record of Decision (ROD) signed January 1996, that an environmental assessment, rather than a more comprehensive Environmental Impact Statement, is adequate for the proposed project. The ROD selected Alternative six of the FEIS as the preferred alternative, supporting funding for three alternatives (i.e. suppression, eradication, and slow the spread) for management of gypsy moth. Approval for funding of this proposed project has been granted by the Forest Service, based on surveys and a biological evaluation conducted for the park (USFS, Whiteman, 2007).

This environmental assessment is tiered off the FEIS and ROD and documents the site-specific evaluation of the Gypsy moth situation at HAFE.

1.6 How the Gypsy Moth Affects the Environment

The gypsy moth (*Lymantria dispar*), a native of Europe, was introduced into North America around 1869 near Boston, Massachusetts. Since that time the moth has become established and has spread throughout Northeastern United States, into Ohio and Michigan, and further south into Virginia.

Gypsy moth larvae are voracious defoliators. They prefer oaks, but will also consume dozens of other tree and shrub species to varying degrees including such HAFE resources as box elder, sweet gum, willow, maple, hickory, beech and dogwood. In the park, the larval or caterpillar life stage of the gypsy moth emerges from egg masses in late April – early May. In order to develop, larvae go through 5-6 molts or stages (instars) shedding skin as they make their way up into the tree canopy where they produce silken threads that enable them to disperse on wind currents. Larvae then feed on leaves through much of June, consuming increasingly large amounts of foliage. By late-June, defoliation damage is most apparent. Fully developed caterpillars then go through a two-week pupation stage. Adult moths begin to emerge in numbers by late June through early August, at which time brown male moths can be seen flying during the day seeking females. Female moths are white and do not fly but attract male moths by releasing a powerful sex attractant, or pheromone. After mating, each female lays one egg mass containing 100 – 1,000 eggs. The mass is coated with hairs from her abdomen. These egg masses remain on the trees, rocks or whatever surface they deposited through the winter unless consumed, removed or killed by various agents.

The impacts on people and the environment caused by gypsy moths are well documented. A broad spectrum of impacts have been identified and summarized in the FEIS described above. As this environmental assessment (EA) is tiered off the FEIS, only a brief overview of these impacts follows.

Defoliation directly affects trees by decreasing their health and vigor. This can result in an increased susceptibility to disease and parasites, leading to increased tree mortality. Defoliation and the loss of mature trees can change forest and under story composition, water quality in streams and lakes, and food and habitat quality and availability for both terrestrial and aquatic wildlife. This can result in changes in the abundance and distribution of wildlife. Since the gypsy moth is a non-native species, its known and unknown effects on the environment are not part of natural ecological processes and are therefore largely undesirable.

Gypsy moths also present aesthetic, safety, and health concerns to employees and the public. Large stands of defoliated or dead trees can

impact scenic values and present hazardous tree conditions along roadsides and trails. Large numbers of caterpillars and their frass (droppings) can be a nuisance, affecting outdoor recreational experiences. Forest fire hazard levels can be increased with defoliation and tree mortality. Dead trees themselves are safety hazards for park visitors. Some individuals that are exposed to the hairs on gypsy moth larvae may develop skin rashes or irritations and allergies.

1.7 Gypsy Moth Monitoring in Harpers Ferry NHP

Gypsy moths have been in Jefferson County, West Virginia since 1975 and have been monitored by the park since 1981. The first noticeable effects of gypsy moth defoliation occurred in 1983 with seven acres of light defoliation on Maryland Heights (U.S. Forest Service 1983). Results of the 1983 monitoring program indicated that moderate to heavy defoliation would occur in 1984 on Maryland and Loudoun Heights (U.S. Forest Service 1983).

Early mass surveys conducted by the U.S. Forest Service and/or the park have been the primary monitoring tool to determine population density and the basis for management action. Each fall egg mass surveys have been conducted in all susceptible areas of the park.

Based on existing egg mass densities and the general size of egg masses, gypsy moth populations appear to be building and healthy throughout most areas surveyed in HAFE. The average egg mass length is 32 mm. Egg masses larger than 25 mm typically indicate healthy populations with no obvious stress from either the gypsy moth nucleopolyhedrosis virus (NPV) or the *Entomophaga maimaiga* fungus, two of the primary natural control agents that often express themselves in declining or stressed populations

In response to high egg mass densities and the likelihood that moderate to heavy defoliation would occur the following year, the park implemented management actions to suppress gypsy moth as follows:

- 1984 one application of B.t. on Maryland Heights (400 acres) and Loudoun Heights (200 acres)
- 1987 one application of B.t. on Loudoun Heights (200 acres) and Short Hill (150 acres)
- 1988 two applications of B.t. on Loudoun Heights (200 acres) and Maryland Heights (400 acres)
- 1989 two applications of B.t. on Maryland Heights (515 acres) and Cavalier Heights (45 acres)
- 1993 one application of B.t. on Loudoun Heights (150 acres) and Maryland Heights (430 acres)

2001 two applications of Gypchek® on Maryland Heights (720 acres), Loudoun Heights (232 acres) and Short Hill (289 acres).
2002 one application of Gypchek® on Maryland Heights (250 acres) and Short Hill (50 acres).
2008 two applications of B.t. on Maryland Heights (616 acres), Loudoun Heights (650 acres), and Short Hill (249 acres), and two applications of Gypchek® on Maryland Heights (100 acres)

The Forest Service conducted an egg mass survey in the fall of 2008 to assess the current status of gypsy moth on Loudoun Heights, Maryland Heights and Short Hill. Egg Mass results (see [appendix 1](#)) of this survey indicate that gypsy moth populations are sufficient to cause light defoliation on approximately 141 acres in 2009 on Loudoun Heights (Forest Service 2008). Map delineating the proposed treatment area is in [Appendix 2](#). The basic guidelines used to evaluate the risk of defoliation include: previous defoliation events; number of egg mass/acre; size and condition of the egg masses; available preferred food; and risk of larval blow-in following egg hatch.

2.0 Public Involvement

2.1 Scoping

Public notification of the park's proposed suppression project was presented in local newspapers and the park's Community Bulletin in February 2009. Adjacent landowners, the mayors of Bolivar and Harpers Ferry were notified by mail. The West Virginia State Heritage and the West Virginia Field office of the United States Fish & Wildlife Service were notified by mail. Comments were received by March 4. Two emails were received requesting additional information; however both requests concerned areas outside of the spray zone and further South on Loudoun Heights near the Shannondale area.

2.2 Public Review and Comment on the Draft EA

The Draft Environmental Assessment will be available for public review in accordance with Director's Order #12, National Environmental Policy Act Reference Manual for a 30-day period from **March 13 to April 13**. Newspaper articles will be released in West Virginia, Virginia, informing the public of the availability of the EA for public review. Copies of the EA will be available by calling or writing to the park or by viewing on the park's internet web page at www.nps.gov/hafe and the NPS website <http://parkplanning.nps.gov/hafe>). Copies of the EA will be placed in local public libraries in Bolivar, Brunswick, and Charles Town. Copies will also be available at the Harpers Ferry Town Hall and at Park Headquarters. A Special

Edition of the park's Community Bulletin will also include an article on the availability of the EA. The mayors of Bolivar and Harpers Ferry and the adjacent landowners on Loudoun Heights will be notified by mail.

3. ALTERNATIVES CONSIDERED

3.1 Process Used to Formulate Alternatives

3.1.1 Management Options

In 2009, five management options have been evaluated for managing gypsy moth populations at Harpers Ferry N.H.P. The intervention options are offered based upon the following two treatment objectives: 1) protect host tree foliage to prevent branch dieback and tree mortality; and 2) reduce gypsy moth population below the treatment threshold (Forest Service, 2008).

The NPS manages pest species using an integrated Pest Management (IPM) approach. IPM reduces the negative effects on pests while minimizing the impacts of pest management strategies on people and the environment. The FEIS specifies management options available to agencies interested in managing the gypsy moth under several situations, including monitoring, detection and eradication, 'slow the spread' and suppression, depending upon the occurrence and stage of gypsy moth infestation. The park is located within an area established for gypsy moth suppression (Forest Service, 1995). Eradication is aimed primarily at new, isolated infestations and 'slow the spread' is aimed at reducing the expansion of the gypsy moth from infested to non-infested areas. Treatments prescribed for suppression include the use of two biological insecticides, *Bacillus thuringiensis* variety *kurstaki* (*B.t.k.*) and Gypchek®, the formulated version of the gypsy moth nucleopolyhedrosis virus.

Bacillus thuringiensis variety *kurstaki* (*B.t.k.*), a microbial insecticide, is the only biological insecticide currently registered and commercially available for gypsy moth control. This product is available through several manufacturers and has been used extensively in suppression projects throughout the U.S. in both forested and residential areas. *B.t.k* is a bacterium that acts specifically against lepidopterous larvae as a stomach poison and therefore must be ingested. The major mode of action is by mid-gut paralysis which occurs soon after feeding. This results in a cessation of feeding, and death by starvation. It is persistent on foliage for about 7-10 days. After many years of research and use, there is no evidence that the application of *B.t.k* causes adverse effects on people in treated areas. The Forest Service EIS, Record of Decision recommends one or two applications of *B.t.k*. If two

applications, the second is applied 5-7 days after the first depending upon infestation level and threat to resource. Double application is known to have significant non-target impacts on native Lepidoptera.

Gypchek® is a microbial insecticide ([see appendix 3](#)) that is target-specific to gypsy moth. It is preferred over *B.t.k.* as a treatment option primarily for this reason. This product is not available commercially but is produced in limited quantities by a cooperative effort of the USDA Forest Service and the Animal Plant Health Inspection Service (APHIS). The active ingredient in Gypchek® formulations has a very narrow host range (lymnatriids) and occurs naturally in gypsy moth populations. Normally the virus reaches epizootic proportions when gypsy moth populations reach high densities as a result of increased transmission within and between gypsy moth generations. The application of Gypchek® to gypsy moth populations simply expedites this process by increasing the exposure of the virus at an earlier stage. Healthy, feeding gypsy moth caterpillars become infected by ingesting contaminated foliage and soon stop feeding and die.

The efficacy of Gypchek® treatments to reduce gypsy moth populations has been variable; however, they were successful in the park's 2001, 2002 and limited use in 2008 projects. Because of the short period of viral activity on foliage (3-5 days) as well as other biological factors such as feeding activity and weather conditions, it has been difficult at best to project treatment efficacy. Most often foliage protection can be achieved but significant reductions in gypsy moth densities do not always occur. Should inadequate population reduction occur, areas may need to be treated again the following year.

3.1.2. Management Areas

The decision to implement suppression actions for the gypsy moth is based on egg mass survey conducted during the fall of 2008. Egg mass densities, egg mass sizes, and past defoliation history were used to predict defoliation tree mortality risks. All areas with egg mass densities higher than 500 egg masses/acre are recommended for suppression. The survey results indicated that light defoliation is likely on the southern portion of Loudoun Heights and will encompass approximately 141 acres.

Defoliation and tree mortality risk are important considerations when developing alternatives for treatment areas. Since the park treated much of the park in the Spring of 2008, and egg mass counts show treatment was effective over 97.5 % of the park. Tree mortality is considered the most critical impact of the gypsy moth, as this impact has long-term consequences: loss of habitat, undesirable ecological changes, adverse

scenic impacts and hazardous trees. These criteria address the objectives for protection of the forest ecosystem and scenic values.

Another evaluation criterion is recreational use significance as determined by the presence of developed trail systems. The trail systems and facilities considered critical for this assessment include the Appalachian Trail within the park, and other hiking trails Loudoun Heights. This criterion addresses the objectives of protecting the recreational and scenic values of the park and the health and safety of visitors and employees.

Treatment areas have been somewhat consolidated and generalized to form uniform spray blocks, eliminating small gaps in coverage. Egg mass survey results and the associated defoliation risks were considered when finalizing treatment area boundaries.

3.2 Alternatives Eliminated From Detailed Study

3.2.1. Other Gypsy Moth Management Strategies

Management strategies considered inappropriate or ineffective for gypsy moth suppression in the FEIS were not considered. These include introducing natural controls (e.g., fungal pathogens, parasitoids, and predators), removing and destroying egg masses, tree trunk bands, silvicultural techniques (selective removal of susceptible trees) and using insecticides other than Gypchek® and *B.t.k.* Other strategies such as mass trapping, mating disruption, and sterile insect techniques were also not considered because these methods are effective only at very low egg mass densities (<10 egg masses/acre) and are recommended only for 'slow the spread' situations.

3.2.2. Suppression in Forests With High Mortality Risks Only

The option of spraying only forests facing a high risk of mortality due to another year of defoliation would help to address the project objectives of protecting scenic values and the forest ecosystem. However, this option alone would not address the project objectives of protecting recreational values, providing for visitor safety across the park, and cooperating with other landowners and agencies to suppress the gypsy moth. This option will be considered together with others that address all project objectives.

3.2.3. Suppression in Buffer Zones Only

The option of spraying only buffer areas to non-federal land would address the project objective of cooperating with other landowners and agencies to suppress the effects of the gypsy moth. However, this option alone would not address the project objectives of protecting recreational, scenic and

ecological values and providing for visitor safety across the park. This option will be considered together with others that address all project objectives.

3.3. Alternatives

3.3.1. Alternative 1: No Action

The no action alternative in this document means that HAFE would take no action to suppress or control the gypsy moth on federal land within the park. The gypsy moth populations and any associated impacts would continue to fluctuate in response to food availability, weather, natural control agents, and suppression activities performed by other agencies and private landowners on adjacent lands.

3.3.2. Alternative 2: Suppression Using One Application of *Bacillus thuringiensis* variety *kurstaki* (*B.t.k.*)

The treatment areas would be sprayed at an application rate of 36 BIUs in a total mix of $\frac{3}{4}$ gallon per acre. This alternative is more likely to reduce gypsy moth populations; however, non-target Lepidoptera would be affected. This alternative has been used in previous gypsy moth suppression projects at the park.

3.3.3. Alternative 3: Suppression Using Two Applications of *B.t.k.*

It is the same treatment as the previous alternative 3.3.2, but using two aerial applications. The treatment areas would be sprayed at an application rate of 36 BIUs in a total mix of $\frac{3}{4}$ gallon per acre, applied 4 – 7 days apart. Two applications address both foliage protection and greater degree of population reduction. This alternative was used in the Spring of 2008 on approximately 1,615 acres of forested federal land.

3.3.4. Alternative 4: Suppression Using One Application of Gypchek®

This is the preferred alternative. This method is species specific and would not affect other lepidoptera species. Areas would be treated with one application of Gypchek® at an application rate: 4×10^{11} occlusion bodies/acre. A sticker agent may be added to the formulation (molasses) to enhance rain-fastness and adhesion to feeding surfaces. This increases the amount of time the pesticide remains on treated surfaces thus allowing a longer time for larvae to ingest the pesticide. This alternative achieves the

same effect as Alternative 5. NOTE: Gypchek® is produced by the U.S. Forest Service in limited quantities each year. There should be sufficient quantities available for the Harpers Ferry project.

3.3.5. Alternative 5: Suppression Using Two Applications of Gypchek®

The treatment areas would be sprayed with two applications of Gypchek® at an application rate: 2×10^{11} occlusion bodies/acre. Low-flying aircraft (fixed wing or helicopters) would apply these pesticides to tree canopies during two separate flights during the 2nd and 3rd larval instars. Larval monitoring will be conducted by the Forest Service and NPS. The first application would be just after the emergence of the gypsy moth caterpillar in early May. The second application would follow 5 to 7 days later and would be an attempt to increase the effectiveness of the suppression program by exposing gypsy moth caterpillars that may have survived/escaped the first application. This alternative was used for 100 acres in 2008.

4. IMPACTS OF THE ALTERNATIVES

4.1. Methodology

A number of ecological, cultural, social, and economic factors were considered in assessing the potential environmental impacts of the alternatives being considered. A large amount of information on impacts were compiled and analyzed in respect to gypsy moth treatment alternatives in the FEIS. The analysis of impacts in this section is tiered off the FEIS and is appropriately brief and focused on critical site-specific issues. Additional detail on the effects of the Alternatives on the environment is available in the FEIS.

4.2. Impacts of the Alternatives

4.2.1. Impacts of Alternatives on the Biological Environment

4.2.1.1 Gypsy Moth

Affected Environment

The current status of the gypsy moth population is discussed in Section 1.7. The gypsy moth is the target for the proposed action.

Direct and Indirect Effects

Alternative 1 would allow gypsy moth populations to fluctuate unimpeded in response to environmental conditions, host availability, predation, and natural control organisms. Fluctuations may include future outbreaks or population crashes. Fall 2008 egg mass surveys indicate that heavy

defoliation is likely to occur on approximately 141 acres in the park in 2009. Left unchecked, the gypsy moth population would increase and cause significant amounts of defoliation in some areas of the park for several more years before a population crash. In Alternatives 2-5, significant mortality (60-90%) to young gypsy moth caterpillars is expected in treated areas. A reduction in gypsy moth populations is expected for 1-2 years following treatment. Caterpillars outside treated areas would be expected to fluctuate as in Alternative 1. This year's treatment of 141 acres was not treated in 2008 and the population increased, thus an example of this alternative.

Cumulative Impacts

In Alternative 1, the reduced availability of preferred host tree species may occur if outbreaks cause significant tree mortality. This may cause gypsy moth population declines as well as other Lepidoptera species. In Alternatives 2-5, the future effectiveness of natural control by the fungus *Entomophaga maimaiga* and the nucleopolyhedrosis virus (NPV) may be diminished in treatment areas because these natural controls are most effective at high population densities. This may benefit gypsy moth populations. However, as expected mortality levels will not be 100% and pockets of gypsy moth populations will remain untreated, these natural controls are expected to remain in place throughout the ecosystem.

4.2.1.2. Non-target Lepidoptera (Butterflies and Moths)

Affected Environment

Information on the lepidopteran fauna of HAFE is contained in a Checklist of butterflies (Durkin 2002-2003) and Dragonflies (Orr 2005). The checklist for butterflies indicates that 97 species were observed or otherwise documented for the park, including 9 species on state Heritage lists. See [Appendix 4](#) for park species. There were a total of 51 species of dragonflies and damselflies observed or documented. See [Appendix 5](#) for park species.

Direct and Indirect Effects

The impact of the gypsy moth and gypsy moth treatments on native Lepidoptera will largely be dependent upon the species and developmental stages of caterpillars in the treatment areas. Characteristics such as larval stages and activity, number of broods per year, host plant preferences, habitat associations and other factors may determine susceptibility. It is expected that spring-feeding lepidopteron and species more closely associated with forested areas are most likely to be directly affected, but other species may also be affected indirectly. For example, changes in the understory may subsequently affect host plant availability.

In Alternative 1, native Lepidoptera dependent upon forests and forest margin habitats, especially oak-dominant forests, may be negatively affected

by an additional defoliation event and the resulting tree mortality. Other species may benefit by the presence of gypsy moths and their effects on the habitat due to changes in understory host plant communities. Under Alternatives 2, 3, some non-target Lepidoptera populations that are actively feeding 8-10 days after treatment are expected to suffer mortality in areas treated with *B.t.k.*, resulting in temporary population declines. The level of mortality experienced will vary from species to species. Under Alternatives 4 and 5 where Gypchek® is used, no such treatment effects are expected.

Cumulative Impacts

In Alternative 1, forest-dependent Lepidoptera may be negatively affected by future defoliation events and the resulting tree mortality and changes in forest composition. Lepidoptera associated with open woods not dominated by oaks may benefit from these impacts. Other species may benefit from changes in the understory brought about by defoliation and tree mortality. Under Alternatives 4 and 5, native Lepidoptera are expected to remain at current levels since Gypchek® does not affect non-target moths and butterflies. Under Alternatives 2 and 3 where *B.t.k.* is used, native Lepidoptera populations may remain low for several years but are expected to recover to pre-treatment levels within 1-2 years of treatment through recolonization and reproduction. Recovery time for each species may be dependent upon the number of broods per year (i.e., species with multiple broods may recover more quickly) and dispersal abilities.

4.2.1.3. Vegetation

Affected Environment

Approximately 80% of the park is forested and susceptible to gypsy moth defoliation. Forest composition includes oak-hickory, maple-oak, oak-beech-maple, and maple-sycamore forest types. Oak-type forests, the most highly preferred host type for gypsy moths, comprise the majority forest cover in the mid to upper elevations. Important riparian zones exist along the two rivers and streams. Other major park habitats include old field/scrub, agricultural fields, wetlands, and suburban lands. Approximately 580 plant species occur in the park (Rouse, 1998).

Direct and Indirect Effects

Under Alternative 1, defoliation is expected to occur on the southern portion of Loudoun Heights. Deterioration of tree health is expected in defoliated areas, which leads to increased tree mortality. Some trees may die after one year of defoliation stress, but tree mortality is expected to be higher in areas suffering from repeated defoliation events. Defoliation allows sunlight to penetrate to the forest floor, benefiting some shade-intolerant species while adversely affecting other plants that require shade. Changes in humidity

levels on the forest floor may affect plant growth. Changes in the forest understory composition would be expected.

Under Alternatives 2-5, treatment areas would largely be protected from gypsy moth defoliation and its impacts. In Alternative 2, 3 a temporary reduction in lepidopteron pollinators in areas treated with *B.t.k* may occur.

Cumulative Impacts

Under Alternative 1, repeated outbreaks of gypsy moth may lead to the loss of oak species and other trees and could permanently change the composition of the forest and its understory vegetation. Loss of oaks may make the forests less susceptible to gypsy moth in the future. Species adapted to openings in the forest are expected to thrive while shade-tolerant species may decrease in abundance. Implementing alternative 4

Alternatives 2 and 3 may protect treated areas from the impacts of defoliation for several years. In Alternative 4, lepidopteron pollinators are expected to recover to pre-treatment levels within 1-2 years.

4.2.1.4. Wildlife

Affected Environment

The forests, fields, wetlands, streams, and ponds in HAFE harbor a broad diversity of wildlife, including 18 species of mammals, approximately 122 species of birds, 12 amphibians, 15 reptiles, and 32 fish species. Some notable species include white-tailed deer (*Odocoileus virginianus*), beaver (*Castor canadensis*), and great-blue herons (*Ardea herodias*). Other than aquatic macroinvertebrate fauna, which number in the hundreds, the invertebrate taxa are not well inventoried. Hundreds of insects, arachnids, crustaceans and other invertebrate species are probably found in HAFE.

Direct and Indirect Effects

In Alternative 1, the expected gypsy moth defoliation may affect the abundance and distribution of wildlife due to changes in vegetation and habitat structure. Some species may respond favorably while others are negatively impacted. For example, defoliation causes a loss of cover for nesting bird species, increasing predation risk. A reduction in the abundance of other leaf-feeding insects can be expected as well, reducing food availability for some songbirds. However, some wildlife species may thrive in response to the abundant gypsy moth caterpillar as a food source itself. White-tailed deer may migrate to avoid defoliated areas. Decreased acorn production in oaks stressed by defoliation can reduce food availability and may cause declines in some acorn-dependent wildlife populations.

Defoliation can increase water temperatures in small streams and can cause declines in fish and aquatic invertebrate populations.

Under Alternatives 2-5, the impacts to wildlife resulting from defoliation would largely be prevented in treated areas. *B.t.k.* is not known to have significant direct effects on any other wildlife, except feeding Lepidoptera as discussed in Sections 4.3.1.2. and 4.3.1.3. Gypchek® affects only the gypsy moth. Birds and mammals may temporarily switch their diet due to a reduction of caterpillars in treated areas. It is possible that some gypsy moth parasitoids (e.g., parasitic wasps) may be negatively or positively indirectly affected by a reduction in their host. The greatest concerns regarding the use of *B.t.k.* are the potential adverse affects both terrestrial and aquatic invertebrates. Since *B.t.k.* has been demonstrated to have very low toxicity to vertebrates, the main concern is with non-target insects and crustaceans. The specificity of *B.t.k.* to Lepidoptera would limit the negative effects on aquatic invertebrates, except for a few species of aquatic Lepidoptera.

Cumulative Impacts

In Alternative 1, tree mortality due to defoliation stress may cause reductions or elimination of squirrel and tree nesting bird populations but may also provide additional habitat (in the form of dead trees) for other wildlife. Acorn production may be reduced for several years after the actual defoliation events. Increased understory growth due to forest openings may provide additional habitat and food sources for some wildlife. Alternatives 2-5 may protect treated areas from the impacts of defoliation on wildlife for several years. Therefore, the only organisms likely to be affected by *B.t.k.* are Lepidoptera feeding on plants (principally forest canopy leaves) within 7 to 10 days of application. *B.t.k.* will not affect adult insects. If *B.t.k.* were used for gypsy moth suppression there would be some negative impacts to non-target Lepidopteron species. Under alternatives 4 and 5 non-target lepidopteron caterpillars would not be affected.

4.2.1.5. Endangered and threatened species

Affected Environment

No federally listed endangered or threatened species are known to occur in HAFE. The federally protected bald eagle (*Haliaeetus leucocephalus*) has been reported at a nest sites in the Potomac and use the Shenandoah River as a travel corridor. Some state-listed endangered, threatened or potentially threatened plant species have been recorded in HAFE including 93 occurrences of 33 plants (Fleming, 1999, Pearles, 2007).

In response to requests of the West Virginia State Heritage Program and the U.S. Fish and Wildlife Service, West Virginia responded by commenting that

There were no known records of any Rare, Threatened or Endangered (RTE) species or sensitive habitats within the project area.

In previous inventories of the park's flora, thirty-three state-listed rare, endangered, species of concern or threatened plants have been recorded in the park. Of these species, ten are found at least occasionally in and near forested habitats, including: *Aster shortii*, *Arabis shortii*, *Hasteolola suavens*, *Eruthromium albidum*, *Carex careyana*, *Scutellaria saxatilis*, *Ellisia nycetelea*, *Iris cristata*, *Asplenium pinnatididum*, and *Heuchera pubescens*.

Compliance with the Section 7 of the Endangered Species Act of 1972, as amended, was completed by consulting with the U.S. Fish and Wildlife Service. Their correspondence to the park is contained in [Appendix 7](#) along with correspondence from the State Historic Preservation Offices.

Direct and Indirect Effects

Alternative 1 may affect state-listed bird species as described for birds in Section 4.3.1.4. Those more closely associated with forested habitats and adjacent open areas and that nest in the park are probably more sensitive to these changes. Species associated with closed canopy forests may be negatively affected, while others may thrive in response to changes and openings in the forest caused by gypsy moth outbreaks. Alternatives 2-5 would largely protect state-listed species from the consequences of defoliation in treated areas. Alternative 2 and 3 where *B.t.k* is used may cause some of the state-listed birds, especially nesting species, to temporarily switch diets in response to a reduced abundance of caterpillars. This impact is reduced in Alternatives 4 and 5 where Gypchek® is used.

In Alternative 1, state-listed rare plants that are dependent upon closed-canopy forests may be negatively affected by additional defoliation events. However, other species may benefit from the additional sunlight that reaches the forest floor. In Alternatives 2-5 state-listed rare plants in forests would largely be protected from the impacts of defoliation in treated areas. In Alternative 2 and 3 where *B.t.k* is used, a temporary reduction in lepidopteron pollinators may affect the reproduction of a few state-listed species. This impact is not expected under Alternatives 4 and 5 and that where Gypchek® is used.

Cumulative Impacts

In Alternative 1, changes in the forest canopy and understory due to repeated defoliation events may change the distribution and abundance of state-listed plants and animals. In Alternative 2-5, these species may be protected from these impacts in treated areas for several years.

4.2.2. Impacts of Alternatives on the Physical Environment

4.2.2.1. Historical, Cultural and Archaeological Resources

Affected Environment

The park is listed on the National Register of Historic Places. It contains many historical and archeological sites and structures that could be susceptible to gypsy moth defoliation. The historic and archeological sites are located in forested areas that are managed as natural landscapes. Management actions are taken for specific sites based on cultural resources needs (e.g. removal or control vegetation to protect a cultural feature).

Loudoun Heights contain earthen and stone fortifications dating to the Civil War period. Pre-Civil War sites include charcoal hearths, logging roads and remnants of domestic dwellings. Virtually all of the forests in the park were removed during the Civil War for military reasons. Logging occurred on the Heights prior to the War to produce charcoal, the fuel used to power the furnaces and forges of the Federal Armory, the Antietam Iron Works, and other industries in Harpers Ferry (Gilbert, 1995). Trees and shrubs grow on or near most of these structures and have both positive and negative effects. Roots provide some stability to earthen structures but can be detrimental when they fall due to age, disease or environmental conditions. Shading from a closed canopy discourages shade-intolerant invasive species such as tree-of-heaven (*Ailanthus altissima*) from growing on structures.

Cultural resource compliance for this project is required under Section 106 of the National Historic Preservation Act.

Direct and Indirect Effects

Under Alternative 1, susceptible trees may be defoliated, increasing the risk of tree mortality and direct impact to historic structures. Trees near archaeological resources may be impacted similarly, leading to changes in the environment (e.g., increased erosion potential and sunlight) around these areas leading to possible impacts. The gypsy moth and their droppings may have a detrimental effect especially in highly infested areas. In Alternatives 2-5, cultural resources in areas designated for treatment would largely be protected from the effects of gypsy moths.

Cumulative Impacts

For Alternative 1, the loss of a large number of trees would open areas where invasive plants may take hold preventing the establishment of native trees. Invasive species over the long-term may have a more detrimental affect on structures. This could lead to undesirable changes in the natural landscape over time and the unnecessary loss of cultural resources. Areas

designated for treatment in Alternatives 2-5 may be protected from these effects for several years.

4.2.2.2. Scenic Values

Affected Environment

The park is composed of a largely mountainous forested landscapes bisected by the Potomac and Shenandoah Rivers, interspersed with old fields, agriculture, and approximately 50 historic buildings. Visitors and passers-by can enjoy this landscape from the roads and highways and trails that cross the park. The scenic values of the park are increasing as natural areas outside the park face increasing development pressures. Many consider Harpers Ferry to be the eastern gateway to West Virginia. The park's 1989 Special Boundary Study identifies several view sheds from historic locations as being worthy of protection. The most popular of the view sheds is from Jefferson Rock where Thomas Jefferson proclaimed the view as being worth a trip across the Atlantic. The Appalachian Trail National Scenic Trail and the C&O Canal National Historical Park bisect the park and contain scenic views of the park and surrounding countryside.

Direct and Indirect Effects

In Alternative 1, gypsy moths will negatively affect the scenic values of the park if defoliation occurs as expected. Large expanses of defoliated forest are unattractive and appear unnatural, as trees should be in full foliage during this time of year. It is possible that other aesthetically pleasing species such as wildflowers may increase in number due to defoliation and thereby enhance scenic value. In Alternatives 2-5, no impacts to scenic values due to gypsy moth defoliation are expected in treated areas as noticeable defoliation is expected to be largely prevented.

Cumulative Impacts

In Alternative 1, gypsy moths may negatively affect the scenic values of the park through repeated outbreaks. Increased tree mortality in areas experiencing multiple defoliation events will leave a large number of dead trees in some areas, negatively affecting the aesthetics of the forest for a longer period of time. Alternatives 2-5 may protect treated areas from the impacts of defoliation on scenic values for several years.

4.2.2.3. Private Land

Affected Environment

Private land within the park boundary is mostly developed. Only 100 acres of the parks 3645 gross acreage is owned by private and public interest. Outside the boundary, the park is largely surrounded by private land,

Direct and Indirect Effects

In Alternative 1, the expected gypsy moth outbreak on federal land may affect neighboring non-federal land, including land that may be treated by private landowners in 2009. Mature gypsy moth caterpillars may migrate several hundred feet from where they have depleted their food source into adjacent untreated areas, possibly leading to defoliation and tree mortality despite the suppression activities of the landowner. In Alternatives 2-5, private lands adjacent to the park that may be treated by the landowner would largely be protected from the effects gypsy moth caterpillars.

Cumulative Impacts

In Alternative 1, gypsy moths may become reestablished on non-federal land despite being treated this season because of movement from untreated federal land. This may result in the need to treat these areas again next year. Alternatives 2-5 may protect non-federal land from dispersing gypsy moth populations for several years.

4.2.2.4. Water Quality and Wetlands

Affected Environment

Approximately 9 miles of the Potomac and Shenandoah Rivers pass through the park. Numerous streams and tributaries exist within the park boundary. There are approximately 100 acres of wetlands within the park and mostly along the two rivers. Water quality of the rivers is good (National Park Service, 1997). Wetlands are found throughout the park and represent an important habitat for many animal and plant species.

Direct and Indirect Effects

In Alternative 1, gypsy moths may affect the water quality of park streams and the two rivers if defoliation occurs as expected. The results of defoliation can include temporary changes in water temperature, dissolved oxygen levels, pH, nutrient concentration, sediment load, stream discharge and flow rate, and other variables. Affected streams may pass these impacts to the wetlands in which they drain. In Alternatives 2-5, the impacts of defoliation on water quality and wetlands may be largely prevented in treated areas. No effects on water quality from pesticide treatments of either *B.t.k.* or Gypchek are anticipated.

Cumulative Impacts

In Alternative 1, the loss of trees due to the stresses of defoliation can increase the impacts on water quality and wetlands. In Alternatives 2-5, the impacts of defoliation on water quality may be largely prevented in treated areas for a number of years.

4.2.3. Impacts of Alternatives on the Social Environment

4.2.3.1. Visitor Use and Recreational Value

Affected Environment

The park contains miles of trails on Loudoun Heights, including the Appalachian National Scenic Trail. The park receives approximately 0.5 million visitors annually, with the highest visitation occurring during the spring, summer and fall months.

Direct and Indirect Effects

In Alternative 1, gypsy moths are likely to impact the recreational value of the park if defoliation occurs as expected. Visitor experiences may be negatively affected by forests denuded of foliage, the lack of shade on trails, large amounts of caterpillars and frass (caterpillar droppings), and health and safety concerns. Some visitors may respond by avoiding use of the park during the summer while gypsy moths are active. In Alternatives 2-5, the impacts to recreational values and visitor use due to gypsy moth defoliation would be largely prevented. Visitor use may be briefly impacted during the treatment period as visitors may avoid being in the park during the applications of pesticides. In Alternative 2 and 3 where *B.t.k.* is used, visitors may experience reduced opportunities for viewing native Lepidoptera.

Cumulative Impacts

In Alternative 1, repeated gypsy moth outbreaks and safety concerns regarding dead trees and falling limbs may affect recreational values and visitor use over the long-run as visitors learn to avoid troublesome areas. In Alternatives 2-5, impacts to recreational values and visitor use due to gypsy moth defoliation are expected to be largely prevented for several years in treated areas.

4.2.3.2. Health and Safety

Affected Environment

In addition to the 0.5 million visitors each year, there are 300 NPS employees. Appalachian Trail hikers Additionally, park volunteers assist in a variety of programs and projects. Many employees and volunteers spend significant amounts of time outdoors. Many additional people just pass through the park each year as transients.

Direct and Indirect Effects

In Alternative 1, gypsy moths may affect the health and safety of visitors, employees and transients. Skin rashes and other irritations from contact with gypsy moths may occur. Some sensitive individuals may become allergic to the gypsy moth. Increased tree mortality resulting from

defoliation stresses may pose a hazard due to falling limbs and trees. Some potential visitors may respond by avoiding use of the park areas containing many dead trees. Defoliated areas are also at an increased risk of fire danger due to solar drying of leaf litter. Transients (visitors that just pass through the park) could be affected if dead trees fall on the trail causing a hazard. In Alternatives 2-5, the impacts to the health and safety use due to gypsy moth defoliation may be largely prevented.

For *B.t.k.*, minor irritations of the skin, eyes or respiratory tract may occur in people who handle and apply the pesticide. Gypchek® has no known adverse effects on people, but some sensitive individuals that are exposed may experience minor irritations similar to that of having contact with gypsy moth. These effects are much more likely to occur in people who handle and apply the pesticide.

Cumulative Impacts

In Alternative 1, repeated gypsy moth outbreaks and safety concerns regarding dead trees and falling limbs may affect public health and safety over the long run as the number of dead and potentially hazardous trees increase. In Alternatives 2-5, impacts to public health and safety due to gypsy moth defoliation are expected to be largely prevented for several years in treated areas.

4.3. Recommendation

Data from gypsy moth egg mass surveys in 2008 indicate the need for selected pesticide applications during the spring of 2009. Based on the analysis documented in this environmental analysis, the FEIS, and the site-specific biological evaluation provided by the Forest Service, it is the recommendation of the NPS that Alternative 4 be implemented. This will involve treatment of approximately 141 acres of forested federal land with one applications of Gypchek®.to suppress gypsy moth in the park in 2009.

While positive and negative impacts can be identified for all of the alternatives, Alternative 1 has the greatest potential for both short-term and long-term negative impacts to people and the environment. If pesticides are not applied, moderate defoliation of forested areas is expected, possibly resulting in significant tree mortality especially in areas previously defoliated. Impacts to scenic, recreational and ecological values, and public health and safety are expected. Furthermore, adjacent non-federal lands would not be protected from dispersing gypsy moths, even if those areas are treated. Suppression activities as outlined in Alternatives 2-5 would help address the impacts expected under Alternative 1. However, Alternatives 2 and 3 where *B.t.k.* will be used may have undesirable negative effects on

non-target species such as native Lepidoptera and on the natural controls of gypsy moth.

Alternatives 4 and 5 best address the project objectives of minimizing the short and long-term effects of gypsy moth outbreaks on the scenic, recreation and ecological values of the park while supporting suppression activities on adjacent non-federal land. Alternative 4 is more desirable for its economic benefits since only one application is needed. Areas where light defoliation is likely to occur in 2009 are designated for treatment while supporting suppression activities on adjacent non-federal land. This approach will help to mitigate and minimize any impacts that this alternative may have on non-target organisms and the natural controls of the gypsy moth. Any temporary effects that treatment may have are outweighed by the potential long-term impacts of Alternative 1. This alternative is compatible with the selected alternative in the FEIS and ROD, in that the biological insecticide applications are the only operational IPM component that will meet the objectives identified in this EA. The objectives and methodology outlined in this EA and ongoing monitoring data should be used to identify any areas in need of treatment in the future.

In carrying out this action, the NPS is bound by the provisions of the National Environmental Policy Act of 1969 (NEPA) which requires environmental analysis of proposed major federal actions that may significantly affect the quality of the human environment. NEPA and NPS policies require assessment of alternative management actions to facilitate balanced, integrated approaches to resource protection and development. These requirements have been met by the FEIS and ROD and the development of this site-specific EA. The selected alternative involves the use of insecticides that are registered for suppression of gypsy moth, and will be applied according to label requirements. This meets the provisions of the Federal Insecticide, Fungicide, and Rodenticide Act of 1947 as amended.

Our recommendation to implement Alternative 4 is based upon compliance with, and the authority granted by the federal laws and regulations previously described and with NPS policies. This project conforms to NPS policy to protect native species and biodiversity from impacts of non-native species, and the Forest Service policy to protect and preserve the forest resources of the nation against destructive forest insects and disease. This recommendation was guided and is supported by the following factors:

- ☐ The insecticides proposed for use are registered for that intended purpose by the Environmental Protection Agency;
- ☐ Insecticide applications proposed in the park comply with EPA

- label directions, city and federal laws, and NPS regulations;
- ☐ The USFWS has determined that no federally listed endangered or threatened species would be adversely affected by suppression actions;
 - ☐ No significant impacts to state listed endangered or threatened species, or other native flora or fauna are expected from the proposed project;
 - ☐ Gypchek® is safe to use around humans;
 - ☐ The public involvement, public notification, project monitoring procedures and mitigation measures that will be followed and implemented during the project will minimize the risk of exposure to individuals visiting and residing in or near areas treated;
 - ☐ There are no apparent significant deleterious effects on the environment; and
 - ☐ This suppression project is within the scope of the FEIS and the decision announced in the ROD.

4.4. Mitigating Measures

The treatment program will be conducted such that every aspect will proceed only if it can be done so safely. Pesticides will be applied in accordance with pesticide label specifications. Every effort will be made to restrict the application of pesticides to target areas and to minimize drift to off-site areas.

Pilots will be provided with digital and hardcopy maps of treatment areas. Delineated spray areas will be defined by Global Positioning System (GPS) technology used onboard the aircraft. Pilots will be briefed daily on conditions and on any unusual features that require consideration or special attention. Pilots will be informed of no fly zones including populated areas including the towns of Bolivar and Harpers Ferry. In addition to the application aircraft, secondary craft may be used with personnel from the Forest Service that would monitor and guide spray activities.

The following notifications will be undertaken one week prior to the proposed treatment date:

- ☐ A news release in local papers will be issued to notify the public of the upcoming aerial operations.
- ☐ Individual landowners will be notified by letter.

- Signs will be posted at trail heads to notify hikers of the upcoming aerial operations.
- The Towns of Harpers Ferry and Bolivar will be notified by contacting the mayors. Dissemination of this information to the residents of Harpers Ferry and Bolivar via telephone messages may be undertaken by town government officials.
- Signs will be posted in visitor centers and information sites around the park and local community.
- The park's emergency telephone number (304 535-6776) will be available for incoming calls and will contain information on the spraying operations including the time and date of the treatment. This message may change several times due to changes in environmental conditions which may cause a delay or cancellation of the treatment.

Map of the treatment area and copies of the environmental assessment will be available for inspection at the park's Headquarters in Harpers Ferry.

Coordination with the Appalachian Trail Office in Harpers Ferry, the Potomac Appalachian Trail Club, and park staff will minimize the number of hikers that may be on the trails within the treatment areas.

4.5. Project Monitoring

As part of an ongoing IPM program, annual monitoring of forests for defoliation, surveys of gypsy moth populations and post-treatment efficacy of treatments will be conducted. The effectiveness of the spray application will be assessed through the placement of spray cards in selected treatment areas. The park will continue to monitor gypsy moth populations throughout 2009 and subsequent years. Aerial surveys later in the summer will document any defoliation that may occur in the park. Egg mass surveys performed as needed during the fall of 2009 should provide insight as to the effectiveness of this spray program when compared to data from earlier egg mass surveys. It is expected that most treated areas will be protected from defoliation for several years.

The management of the gypsy moth is an ongoing process. The decision to treat areas of the park in the future will be based upon the same project objectives and analysis outlined in this EA. Egg mass survey and aerial observations of defoliation will be used to assess the need for future treatments across the park. Total treatment area may change from year to year, and it is expected that no treatment will be necessary for most years.

Separate EAs will be developed to address any future suppression activities and will be made available for public review.

5. PERSONS AND AGENCIES CONSULTED

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Appendix 1

Egg Mass Survey Results – Loudoun Heights

Table 2– Results of the gypsy moth egg mass survey conducted at the Loudoun Heights area of Harpers Ferry National Historical Park on September 11, 2008.

Plot #	#em/acre	em size (mm)
18	0	28,30
19	240	---
20	120	---
21 *	0	---
22 *	0	---
23 *	0	---
24 *	0	---
25 *	0	---
26 *	0	---
27 *	0	---
28 *	0	---
29 *	0	---
30 *	40	---
31 *	0	---
32 *	0	---
33 *	0	---
34 *	0	---
35 *	0	---
36 *	0	---
37 *	0	---
38 *	0	---
39 *	0	---
40 *	0	---
41 ^z	1680	40,28,20
42 ^z	960	24,42,26
43 ^z	80	---
44 ^z	1720	32,34,38
45 ^z	1080	28,26

em/acre range = 0 – 1720

em/acre average = 211

em size range (mm) = 20-40

em size average (mm) = 30

* = plot located in Btk treatment area

em/acre average in Btk treatment area = 2

^z = recommend treatment area

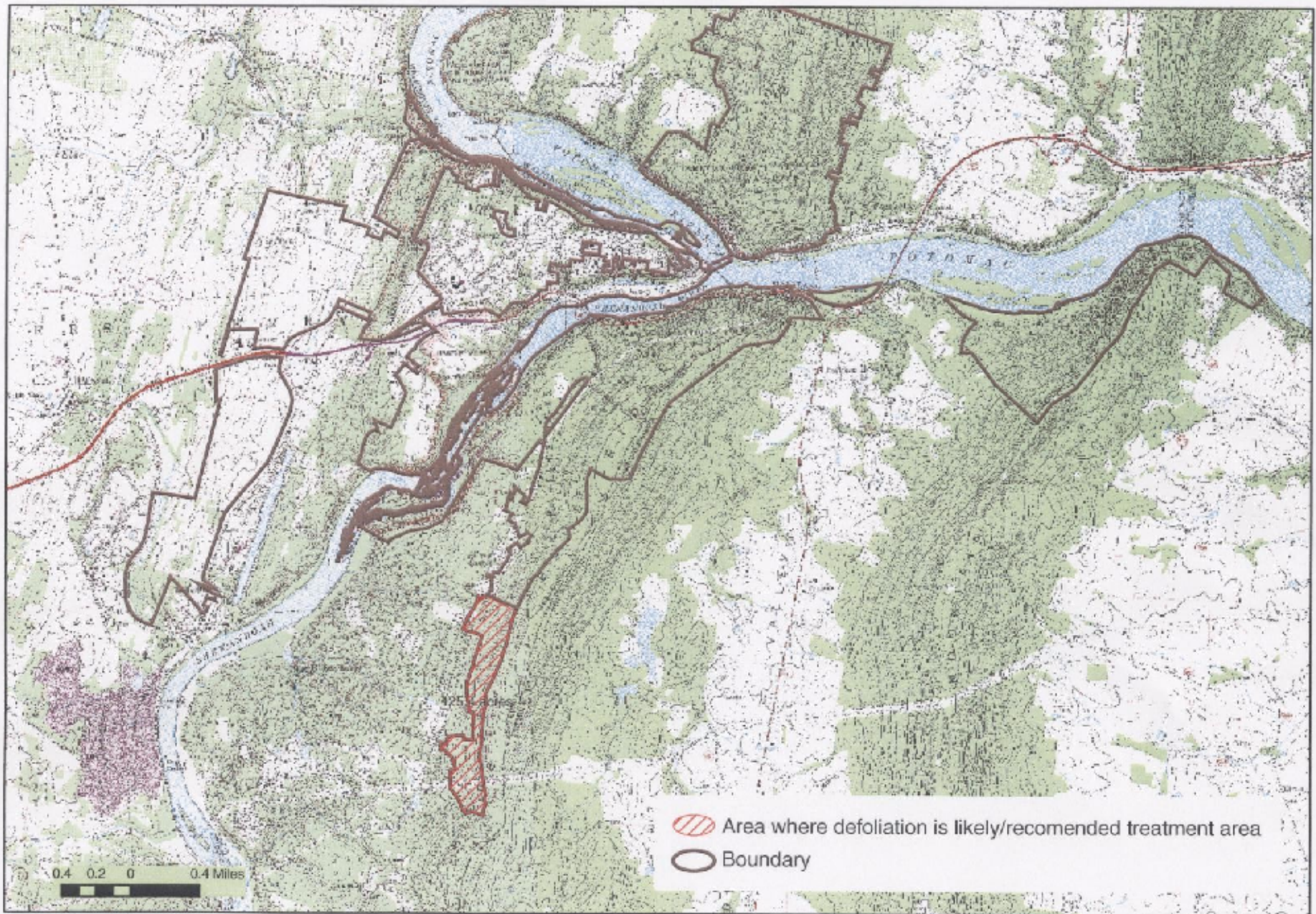
em /acrerange in recommended treatment area = 80-1720

em/acre average in recommended treatment area = 1104

em size average (mm) in recommended treatment area = 31

Appendix 2 Proposed Treatment Area

Figure 5. -- Area where defoliation is likely at Harpers Ferry NHP in 2009/recomended treatment area.



Appendix 3 Gypchek® Fact Sheet

Development of the Virus Product - Gypchek

Registration - In April 1978, after many years of research and development, the gypsy moth nucleopolyhedrosis virus product Gypchek was registered by the U. S. Environmental Protection Agency (US-EPA) (EPA Registration #27586-2) as a general use insecticide for aerial and ground application to control gypsy moth. In 1996, the product satisfied all re-registration requirements established by the US EPA and was relabeled.



Identity and Safety - Based upon extensive safety testing, the virus that is the active ingredient in Gypchek has been shown to be unrelated to human and other mammalian viruses and only distantly related to other insect viruses. Toxicological and pathogenicity testing of Gypchek on laboratory animals, wild mammals, bird and fish in support of registration have revealed no effects at field doses.

Production - Gypchek is produced by the US Department of Agriculture Animal and Plant Health Inspection Service and the Forest Service. A standard laboratory strain of the gypsy moth is reared year-round and the larvae infected with the virus. The larvae die and are harvested and processed to produce a finely ground powder. The final product is subjected to quality assurance testing before packaging and distribution. In general, it takes between 500 and 1,000 infected gypsy moth larvae to produce enough Gypchek to treat one acre.

Application - Gypchek can be applied using aerial or ground application equipment. Its use is limited to wide-area public pest control programs sponsored by government entities. Gypsy moth larvae need to ingest the virus (i.e. Gypchek is not a contact insecticide), the virus interferes with food absorption and the larvae die in approximately 7-10 days. The addition of virus to the environment at dosages consistent with those used for control of the gypsy moth does not raise virus levels above those that would occur naturally. Gypchek is one of two biological insecticides, the other being the bacterium *Bacillus thuringiensis* var. *kurstaki*, (Btk) currently registered for use against gypsy moth. Gypchek kills only gypsy moth larvae, whereas Btk kills gypsy moth as well as other selected non-target lepidopteran larvae.



For additional information concerning Gypchek, contact Dr. Richard Reardon, USDA Forest Service, Forest Health Technology Enterprise Team, Morgantown, WV at (304) 285-1566 or email - rreardon@fs.fed.us or Dr. John Podgwaite, USDA Forest Service, Northern Research Station, Hamden, CT at (203) 230-4325 or email - jpodgwaite@fs.fed.us. The material safety data sheet (MSDS) can be accessed at: http://www.fs.fed.us/foresthealth/pesticide/pdfs/msds_gypchek.pdf



USDA Forest Service - FHTET March 2009

Appendix 4

Butterfly and Skipper Species Observed at Harpers Ferry National Historical Park

English name	Latin name
Swallowtails	Papilioninae
Pipevine Swallowtail	<i>Battus philenor</i>
Zebra Swallowtail	<i>Eurytides marcellus</i>
Black Swallowtail	<i>Papilio polyxenes</i>
Spicebush Swallowtail	<i>Papilio troilus</i>
Eastern Tiger Swallowtail	<i>Papilio glaucus</i>
Appalachian Tiger Swallowtail	<i>Pterourus appalachiensis</i>
Giant Swallowtail	<i>Papilio cresphontes</i>
Whites	Pierinae
West Virginia White	<i>Pieris virginiensis</i>
Cabbage White	<i>Pieris rapae</i>
Falcate Orange-tip	<i>Anthrocharis midea</i>
Sulphurs	Coliadinae
Clouded Sulphur	<i>Colias philodice</i>
Orange Sulphur	<i>Colias eurytheme</i>
Cloudless Sulphur	<i>Phoebis sennae eubule</i>
Little Yellow	<i>Eurema lisa</i>
Sleepy Orange	<i>Eurema nicippe</i>
Hairstreaks	Theclinae
Banded Hairstreak	<i>Satyrus colanus</i>
Juniper Hairstreak	<i>Callophrys gryneus</i>
Henry's Elfin	<i>Callophrys henrici</i>
Gray Hairstreak	<i>Strymon melinus</i>
Blues	Polyommatae
Eastern-tailed Blue	<i>Everes comyntas</i>
Spring Azure	<i>Celastrina ladon</i>
Summer Azure	<i>Celastrina ladon neglecta</i>
Appalachian Azure	<i>Celastrina neglecta major</i>
Silvery Blue	<i>Glaucopsyche lydgamus</i>

English name	Latin name
Brush-foots	Nymphalidae
American Snout	<i>Libytheana carinenta</i>
Variegated Fritillary	<i>Euptoieta claudia</i>
Great-Spangled Fritillary	<i>Speyeria cybele</i>
Meadow Fritillary	<i>Boloria bellona</i>
Silvery Checkerspot	<i>Chlosyne nycteis</i>
Pearl Crescent	<i>Phyciodes tharos</i>
Question Mark	<i>Polygonia interrogationis</i>
Eastern Comma	<i>Polygonia comma</i>
Mourning Cloak	<i>Nymphalis antiopa</i>
American Lady	<i>Vanessa virginiensis</i>
Painted Lady	<i>Vanessa cardui</i>
Red Admiral	<i>Vanessa atalanta</i>
Common Buckeye	<i>Junonia coenia</i>
Red-spotted Purple	<i>Limenitis arthemis astyanax</i>
Viceroy	<i>Limenitis archippus</i>
Hackberry Emperor	<i>Asterocampa celitis</i>
Tawny Emperor	<i>Asterocampa clyton</i>
Satyrus	Satyrinae
Northern Pearly Eye	<i>Enodia anthedon</i>
Little Wood Satyr	<i>Megisto cymela</i>
Common Wood Nymph	<i>Cercyonis pegala</i>
Milkweed Butterflies	Danaeinae
Monarch	<i>Danaus plexippus</i>
Open-winged Skippers	Pyrginae
Silver-spotted Skipper	<i>Epargyreus clarus</i>
Northern Cloudywing	<i>Thorybes pylades</i>
Hayhurst's Scallopwing**	<i>Staphylus hayhurstii</i>
Dreamy Duskywing	<i>Erynnis icelus</i>
Sleepy Duskywing	<i>Erynnis brizo</i>
Juvenal's Duskywing	<i>Erynnis juvenalis</i>
Horace's Duskywing	<i>Erynnis horatius</i>
Wild Indigo Duskywing	<i>Erynnis baptisiae</i>
Comm. Checkered Skipper	<i>Pyrgus communis</i>
Common Sootywing	<i>Pholisora catullus</i>

Butterfly and Skipper Species Observed at Harpers Ferry National Historical Park

English name	Latin name
Peck's Skipper	<i>Polites peckius</i>
Tawny-edge Skipper	<i>Polites themistocles</i>
Crossline Skipper	<i>Polites origenes</i>
Northern Broken-Dash	<i>Wallengrenia egeremet</i>
Little Glassywing	<i>Pompeius verna</i>
Sachem	<i>Atalopedes campestris</i>
Delaware Skipper	<i>Anatrytone logan</i>
Hobomok Skipper	<i>Poanes hobomok</i>
Zabulon Skipper	<i>Poanes zabulon</i>
Dun Skipper	<i>Euphyes vestris</i>
Pepper and Salt Skipper	<i>Amblyscirtes hegon</i>
Comn. Roadside Skipper	<i>Amblyscirtes vialis</i>
Ocola Skipper	<i>Panoquina ocola</i>

Grass Skippers	<i>Hesperiinae</i>
Swarthy Skipper	<i>Nastra lherminier</i>
Clouded Skipper	<i>Lerema accius</i>
Least Skipper	<i>Ancyloxypha numitor</i>
European Skipper	<i>Thymelicus lineola</i>
Fiery Skipper	<i>Hylephila phyleus</i>
Indian Skipper	<i>Heperia sassacus</i>

Appendix 5

DRAGONFLIES AND DAMSELFLIES OF HARPERS FERRY NHP

COMMON NAME
Spatterdock Darner
Shadow Darner
Common Green Darner
Springtime Darner
Swamp Darner
Black-shouldered Spinyleg
Eastern Ringtail
Spine-crowned Clubtail
Lancet Clubtail
Midland Clubtail
Ashy Clubtail
Cobra Clubtail
Dragonhunter
Arrow Clubtail
Stream Cruiser
Swift River Cruiser
Royal River Cruiser
Common Baskettail
Prince Baskettail
Umber Shadowdragon
Calico Pennant
Halloween Pennant
Common Pondhawk
Bar-winged Skimmer
Slaty Skimmer
Widow Skimmer
Common Whitetail
Twelve-spotted Skimmer
Great Blue Skimmer
Blue Dasher
Wandering Glider
Spot-winged Glider
Eastern Amberwing
Cherry-faced Meadowhawk
Black Saddlebags
Ebony Jewelwing
American Rubyspot
Southern Spreadwing
Slender Spreadwing
Blue-fronted Dancer
Violet Dancer
Powdered Dancer
Blue-ringed Dancer
Blue-tipped Dancer
Dusky Dancer
Double-striped Bluet
Familiar Bluet
Stream Bluet
Skimming Bluet
Fragile Forktail
Eastern Forktail

Appendix 6

West Virginia State Heritage Response



DIVISION OF NATURAL RESOURCES

Wildlife Resources Section

Operations Center

P.O. Box 67

Elkins, West Virginia 26241-3235

Telephone (304) 637-0245

Fax (304) 637-0250

February 24, 2009

Joe Manchin III
Governor

Frank Jezioro
Director

Ms. Rebecca L. Harriett
National Park Service
Harpers Ferry National Historical Park
P.O. Box 65
Harpers Ferry, WV 25425

Dear Ms. Harriett:

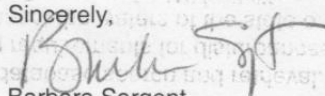
We have reviewed our files for information on rare, threatened and endangered (RTE) species and sensitive habitats for the area of the proposed 141 acre gypsy moth treatment block (with Gypcheck) on Loudon Heights in Jefferson County, WV.

We have no known records of any RTE species or sensitive habitats within the project area. The Wildlife Resources Section knows of no surveys that have been conducted in the area for rare species or rare species habitat. Consequently, this response is based on information currently available and should not be considered a comprehensive survey of the area under review.

The information provided above is the product of a database search and retrieval. This information does not satisfy other consultation or permitting requirements for disturbances to the natural resources of the state. If your project will directly impact the waters of the state or cause a "take" of fish and/or wildlife, consultation may be required. Requests for WV wildlife agency consultation should be directed to Mr. Roger Anderson at the address given in the letterhead or by email at rogeranderson@wvdnr.gov. Database requests for information on RTE species and sensitive habitats should still be directed to me.

Thank you for your inquiry, and should you have any questions please feel free to contact me at the above number, extension 2048.

Sincerely,


Barbara Sargent
Environmental Resources Specialist
Wildlife Diversity Program