Slowing the Spread of Gypsy moths in Indiana

USDA FOREST SERVICE UAS DEPARTMENT OF AGRICULTURE DNR INDIANA DEPARTMENT OF NATURAL RESOURCES PURDUE UNIVERSITY Purdue Extension Knowledge to Go 1-888-EXT-INFO

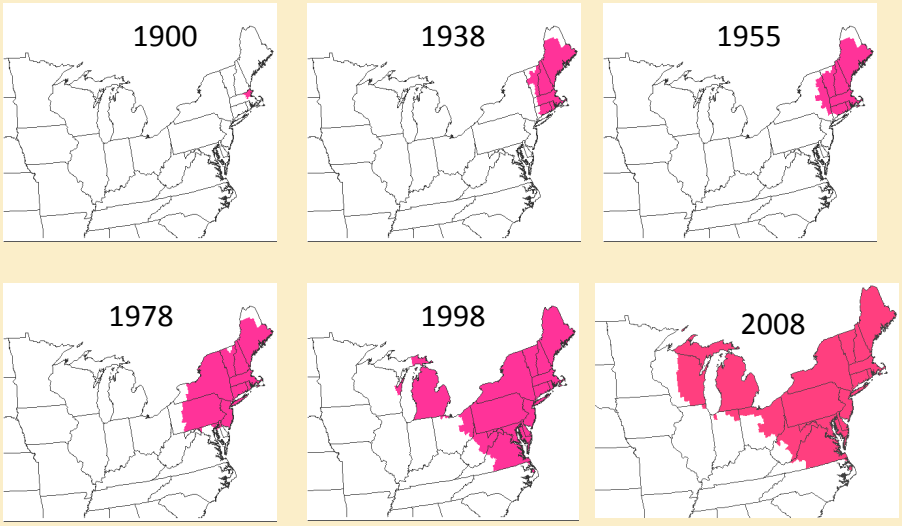
Agenda

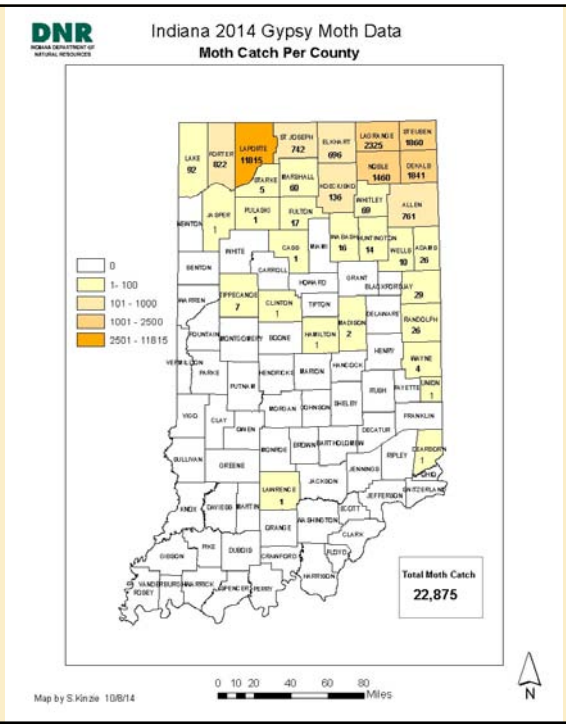
- Biology
- Damage
- Survey
- Treatment Options
- Proposal
- Questions and Comments

The Gypsy moth, *Lymantria dispar*, is one of North America's most devastating forest pests. It originally evolved in Europe and Asia.

In the late 1860s, Gypsy moths (GM) were accidentally released near Boston, MA. Since that time, the range of GM has continued to spread in North America.

Spread of Gypsy moths



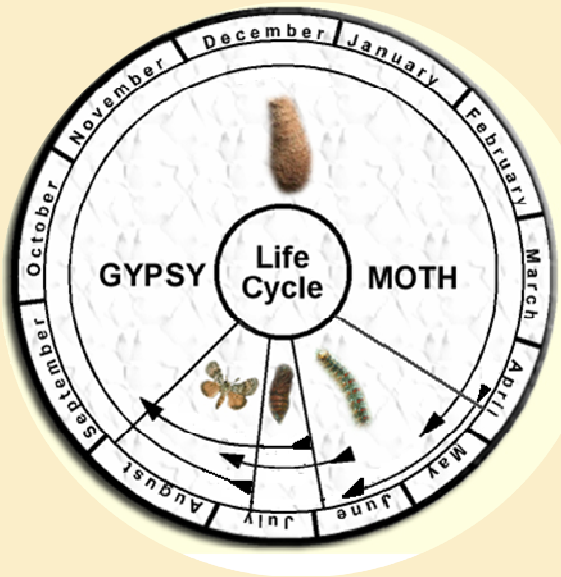


The Gypsy moth feeds on the foliage of hundreds of types of plants in North America. It greatly prefers oak trees.

When GM populations grow large, they completely defoliate trees. If this happens several years in a row, the weakened trees start to die.

Biology

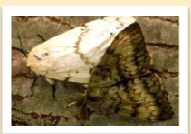
Life Cycle



Egg masses

Caterpillar (Larva)

Pupae


Adults

Egg Masses (July – April)

- Eggs overwinter in egg masses (starting in July).
- Each egg mass contains between 500 to 1,000 eggs.

Caterpillars (late April – June)

- Tiny caterpillars begin hatching from the egg masses in late April.
- Caterpillars immediately move to the tree canopy to feed on young leaves.

When crowded, newly hatched caterpillars colonize other trees by producing silken threads that they ride on the breeze.

This is called ballooning.

Gypsy moth caterpillars <u>do not make webbed nests</u>.

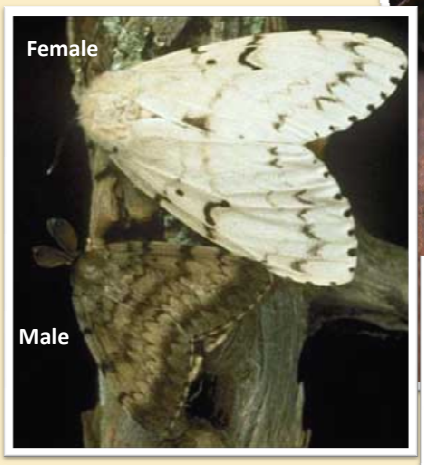
Older caterpillars have <u>5 pairs of blue dots</u> followed by <u>6 pairs of red dots</u> along their backs.

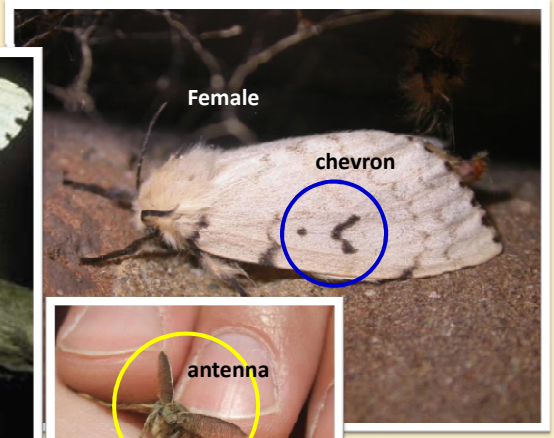
Mature caterpillars can reach up to 3 inches in length.

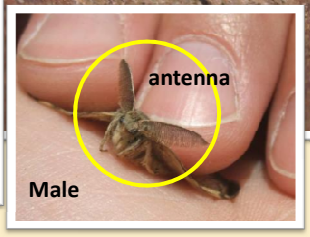
Pupae (June to July)

During the last weeks of June, larvae stop feeding and change into pupae, where they will continue developing into adults.

Adults - Males begin emerging in mid to late June; the flightless females begin emerging a few days later and mating takes place.







Insects often mistaken for gypsy moths

Fall webworm

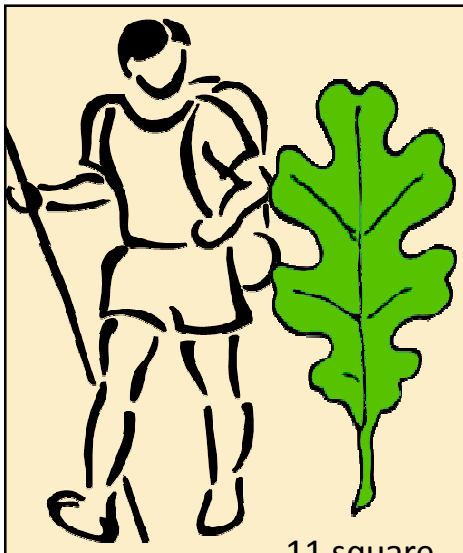
Bagworm

Tent Caterpillar

Damage

Reasons to be Concerned

- Gypsy moths spread easily.
  - Natural spread
  - Artificial spread
- Caterpillars feed on over 500 types of plants (but prefer oak trees).
- Defoliation for more than 2-3 years in a row kills trees.



6 foot tall man

11 square foot oak leaf

**<u>Each</u> <u>caterpillar</u> consumes up to 11 square feet of oak foliage during its lifetime.

Gypsy moths can defoliate millions of acres annually as seen in the damage near Snow Shoe, PA in 2007.

Defoliation from Gypsy moth larvae in Fort Wayne, IN

Caterpillars feed on over 500 types of plants

Most Preferred	Moderately Preferred	Least Preferred
Oak	Black Walnut	Arborvitae
Apple/Crabapples	Cherry	Catalpa
Poplar	Hickory	Dogwood
Birch	Elm	Honey locust
Blue Spruce	Maple	Rhododendron
American Beech	Paw Paw	Yellow Poplar (Tulip Tree)
Hawthorn	Sassafras	Viburnum
White Pine	White/Norway Spruce	Ash

Dangers of repeated defoliation

- Reduces ability of trees to produce and store food.
- Trees decline and become susceptible to disease and other insect pests.
- Trees die within 2-3 years of attack.

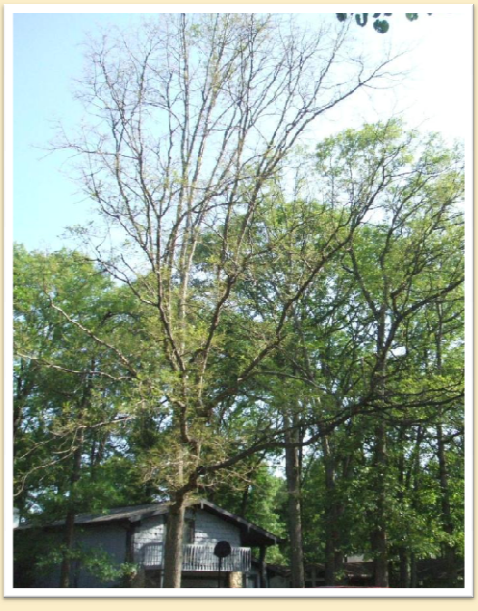


Photo: Fort Wayne, IN

Concerns of Homeowners

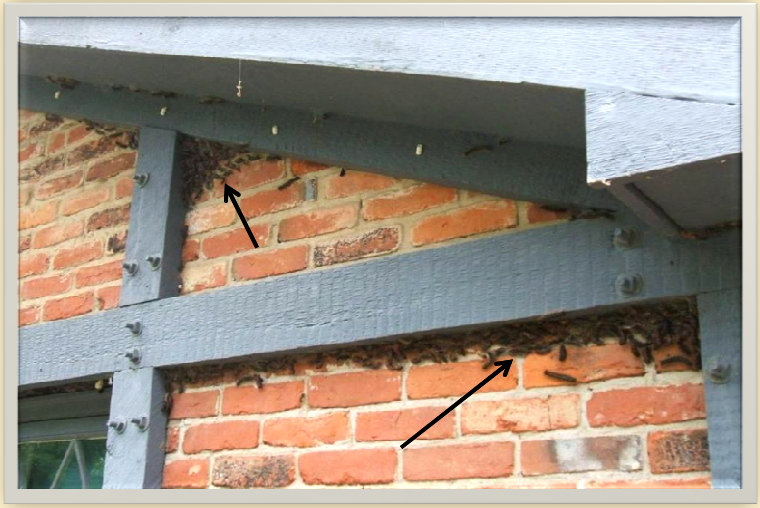
Property values are reduced:

- Aesthetic damage
- Shade reduced
- Noise levels increase

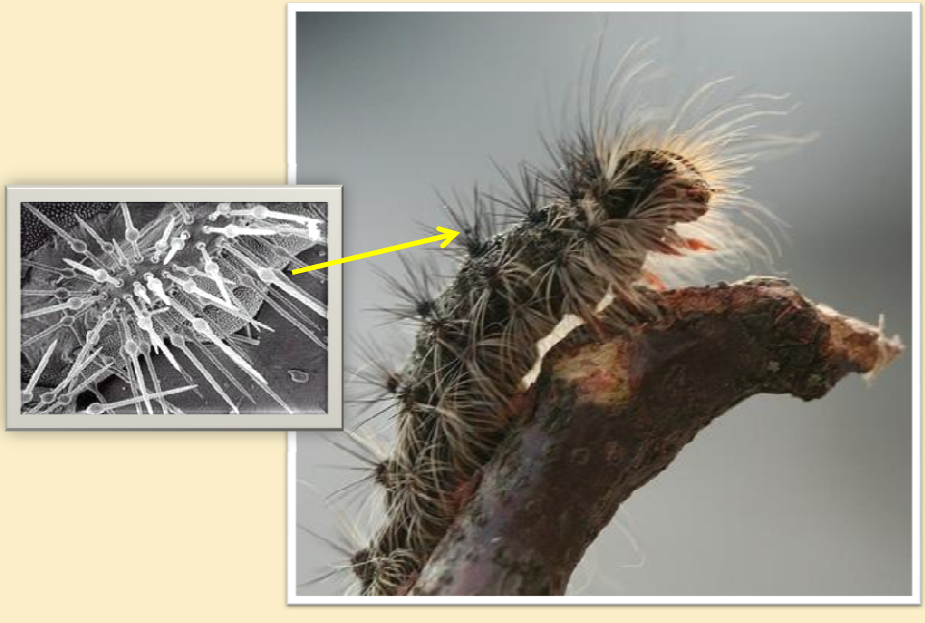
Homeowners are liable for:

- Fallen limbs
- Tree removal costs
- Replacement costs

Gypsy moth caterpillars on house: Arlington Park Subdivision, Fort Wayne, IN



Larval hair may cause allergic reactions.



Outdoor activities are reduced as caterpillars and their excrement fall from the trees, creating unpleasant messes.

Surveys

Indiana and the US Forest Service's "Slow the Spread" Program

The Slow the Spread (STS) Project is a large project managed by the US Forest Service.

Several administrative agencies at both state and federal levels participate, including those from Indiana, Illinois, Iowa, Kentucky, North Carolina, Ohio, Virginia, West Virginia, Minnesota and Wisconsin.

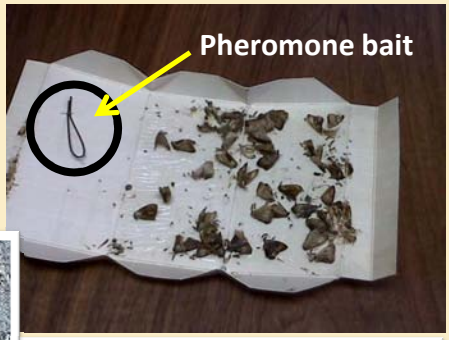
Surveys for Gypsy moths

Survey data provide information about:

- where gypsy moths are and where treatments are needed.
- effectiveness of previous treatments.

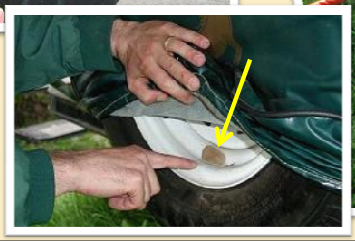
Gypsy moth traps

- Traps are used to detect and monitor male adult moths .



Egg mass surveys

Female gypsy moths hide their eggs everywhere...



Gypsy moths will never be totally eradicated from Indiana but we can (and do) manage the rate at which it moves through the state.

Treatments

Treatment options

- Take no action.
- Conduct additional surveys to better define the gypsy moth infestation and determine the need to treat.
- Perform ground (non-aerial) treatments with Sun Oil, BtK or Dimilin.
- Conduct aerial treatments.
  - Mating disruption treatments.
  - Apply *Bacillus thuringiensis* (BtK), a common bacterium that kills GM caterpillars.

Reasons

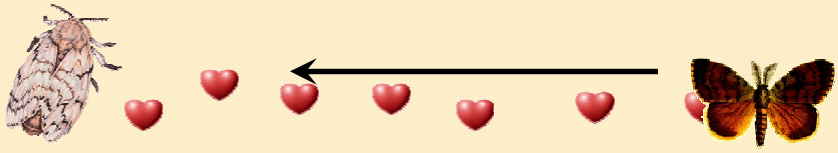
- Need to offset potential ecological and financial threats to the area.
- Survey information indicates that there are growing populations of GM in area.
- It is more efficient and cost-effective to control GM earlier rather than later.

Mating Disruption with Gypsy moth pheromone

- Used when survey data indicate a population but no egg masses are found.
- Effective on very low GM population levels.
- Applied aerially over tree canopies; one application.

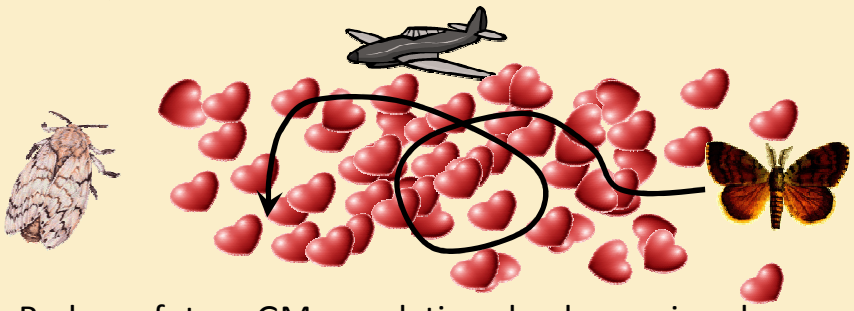
Mating Disruption

- Does not kill living organisms.
- Female gypsy moths cannot fly - They release pheromones to attract male mates to them.



Mating Disruption

- After aerial application, the males' sensory equipment is overwhelmed and they cannot find actual females. Many males die of exhaustion before they encounter a living female moth.



- Reduces future GM populations by decreasing chance of mating.

Disrupt® II

Gypsy moth pheromone embedded in tiny plastic flakes. About one cup of flakes per acre is spread by airplane during late June.

Zach Smith, IDNR

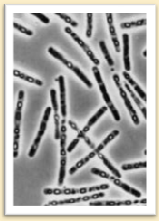
SPLAT® GM

SPLAT is an alternative delivery system for Gypsy moth pheromones. It involves aerial application of small, waxy droplets infused with the pheromone into the tree canopy. About 7 ounces of the product are used per acre.

Aerial application of BtK

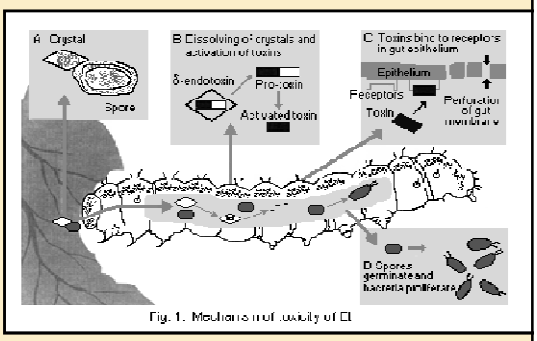
- Btk is very effect on low level GM populations.
- Egg masses must be present for BtK to be considered.
- Usually applied twice (sometimes once when used with mating disruption).
- Applied aerially to the canopy of trees.

Bacillus thuringiensis var. *kurstaki*(Btk)



- Rod-shaped bacterium that occurs naturally on dead or decaying matter in soil.
- Various strains used commercially in the US since 1958 on insect pests of food, forage crops, and forests.
- Commercial landscapers and home gardeners frequently use for pest control because it is effective, selective, and has an excellent safety record.

How does Btk kill a Gypsy moth caterpillar?



- When Btk is ingested by the caterpillar, the highly alkaline environment of the caterpillar's gut triggers the Btk bacterium to release a crystalline protein called an endotoxin.
- The endotoxin kills cells and dissolves holes in the lining of the caterpillar's gut.
- People, other mammals, birds, reptiles, and fish have acidic guts and cannot trigger Btk to produce endotoxins.

Natural Enemies of Gypsy moth

Predators Pathogens Parasitoids

Security Precautions for Aerial Treatments

- Material is secured before, during, and after the operation.
- The aircraft itself is also secured.
- DNR personnel monitor flights from the ground and also at the airport.

Questions or Comments?

Public comment deadline - March 12, 2015 at 5:00pm Eastern

Mail to:

Gypsy Moth 2015
Indiana DNR, Division of Entomology & Plant Pathology
402 West Washington Street, W-290
Indianapolis, Indiana 46204-2739

Phone: (317) 232-4120 Fax: (317) 232-2649

Toll Free Number: (866) NO-EXOTIC (866-663-9684)

E-mail: DEPP@dnr.IN.gov

Web site: gypsymoth.IN.gov