



The Indiana
STRATEGIC PLAN
for
GYPSY MOTH
management

State of Indiana
Frank O'Bannon, Governor

Indiana Department of Natural Resources
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Coordinating Committee

Indiana Department of Natural Resources: Division of Entomology and Plant Pathology Division of Forestry
U.S. Department of Agriculture-Forest Service, Forest Health Protection
U.S. Department of Agriculture-Animal Plant Health Protection Service, Plant Protection and Quarantine
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Table of Contents

Position Statement	1
Purpose	2
I Introduction	2
A Reason for concern	2
B Nationwide perspective	2
C Indiana concerns	2
Program Mission Statement	3
II Process for cooperation and decision making	3
A Organize and define roles fo the coordinating committee	3
B Develop a strategic plan	3
C Communicate the components of the program to the public	3
D Organize a data management system	3
E Develop and evaluate management options	3
F Make decisions by consensus	3
III Strategies	4
A Education	4
B Eradication	4
C Slow the spread	4
D Suppression	5
E Quarantine and regulation	5
F Integrated pest management/Available management practices	5
1 Silviculture	5
2 Biological control	5
G Research	6
H No cooperative state/federal management activities	6
IV Conclusion	6
<i>Appendix A</i> Gypsy moth biology	7
<i>Appendix B</i> Responsible agencies and their roles	9

Position Statement

The Indiana Cooperative Gypsy Moth Management Program

INTENT

The intent of the Department of Natural Resources is to work in cooperation with the agencies responsible for gypsy moth management and the citizens of Indiana to conduct all phases of the Indiana Cooperative Gypsy Moth Management Program.

MISSION

The responsible agencies will provide direction for regulating and managing gypsy moth in Indiana to protect public health, sustain environmental resources and delay the adverse economic and aesthetic effects of gypsy moth.

COOPERATION

The responsible agencies have worked very closely over the years to detect and eradicate isolated infestations of gypsy moth in the state of Indiana. Through these cooperative efforts Indiana has effectively delayed the establishment of gypsy moth and the damaging effects to the urban environment, forests and human health.

STRATEGIC PLAN

The strategic plan provides a mission statement, describes the organizational structure of the Indiana Cooperative Gypsy Moth Management Program, and gives the strategies available to pursue the mission of the program. Action plans will be drafted and implemented for each strategy in the plan. The strategic plan will be modified and updated as necessary.

APPRECIATION

Special thanks is given to the following members of the coordinating committee:

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Strategic Plan for Management of Gypsy Moth in Indiana

PURPOSE OF THIS DOCUMENT

This document defines the coordination, cooperation and decision making process for non-regulatory gypsy moth management in Indiana.

I. INTRODUCTION

A. Reason for concern

The gypsy moth is a serious pest of forest and urban landscapes. It is now established in portions of Indiana. From late April through May, caterpillars hatch from an egg mass that may contain 500 - 1000 eggs. The caterpillars climb to the tops of the trees where they feed on foliage or dangle from silk strands and drift in the wind to colonize other trees. The gypsy moth caterpillar can eat the foliage of 500 kinds of trees and other plants. Oak leaves are their preferred food. Over the next month the caterpillars can defoliate entire trees and forests (for more information on biology and habits see appendix A).

Although most plants defoliated by caterpillars eventually produce more leaves, the reduction of reserve energy adds stress to plants. Continued annual defoliation of plants already under stressful conditions may kill them in 2 - 4 years. In the urban landscape removal of dead limbs and trees can have a significant economic effect on homeowners and municipalities. In addition, caterpillar hairs may become skin and respiratory irritants. Caterpillars and their droppings are a nuisance in urban and recreational areas. Tree mortality in forested areas can change tree species composition and may have direct or indirect effects on many other species in the forest ecosystem. Tree mortality can result in significant loss of timber value to forest owners.

B. Nationwide perspective

Gypsy moth was brought from Europe to Massachusetts in 1869. It now occupies the northeastern United States, a portion of Eastern Ohio and Michigan, parts of eastern Wisconsin and northern Indiana. Gypsy moth movement occurs naturally along the front of the generally infested area. The rate of natural movement is approximately 13 miles a year. Commonly, the gypsy defoliates 3 million acres of forest a year in the United States; the approximate equivalent to 70% of Indiana's forested acreage. During 1981, in the United States, 13 million acres of forested land were defoliated. Urban trees, already under considerable stress, will be most affected by gypsy moth feeding damage.

C. Indiana concerns

There are approximately 4.4 million acres of forested land in Indiana. About 3.25 million acres are moderately and highly susceptible to gypsy moth damage. Oaks are the preferred host of gypsy moth. Within Indiana's forests, oaks comprise 40% of the trees. Another 40% of the trees are moderately to highly preferred hosts for gypsy moth. Thus, 80% of Indiana's forest trees are susceptible to gypsy moth damage. Trees in the urban environment are at a similar risk to gypsy moth defoliation. Detection of populations in other areas of the state is attributed to human activities such as commerce and residential movement from infested areas. Indiana has had a program to detect and eradicate artificial introductions of gypsy moth since 1973. The program has slowed the spread of gypsy moth and delayed damage and management costs associated with infestation of new areas. Slowing the spread has also allowed time to develop more environmentally safe and sustainable methods of control.

PROGRAM MISSION STATEMENT

The program cooperators will provide direction for regulating and managing gypsy moth in Indiana to protect public health, sustain environmental resources and delay the economic and aesthetic effects of gypsy moth.

II. PROCESS FOR COOPERATION AND DECISION MAKING

A. Organize a gypsy moth coordinating committee and define the roles and responsibilities of the committee.

The Gypsy Moth coordinating committee includes agencies that have primary work responsibilities and legal mandates to manage gypsy moth in Indiana (Appendix B). The coordinating committee will have the primary responsibility of defining the strategies and implementing them. The committee will coordinate work activities in an efficient, economically and environmentally sensible manner, to incorporate the principles of the Slow the Spread program. Development and implementation of the strategic plan will direct the coordination of work activities and responsibilities. Work activities developed by the agencies will be responsive to the citizens of the state and to the legal requirements of state and federal law.

B. Develop a Strategic Plan.

This strategic plan outlines the initial program activities. It is a document that will respond to current issues and improvements in gypsy moth management tactics. Strategies are the organizational steps used to administer gypsy moth management activities. They are listed and defined in section III.

The cooperators will write project plans from the strategies that will define and select management options to fulfill the strategy objectives.

Annual implementation plans may be written for each project plan. They define activities annually and direct implementation to persons or agencies responsible for program management.

In the development of a strategic plan the

coordinating committee will lead and develop strategies and project plans. The responsible agencies will perform the actions identified in the annual implementation plan.

C. Communicate the components of the program to the public.

Efficient communication will allow for the timely implementation of programs, public understanding of the gypsy moth management options and how the program will be implemented. The public will be encouraged to participate in program activities. Methods will be developed for soliciting, receiving and responding to concerns and questions regarding the management program.

D. Organize a data management system.

Organization of data will allow the coordinating committee to make effective decisions regarding procedures. Information must be easily accessible and comprehensive. Information will be shared by the coordinating committee, the responsible agencies and representatives of affected citizens.

E. Develop and evaluate management options.

The committee will solicit information from the public and develop alternative management options. The alternatives will be regularly reviewed to evaluate their ability to meet strategic objectives. How they affect the management of gypsy moth. An analysis of the alternatives will consider the potential biological, social and economic effects from gypsy moth.

F. Make decisions by consensus among the coordinating committee.

The coordinating committee has the responsibility to solicit information from various agencies and the public to accumulate the biological data and evaluate the alternatives. The process provides the committee with the appropriate information to make informed and ecologically sensible decisions. The cooperators understand that if

consensus can not be achieved, the agency with legal authority has the responsibility to make the final decision. However, each agency has the right to decide whether to invest the resources necessary to implement its responsibilities under an implementation plan.

III. STRATEGIES

A. Education

Indiana citizens and landowners affected by the gypsy moth must be given reliable information so that they may know what to expect from a gypsy moth infestation and be able to participate in program activities. Education will be a key component in the implementation of all strategies and management practices.

We will develop and promote materials and networks to inform and educate the public about the gypsy moth threat, the gypsy moth program and methods for management.

Educational objectives.

- Develop and distribute selected materials that will provide awareness of the gypsy moth.
- Provide information on the state's gypsy moth management strategies and the mission of the program.
- Encourage public participation when making gypsy moth management decisions.
- Develop educational programs that alert urban and rural citizens to the threat of isolated infestations and that can identify when and where gypsy moths are likely to be a problem.
- Furnish information on the economic and environmental consequences of gypsy moth infestations and the benefits and costs of management strategies.
- Provide materials for resource managers who are situated at recreational sites, timber management sites, nursery operations, and Christmas tree plantations on

detection methods and management options.

- Prepare materials for use in classrooms at all levels to educate youth and their families.

B. Eradication

Eradication methods are used to eliminate isolated infestations of the gypsy moth that are detected in the non-infested area. Eradication is used to delay establishment of gypsy moth within the non-infested area.

We will delay the establishment of gypsy moth in Indiana by eradicating artificial infestations in the non-infested area.

Eradication objectives include

- Detect small, isolated populations of gypsy moth.
- Provide information to the public on options and alternatives available for gypsy moth management.
- Select effective methods of eradication after consideration of biological, economic and social values.

C. Slow the Spread

The Slow the Spread Program will slow the rate of gypsy moth and delay the impacts and costs associated with gypsy moth outbreaks. It entails intensively surveying the transition area and aggressively treating pockets of low level gypsy moth populations to keep them from increasing rapidly.

We will use available methods to treat small pockets of infestations located immediately ahead of the leading edge of the gypsy moth population.

Slow the Spread objectives include

- Locate infestations within the transition area.
- Define the core area of infestations.
- Inform the public of the alternatives available for treatment.
- Select the most effective method to reduce the gypsy moth population.

D. Suppression

Gypsy moth suppression programs will be considered when populations rise and prevention of severe defoliation becomes the primary goal. The objective is to reduce high populations of gypsy moth caterpillars, thus minimizing heavy defoliation. Suppression does not eliminate the gypsy moth from the generally infested area, but reduces damage from gypsy moth.

We will cooperate with county and local government in Indiana to treat forested communities or valuable forests to minimize the impact caused by destructive populations of gypsy moth.

Suppression objectives include:

- Conduct egg mass and defoliation surveys to determine the extent and severity of gypsy moth infestations.
- Work with county agencies to develop voluntary guidelines for participating in a cooperative suppression program.
- Assess the need and priorities for treatment.
- Assess the results of a suppression action.
- Prepare sound environmental documents.

E. Quarantine and Regulation

Quarantine programs are developed to inhibit the artificial transport of gypsy moths from known infested areas to non-infested areas. Indiana Natural Resources Commission, IDNR Division of Entomology and Plant Pathology and the USDA Animal and Plant Health Inspection Service have the authority under federal and state law to declare a gypsy moth quarantine. The need for a quarantine is dependent upon scientific evidence and information provided by program cooperators.

We will implement quarantine and regulatory actions to limit the artificial spread of gypsy moth into non-infested areas of Indiana and to reduce the risk of movement to non-infested states.

Quarantine and Regulation objectives

- Develop plans and implement regulations for moving materials from areas generally infested by the gypsy moth.
- Inspect shipments from generally infested areas that have a high risk of containing gypsy moth life stages, such as nursery stock, logs, and outdoor household articles.

F. Integrated Pest Management

When eradication programs and Slow The Spread are no longer feasible in an area, the area will be declared generally infested and gypsy moth populations will be managed through a program of Integrated Pest Management (IPM). This strategy relies on a combination of methods to reduce problems associated with gypsy moth.

Where gypsy moth becomes established we will implement management practices that provide long term management of gypsy moth.

Available management practices

1. Silviculture.

Silviculture is the method of selectively harvesting trees, by age, species and value, to reduce the economic loss caused by gypsy moth. In urban landscapes silviculture is the removal of dead trees and replacement with trees less susceptible to gypsy moth.

Silviculture control methods will be recommended to reduce the hazard of tree mortality in forests stands defoliated by gypsy moth. We will promote silviculture methods to reduce the chance of tree mortality in forests and urban landscapes defoliated by gypsy moth.

- Identify stands that are most likely to be severely damaged by gypsy moth based on Indiana habitat types.
- Provide information for the application of appropriate silviculture guidelines.

2. Biological Control

Biological control is the tactic of using living organisms to manage pest populations.

We will develop and apply biological control methods to provide a safe and economical means of gypsy moth control.

Biological control objectives

- Support the funding and programs necessary to implement effective biological control programs.
- Develop baseline survey to determine current habitat and organisms present that may be affected by biological control agents.
- Determine the impacts of biological control releases.
- Cooperate with research organizations to identify biological control agents that have proven effective and determine whether their introduction into Indiana would produce the desired effect
- Develop appropriate monitoring and evaluation methods to determine effectiveness of introduced organisms.

G. Research

Research of new management techniques may provide additional management alternatives for Indiana citizens and landowners.

We will encourage research of gypsy moth management options and provide the best information on gypsy moth populations, control alternatives, and forest impacts to Indiana resource managers.

- Support research into management techniques that are economically and ecologically effective.
- Share information on new research between agencies and the public.
- Support a central research center to maintain and update research data.

H. Chemical Control

Chemical control is the use of approved chemical compounds to kill insects. These compounds, applied to insects, are generally called insecticides.

We will develop methods for the selection and use of insecticides to manage gypsy moth populations.

- Evaluate the gypsy moth population, habitat, and host availability before recommending insecticide use.
- Recommend products that are registered with the Office of the State Chemist.
- Recommend products that are safe to humans and the environment.

I. Intervention

In some areas where gypsy moth is introduced or becomes established no intervention of gypsy moth populations may be the only option available.

We will distribute information on the consequences of no intervention and cooperate with local government to monitor pest activities and respond to concerns.

No management objectives include

- Provide general program information.
- Provide an avenue to receive public comment on infestations.

IV. CONCLUSION

Gypsy moth will eventually become established in Indiana. It will effect the economy and well being of rural and urban citizens. Indiana is preparing for an increase in gypsy moth populations with strategies that will provide the citizens of Indiana an understanding of what gypsy moth is, the damage it causes and how to minimize its impact on their health and environment.



Appendix A

Gypsy Moth Biology



The gypsy moth (*Lymantria dispar L.*) is one of the most serious defoliators of hardwood forests and urban landscapes in the United States. The larva of this insect, called a caterpillar, eats the foliage of approximately 500 host plants, but prefers oak, apple, willow and to a lesser extent hickory and maple. The gypsy moth has four developmental life stages: The egg, larva (caterpillar), pupa and adult. The adults mate in late summer. After mating, the female moths lay eggs in sheltered areas. Egg masses contain between 500-1000 eggs. Each female covers the eggs with her body hair. The hairs give the egg mass a fuzzy, tan appearance and provide additional protection for the winter. The egg masses can be found all winter long and don't hatch until spring.

In Indiana the caterpillars hatch from the eggs from the middle of April and may be present until the 1st week of June. As caterpillars grow, they molt or shed their skin. Each molt is called an instar. Male caterpillars have 5 instars and female caterpillars have 6 instars. Older caterpillars are approximately 2 inches long, very hairy and have 5 pairs of blue dots followed by 6 pairs of red dots along the back. Young larvae can be seen feeding on foliage during the day. Older larvae feed at night and may not be seen. Caterpillars will feed 24 hours a day prior to pupation.

The pupa is the developmental state in which the caterpillar changes to an adult. Pupae are only present from June to mid July. They are dark brown shell-like cases, which are about 2 inches long and sparsely covered with hairs.

Adults emerge from the pupal cases in July and August. Males emerge first. Males are smaller than the female, dark brown and have feathery antennae. Females emerge after the males. They have creamy white wings, a tan body and cannot fly. Both have distinct markings on their wings: an inverted V-shape that points to a dot. The female produces a pheromone that attracts the male moth to her, they mate and the female lays an egg mass. The egg mass overwinters and

the cycle begins again.

Only the caterpillars defoliate plants. Consecutive years of defoliation may weaken or kill gypsy moth hosts.

PREFERRED LARVAL FOOD PLANTS

All oaks	Sweet gum
Apple	Hawthorn
Basswood	Poplar
Gray birch	Beech
River birch	Willow

LESS DESIRED BUT STILL ATTACKED

Other birches	Elm
Cherry	Sassafras
Hemlock	Spruce
Cottonwood	Pine

PLANTS GYPSY MOTH LARVAE AVOID

Arborvitae	Flowering dogwood
Ash	American Holly
Balsam fir	Locust
Butternut	Sycamore
Black walnut	Tulip tree
Catalpa	Rhododendron
Red cedar	

Caterpillars will feed on almost any available vegetation when populations are high.

All gypsy moth life stages are transported, but egg masses pose the greatest threat of establishing a population in Indiana. Larvae that blow from infested areas pose a threat of small scattered populations becoming established in Indiana.



Appendix B

*Responsible Agencies
&
Their Roles*



1. Indiana Department of Natural Resources - Division of Entomology and Plant Pathology

The Division of Entomology and Plant Pathology is responsible for the detection of exotic plant pests that are detrimental to Indiana's natural and urban plant resources. Upon detection of gypsy moth the Division will assess the damaging potential, eradicate artificial infestations, provide technical advice to cooperating agencies, determine reasonable quarantine and regulatory actions, notify the public of options available for regulatory compliance and provide information on program activities.

2. Indiana Department of Natural Resources - The Division of Forestry

The Division of Forestry is responsible for forest health management of Indiana's forest resources both rural and urban and is directly responsible for forest health management on state owned forests. The division assists with survey coordination and provides assistance in the elimination of artificial introductions of gypsy moth. They provide support in the form of funding for survey, eradication, Slow The Spread and suppression projects. Education and technical advice are provided to foresters and other resource professionals for pest management on Indiana forested lands.

3. Cooperative Extension Service

This service will be responsible for providing resource material about gypsy moth to the public and to advise them about ways that they can cope with problems associated with gypsy moth infestations. Indiana's Agricultural Research Program will develop research specific to the gypsy moth situation in Indiana. Technical advice on cultural and biological control will be identified, developed and distributed to cooperators.

4. USDA - Animal & Plant Health Inspection Service (APHIS)

Within non-infested areas and the transition zone APHIS provides financial assis-

tance to the lead agency for survey operation. APHIS will support regulatory activities to prevent the spread of gypsy moth from generally infested areas to non-infested areas. APHIS will provide funding for non-federal land or within the transition zone as determined by survey evaluations.

5. United States Forest Service (USFS)

This service provides technical assistance to state agencies on gypsy moth management. The USFS provides financial assistance to the lead agency for eradication efforts greater than 640 acres, Slow The Spread projects, and suppression of gypsy moth on non-federal lands. They coordinate and fund program activities on federal land. The USFS serves as the lead agency in preparing the Gypsy Moth Programmatic NEPA document (Environmental Impact Statement).

6. Indiana Department of Environmental Management

This department will provide monitoring of environmental affects of program activities and provide technical assistance on environmental quality issues.

7. Indiana State Department of Health

This department responds to public health effects of gypsy moth and program activities. It answers public health questions concerning gypsy moth and program activities.

8. Office of the Indiana State Chemist

This office is responsible for the registration of products used in program activities, applicator certification and licensing, investigations of misuse and pesticide use complaints.

9. Department of Agriculture

This department assists affected commerce by providing information on program activities, available regulatory initiatives and program strategies. It will provide information to the cooperating agencies on commerce affected by gypsy moth infestations.

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Notes



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