DNR
Indiana Department

2019

Slowing the Spread of Gypsy Moths in Indiana

DNR
Indiana Department
of Natural Resources

Division of Entomology & Plant Pathology

USDA

FOREST SERVICE
US
DEPARTMENT OF AGRICULTURE

PURDUE
UNIVERSITY

PURDUE EXTENSION | LOCAL FACES
COUNTLESS CONNECTIONS

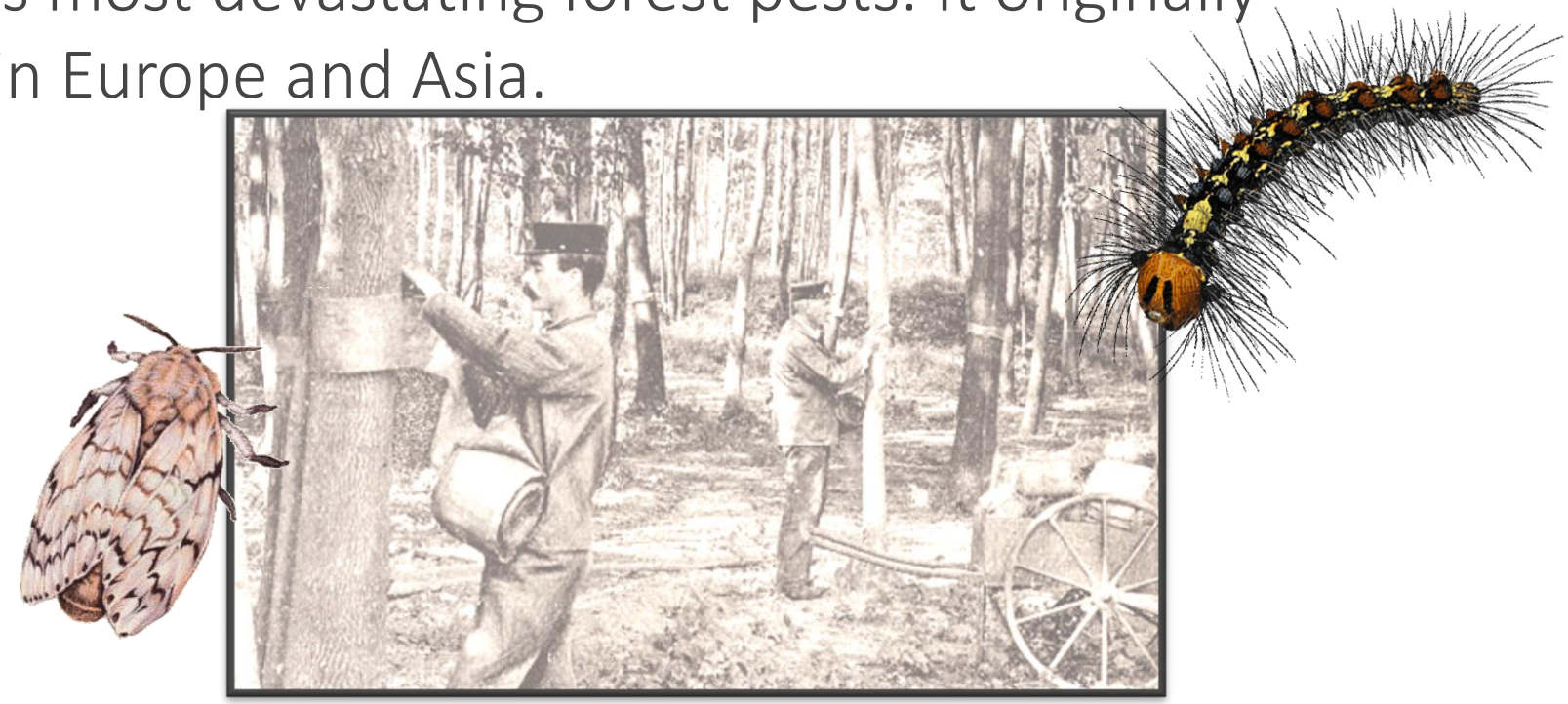
DNR
Indiana Department of Natural Resources

Agenda

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

DNR
Indiana Department of Natural Resources

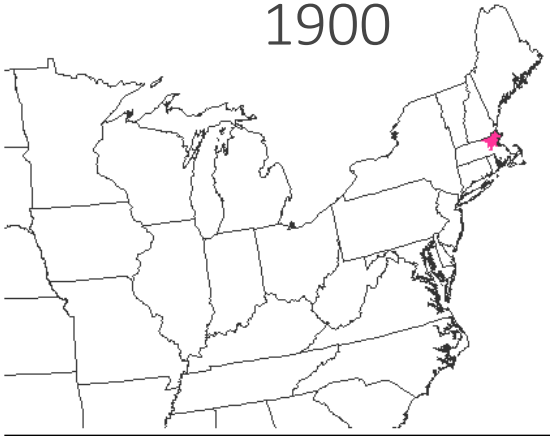
The Gypsy moth, *Lymantria dispar*, is one of North America's most devastating forest pests. It originally evolved in Europe and Asia.

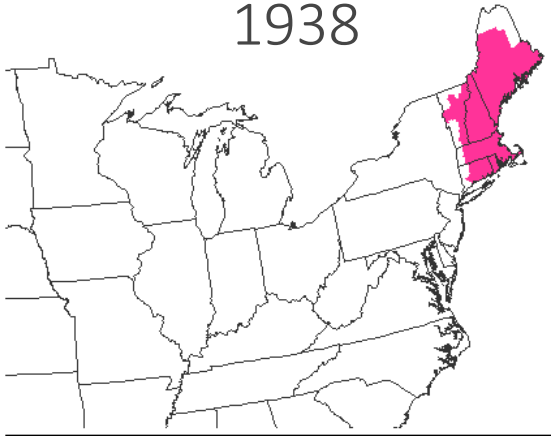


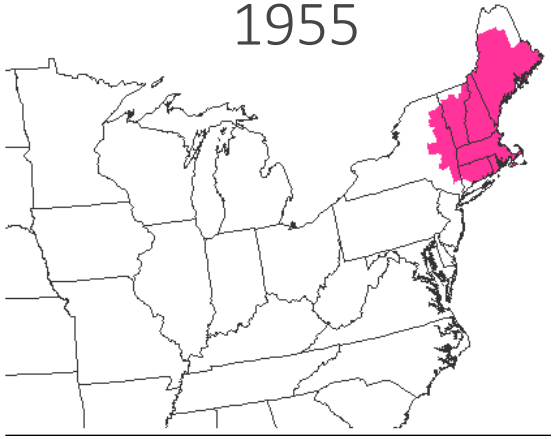
In the late 1860s, Gypsy moths (GM) were accidentally released near Boston, MA. Since that time, the range of GM has continued to spread in North America.

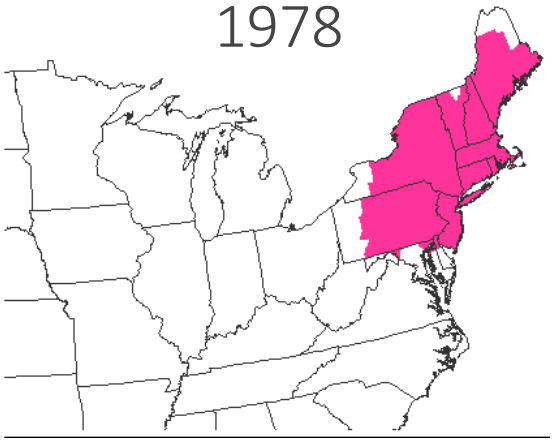
DNR
Indiana Department of Natural Resources

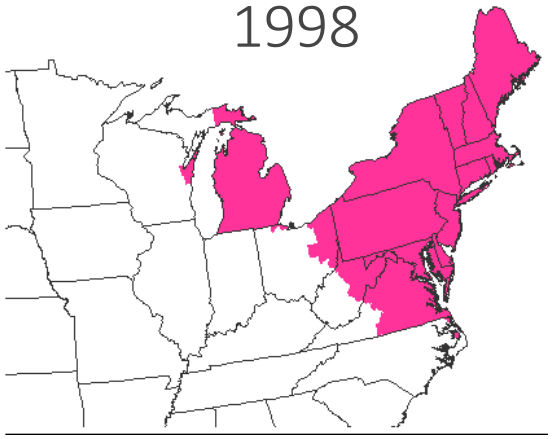
Spread of Gypsy moths

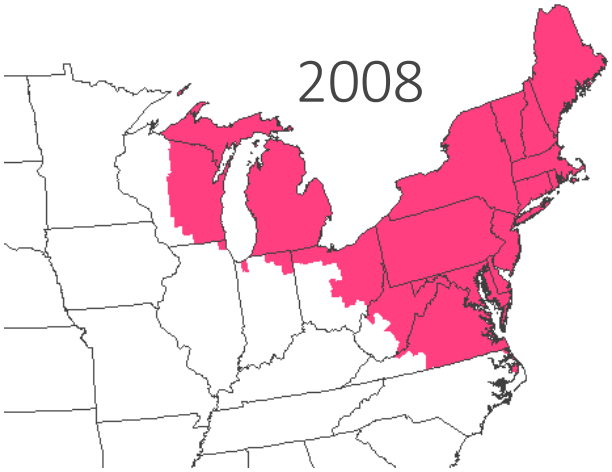












DNR
Indiana Department of Natural Resources

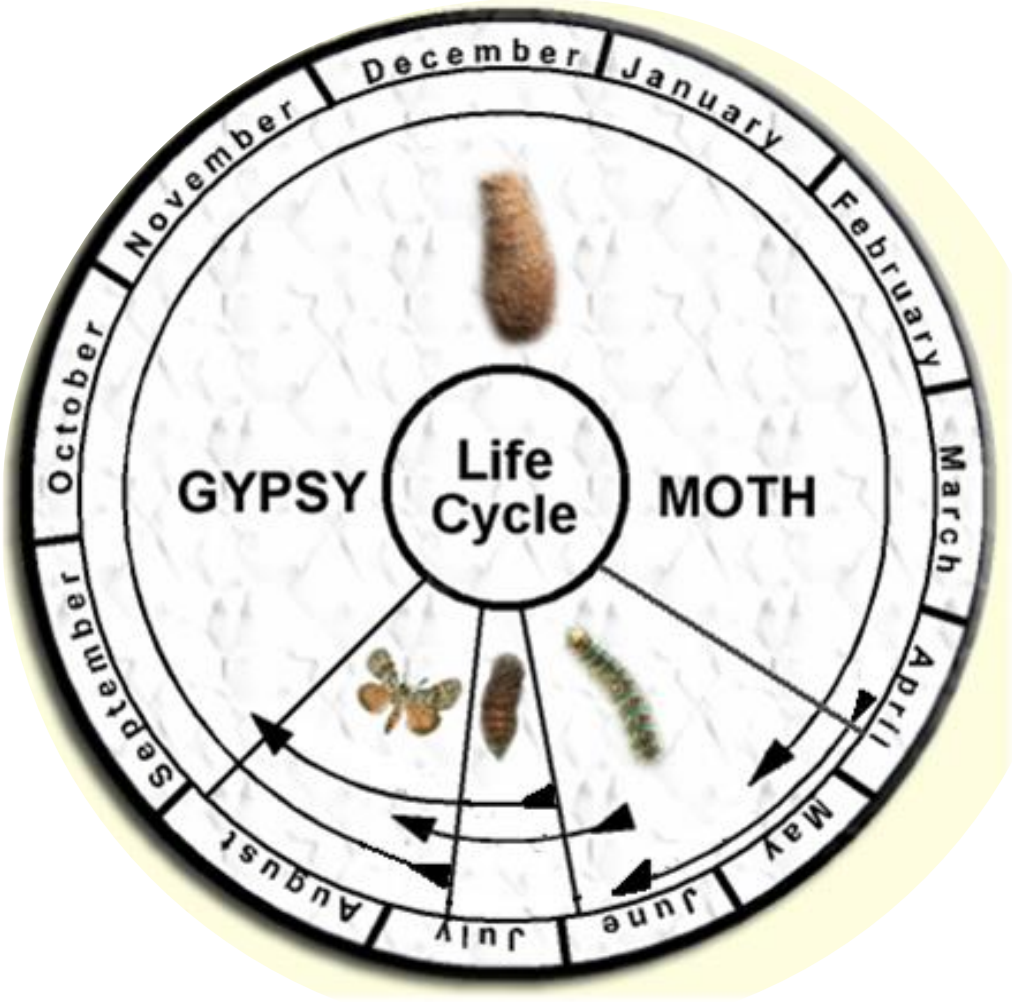
The Gypsy moth feeds on the foliage of hundreds of types of plants in North America. It greatly prefers oak trees.

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

DNR
Indiana Department
of Natural Resources

Biology

Life Cycle



Egg masses

Caterpillar (Larva)

Pupae

Adults

DNR
Indiana Department of Natural Resources

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.

DNR
Indiana Department of Natural Resources

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 **do not make webbed nests**.

DNR
Indiana Department of Natural Resources

Older caterpillars have:

5 pairs of blue dots

6 pairs of red dots

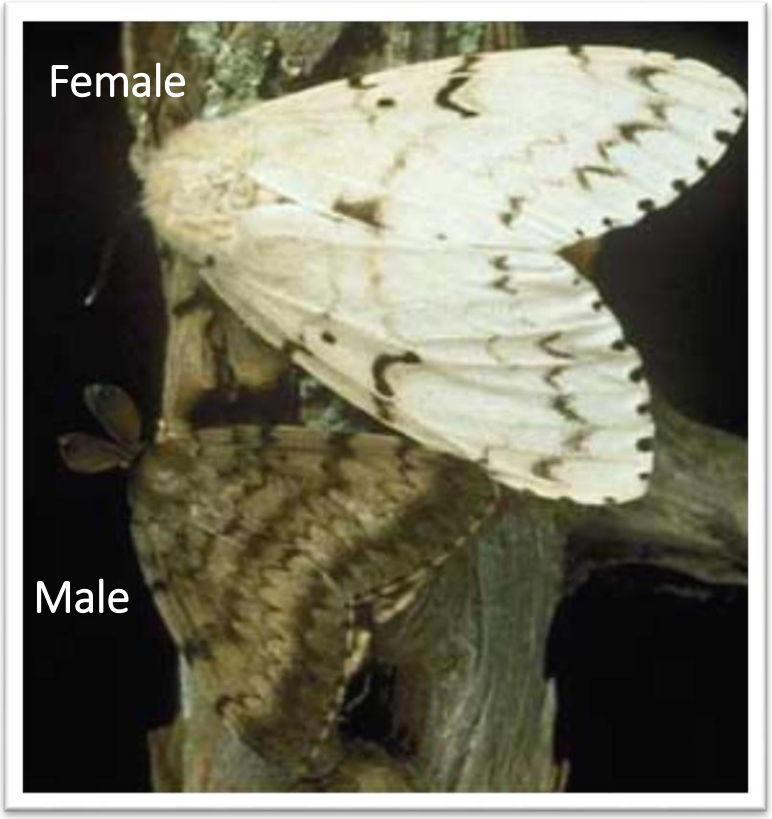
Mature caterpillars can reach up to 3 inches in length.

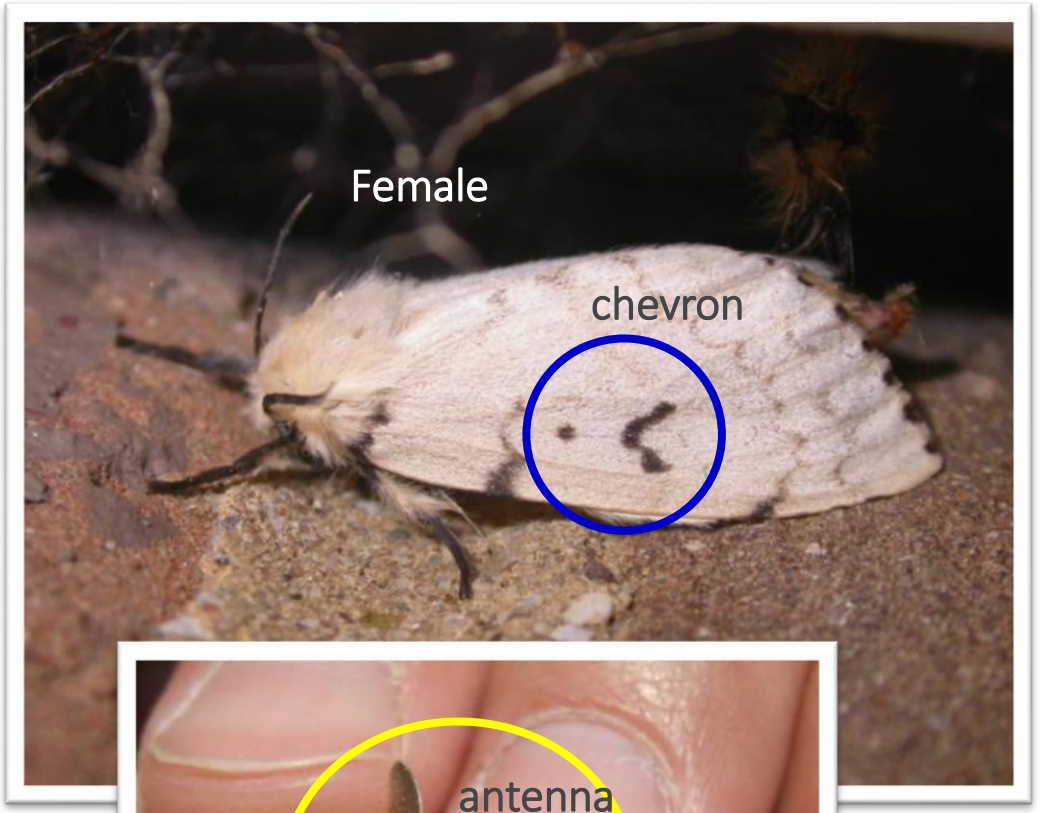
Pupae (June to July)

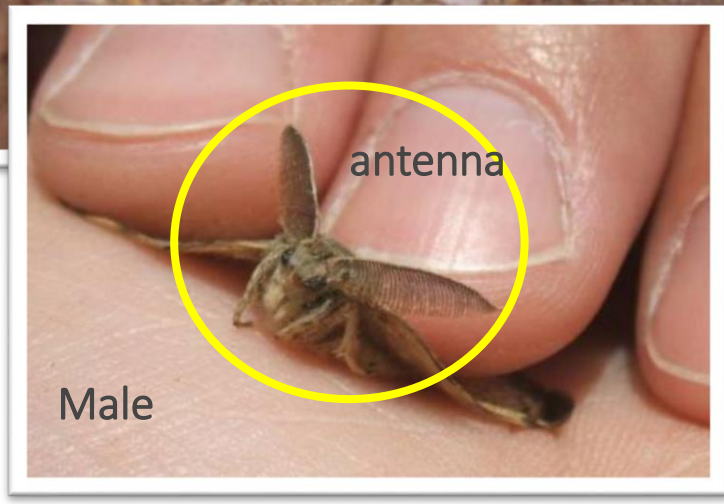
During the last weeks of June, larvae stop feeding and change into pupae, where they will continue developing into adults.

Adults (June to August)

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







Tent caterpillars

DNR
Indiana Department
of Natural Resources

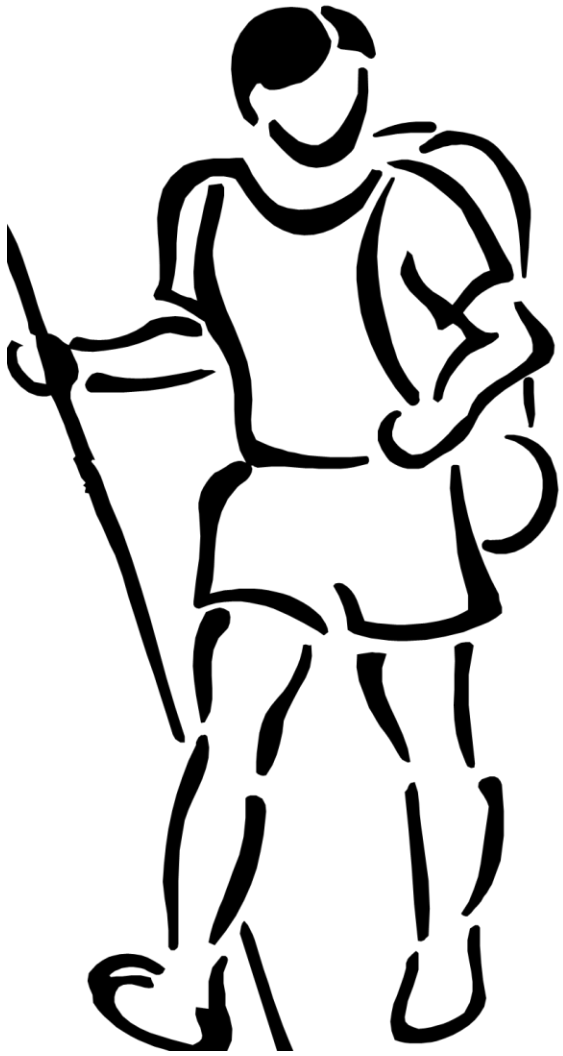
Damage

DNR
Indiana Department of Natural Resources

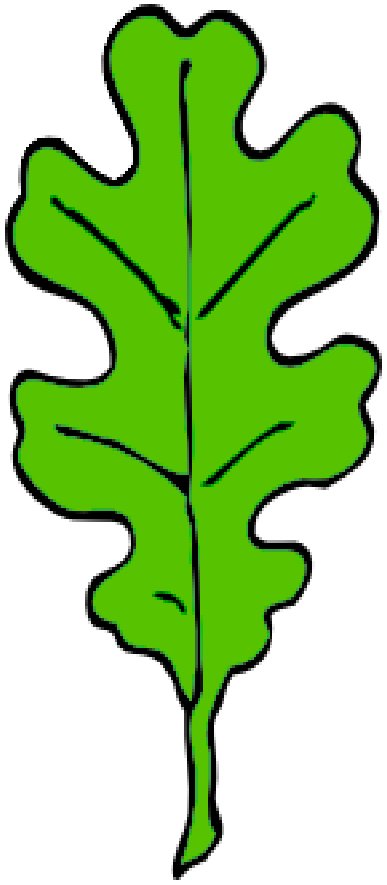
Reasons to be Concerned

- 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.

DNR
Indiana Department of Natural Resources

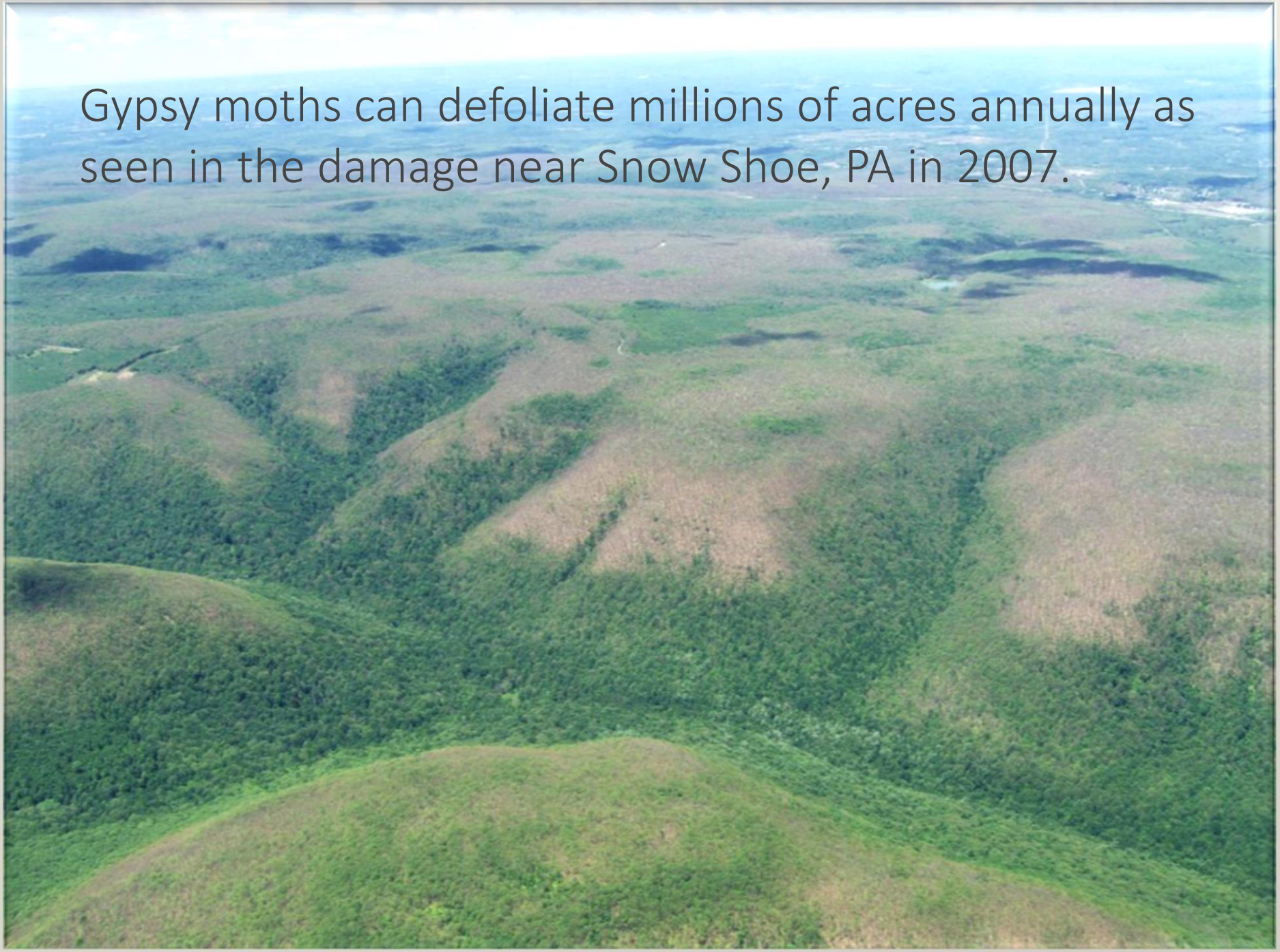


6 foot tall man



11 square foot oak leaf

**Each caterpillar 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.

DNR
Indiana Department
of Natural Resources

Defoliation from Gypsy moth larvae in Fort Wayne, IN

DNR
Indiana Department of Natural Resources

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

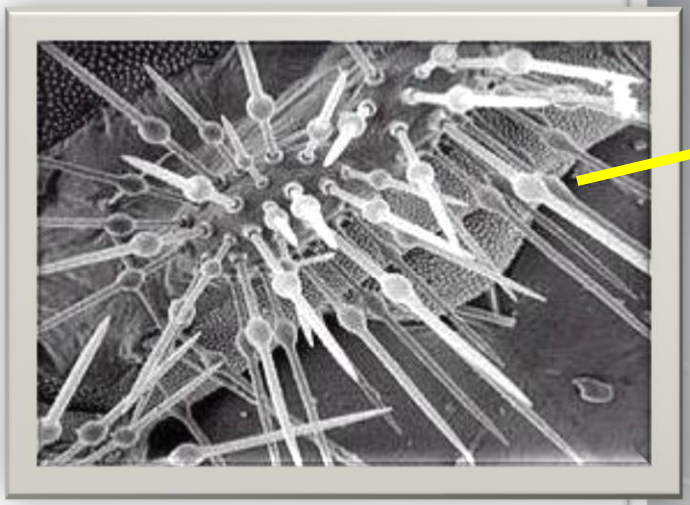
DNR
Indiana Department of Natural Resources

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

DNR
Indiana Department
of Natural Resources

DNR
Indiana Department of Natural Resources

Larval hair may cause allergic reactions



DNR
Indiana Department of Natural Resources

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

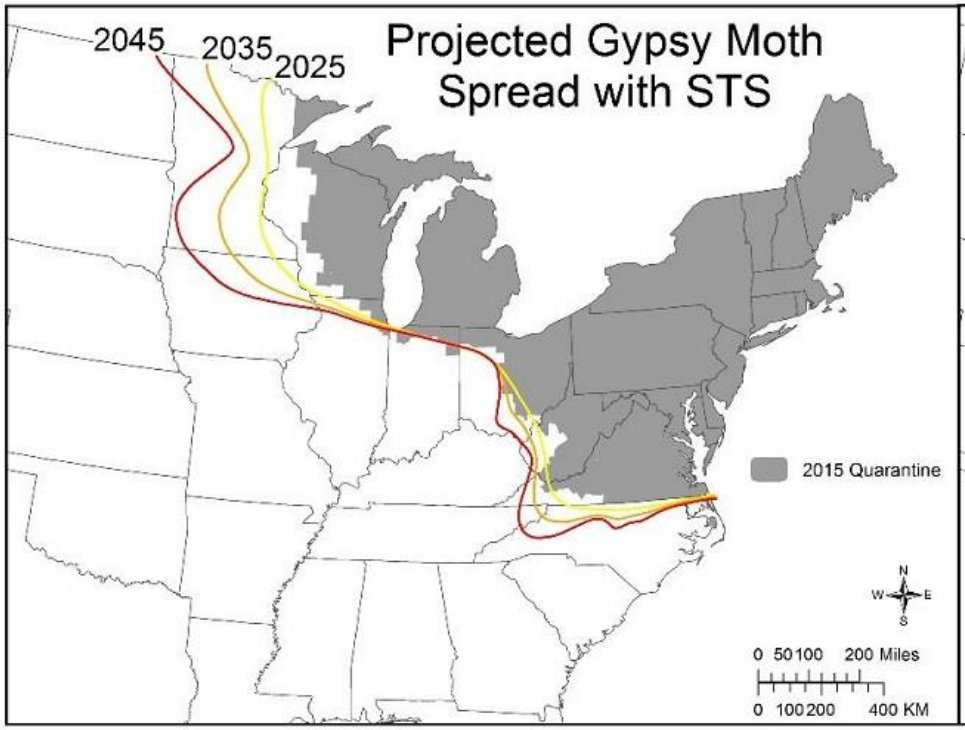
DNR
Indiana Department of Natural Resources

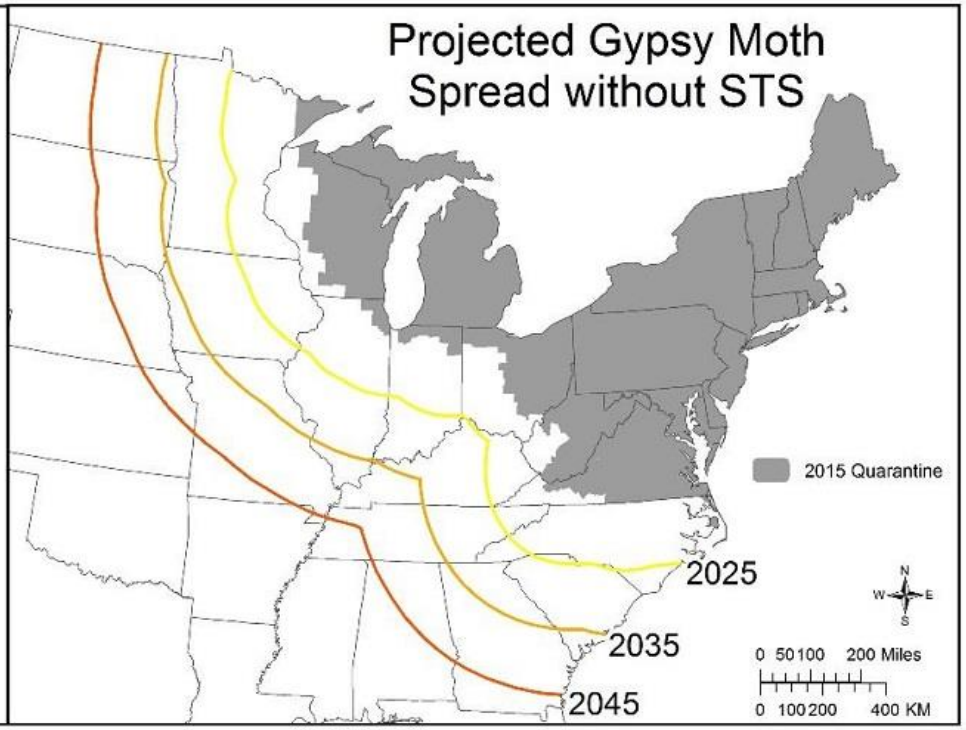
Indiana and the US Forest Service's "Slow the Spread" Program

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.

DNR
Indiana Department
of Natural Resources





DNR
Indiana Department
of Natural Resources

Survey

DNR
Indiana Department of Natural Resources

Surveys for Gypsy moths

Survey data provide information about:

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

Egg mass surveys

Female gypsy moths hide their eggs everywhere…

DNR
Indiana Department
of Natural Resources

Treatments

DNR
Indiana Department
of Natural Resources

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

Natural Enemies of Gypsy moth

Predators

Pathogens

Parasitoids

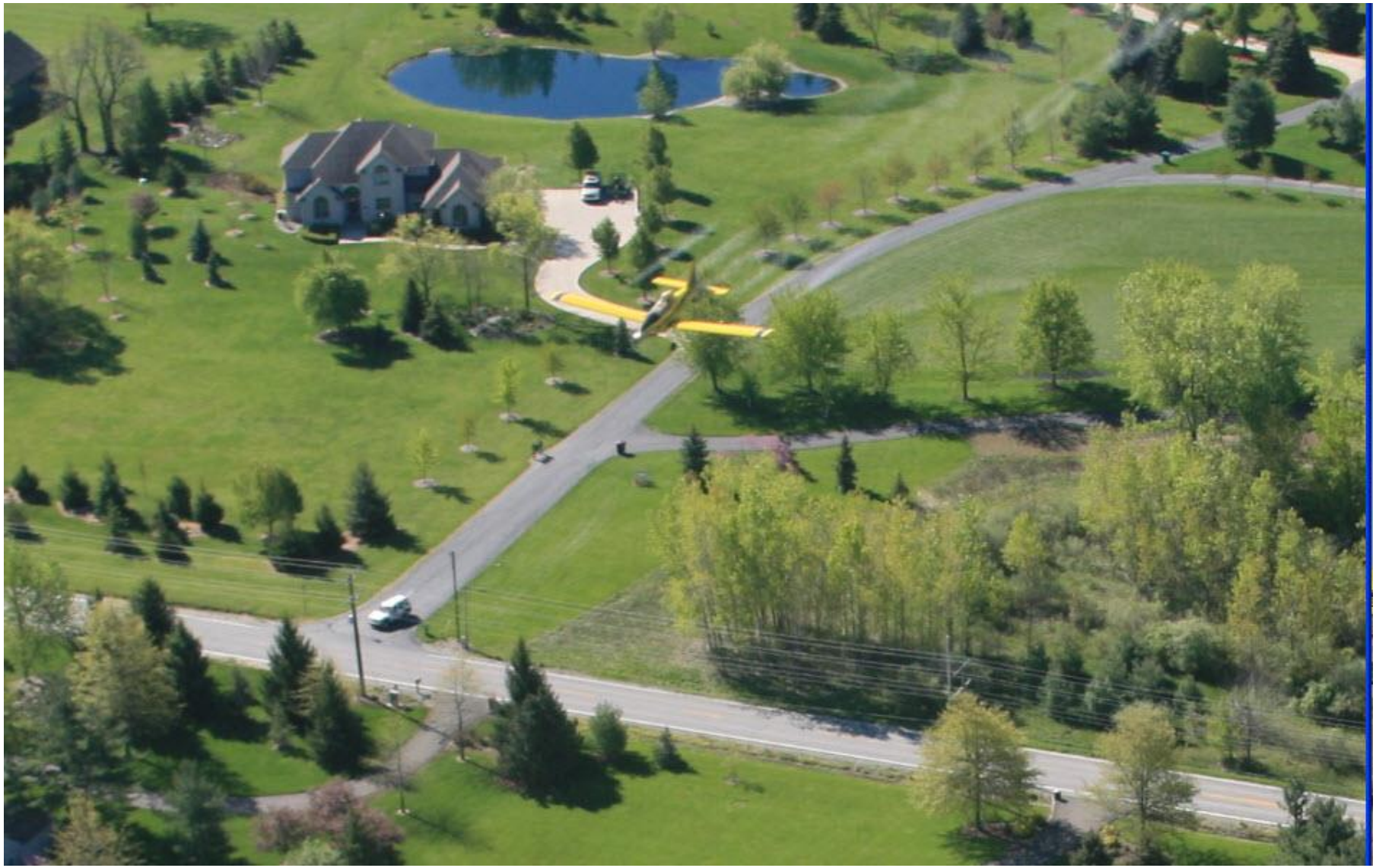

Cliff Sadof, Purdue


Dave Sheltar


USDA

DNR
Indiana Department of Natural Resources

When are treatments for Gypsy moths necessary?



DNR
Indiana Department of Natural Resources

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.

Treatment options

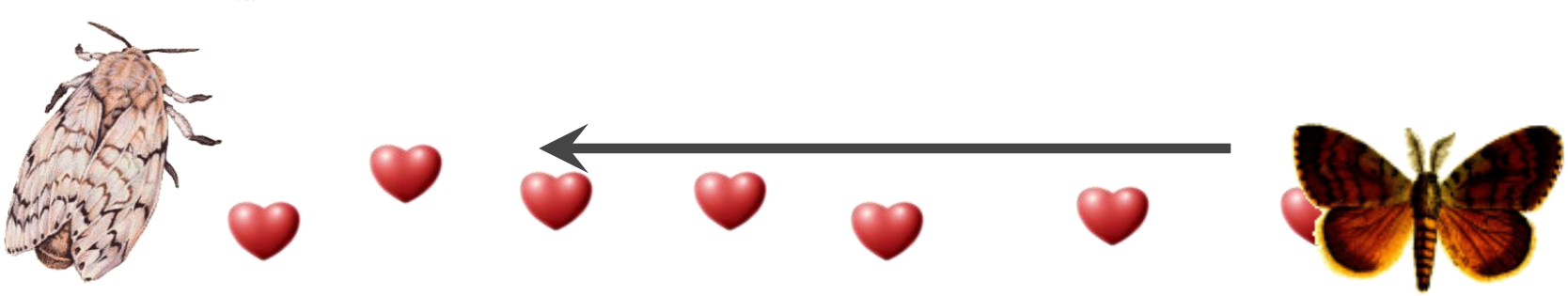
- Take no action.
- Conduct additional surveys to better define the gypsy moth infestation and determine the need to treat.
- Perform ground (non-aerial) treatments with Sun Oil, BtK or Dimilin.
- Conduct aerial treatments.
  - Mating Disruption
  - *Bacillus thuringiensis* (BtK)

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.

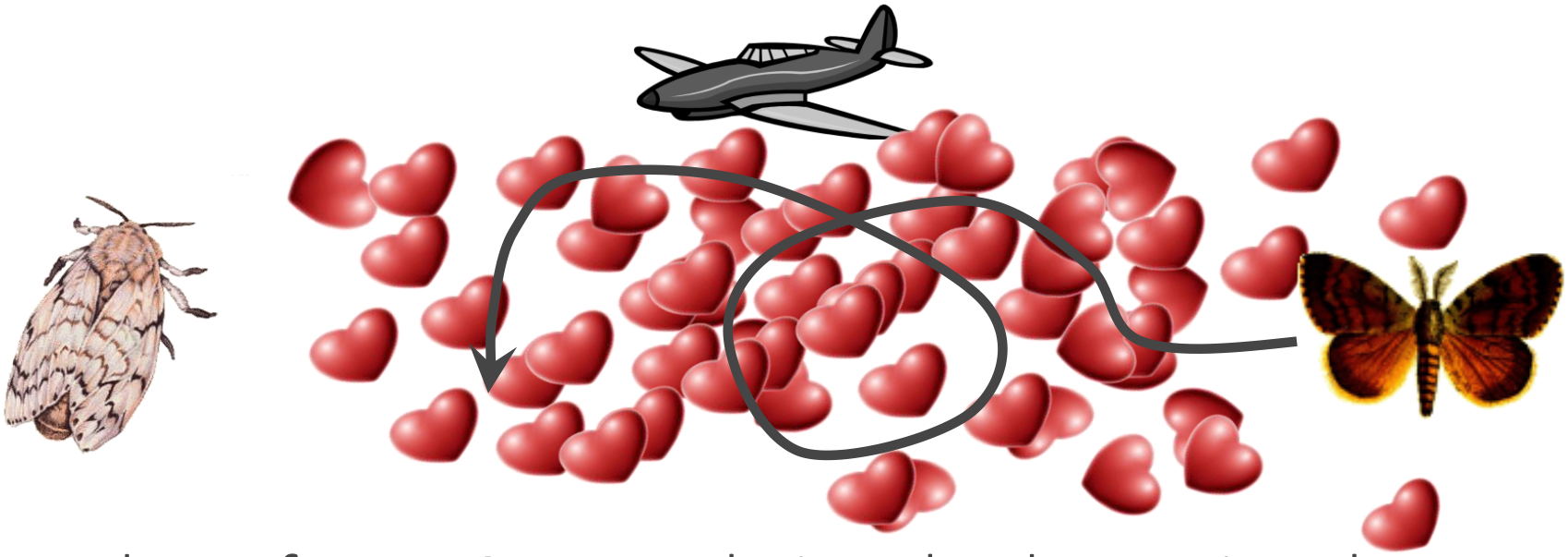
Mating Disruption

- 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.

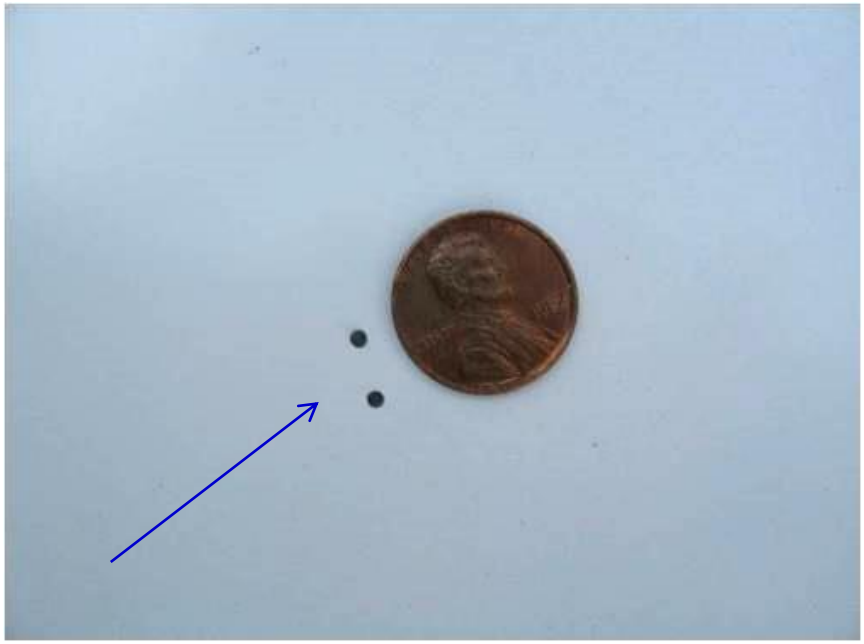
Mating Disruption - Disrupt® II

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

Mating Disruption - 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.



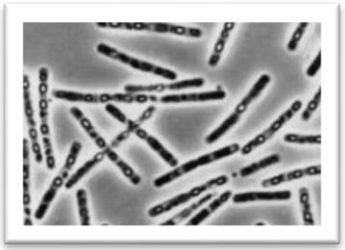
Aerial application of BtK

- Btk is very effective 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.

DNR
Indiana Department of Natural Resources

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.



DNR
Indiana Department of Natural Resources

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.

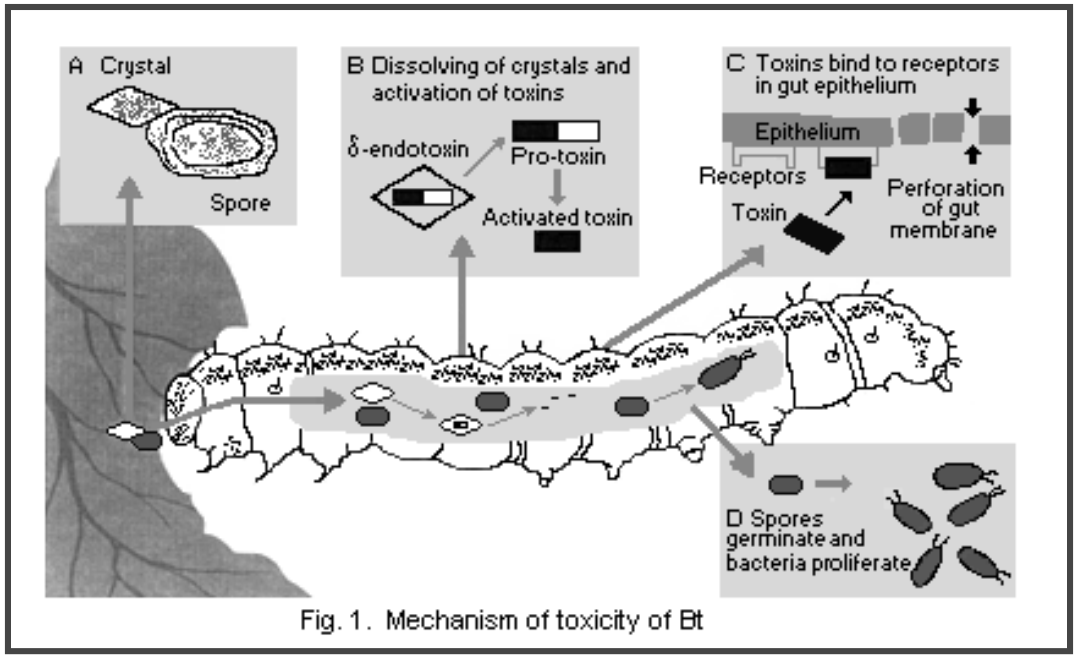


Fig. 1. Mechanism of toxicity of Bt

- 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.

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?

Mail to:

Gypsy Moth
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