

# GYPSY MOTH OUTBREAKS IN CONNECTICUT: PAST, PRESENT, AND FUTURE



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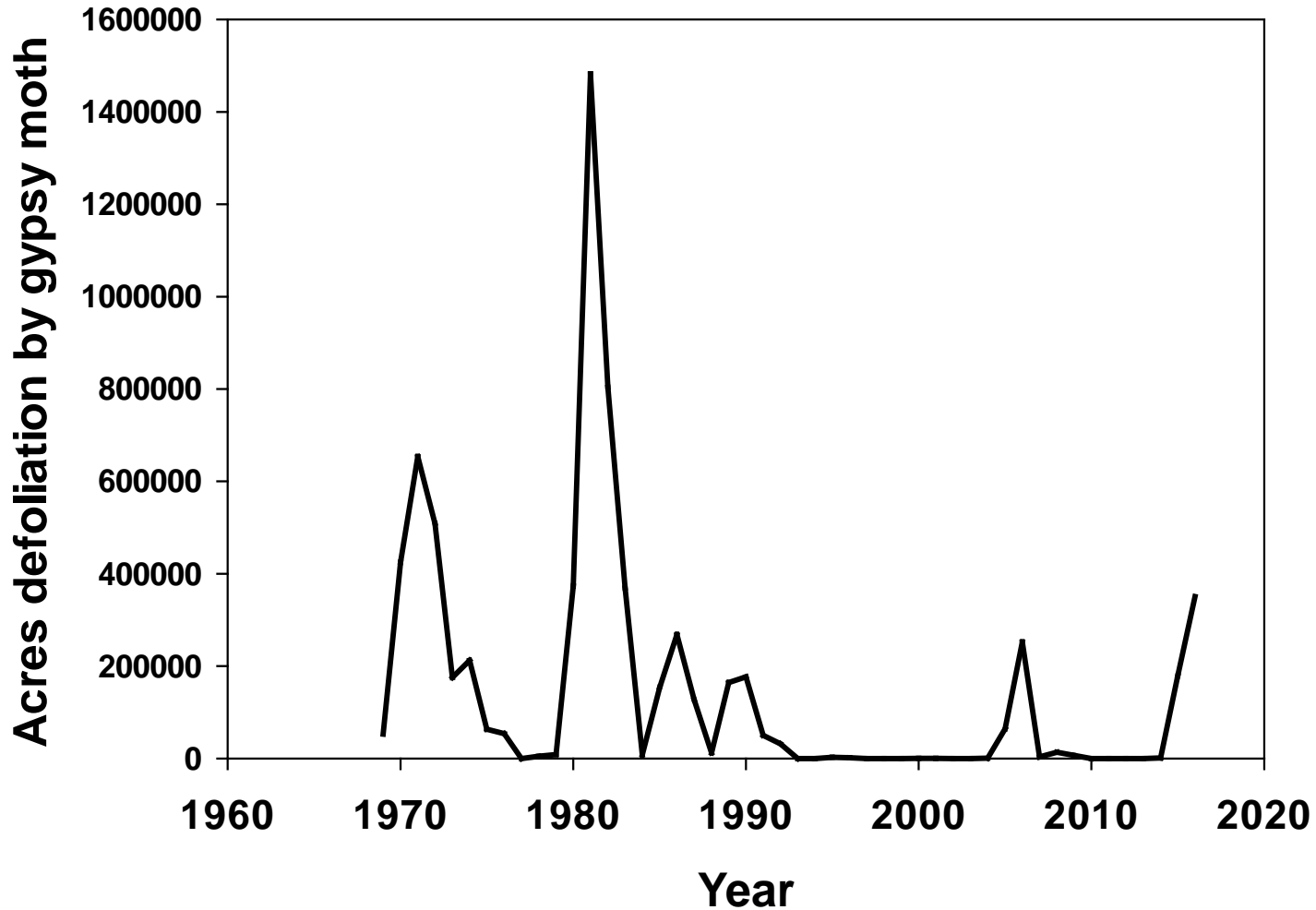


# Gypsy Moth Introduction

- European gypsy moth, *Lymantria dispar*, was first brought into the US (Medford, MA) from France around 1869 by E. Leopold Trouvelot
- Gypsy moth was first discovered in CT in Stonington in July, 1905.
- By 1952, it was present in all 169 Connecticut towns.



# Gypsy Moth Defoliation, CT 1969-2016\* (acres)



# Gypsy Moth Life History



# Gypsy Moth Life History



GM Hatching April 27, 2016

# Gypsy Moth Life History

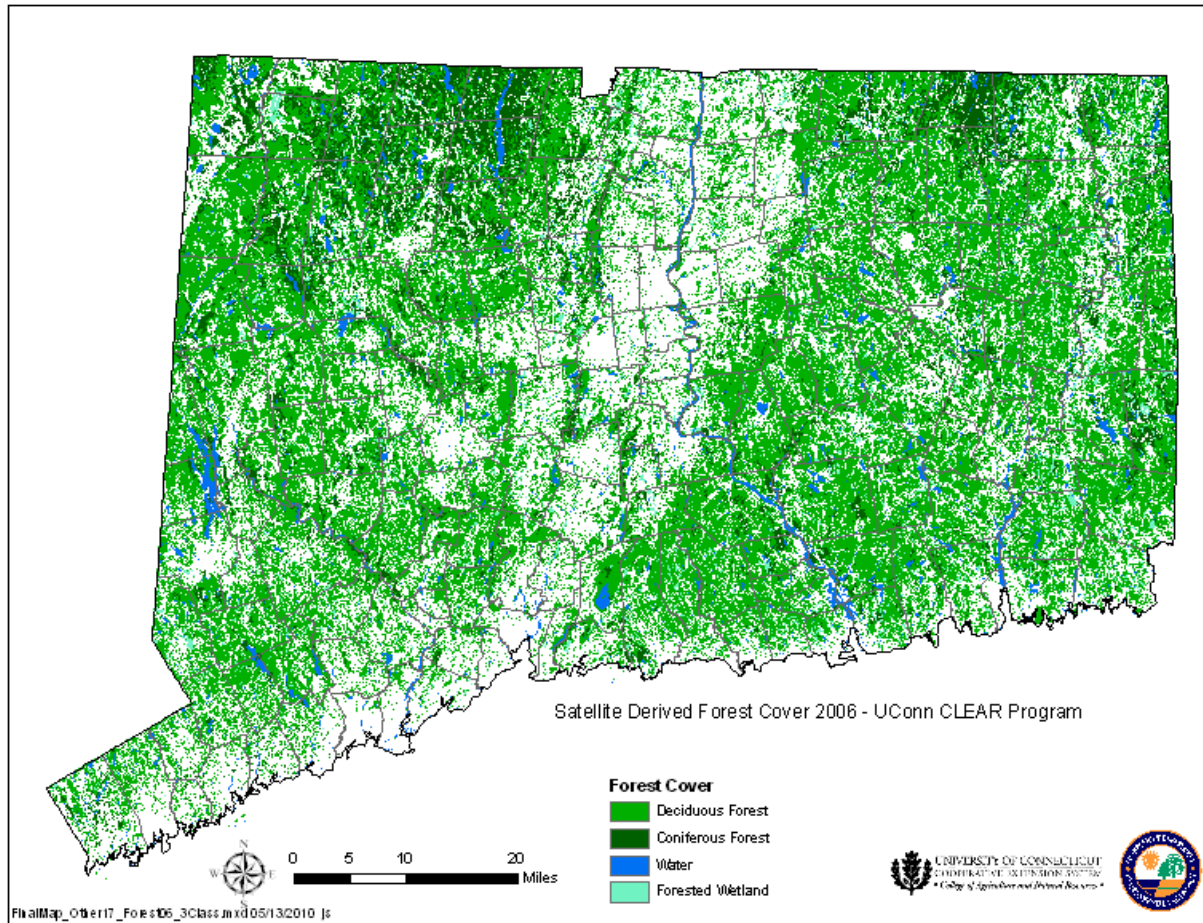
- Oak is their favorite food, but feed on a large variety of trees and shrubs.
- After about 40 days (Late June) the larvae are fully grown and go to protected places to pupate.
- Adults will emerge in 10-14 days.



# Gypsy Moth Life History

- The female is a large bodied white moth; cannot fly.
- The male is smaller and darker in color (brownish) and can fly.
- They begin mating shortly after emerging.
- Adults do not take food and live a short time.
- Eggs laid on anything; trees, fence posts, cars, rocks, firewood, cars, RVs.





Connecticut contains approximately 3,179,254 acres of land, ca. 1,870,055 acres, or 59%, is forested. Our urban tree canopy is highly variable but covers 49.3% urban land area.



# 1<sup>st</sup> Large Recorded Outbreak 1970s

- From 1970-1974, gypsy moth defoliated several hundred thousand acres of Connecticut forest each year.
- 1970 – 425,039 acres
- 1971 – 654,102 acres (36%)
- 1972 – 508,460 acres (28%)
- 1973 – 333,215 acres
- 1974 – 212,315 acres



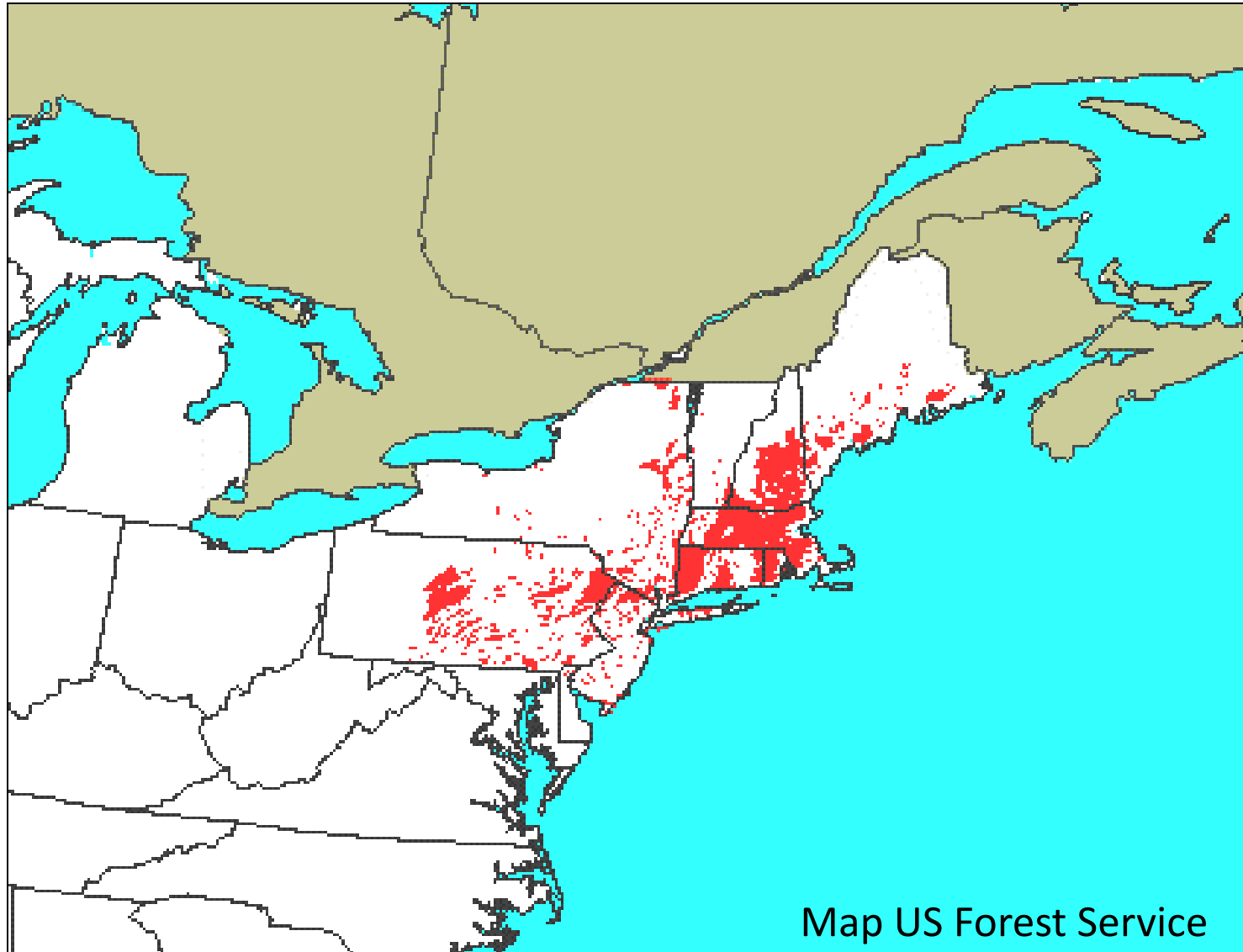


## 2<sup>nd</sup> Large Recorded Outbreak 1980s

- Through 1980s, gypsy moth defoliated several hundred thousand to over a million acres of Connecticut forest each year.
- 1980 – 381,868 acres
- 1981 – 1,482,216 acres (82%)
- 1982 – 803,802 acres (45%)
- 1983 – 369,267 acres
- 1984 – 7,782 acres



# Extent Outbreak in 1981



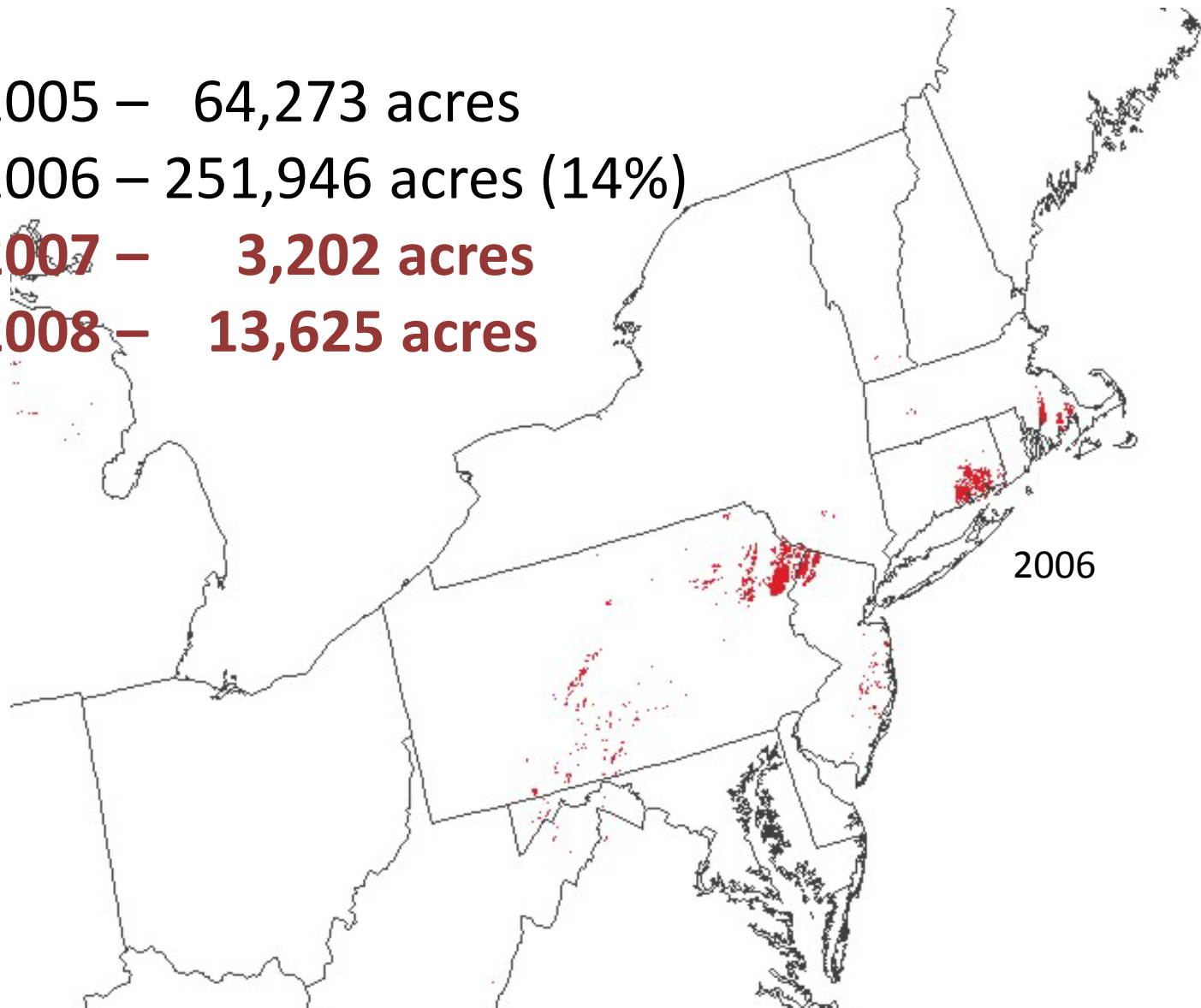
# Last Outbreak 2005 & 2006

2005 – 64,273 acres

2006 – 251,946 acres (14%)

**2007 – 3,202 acres**

**2008 – 13,625 acres**



# *Entomophaga maimaiga*



Larvae killed by *Entomophaga maimaiga* in 2015  
Bethany and Hamden, CT

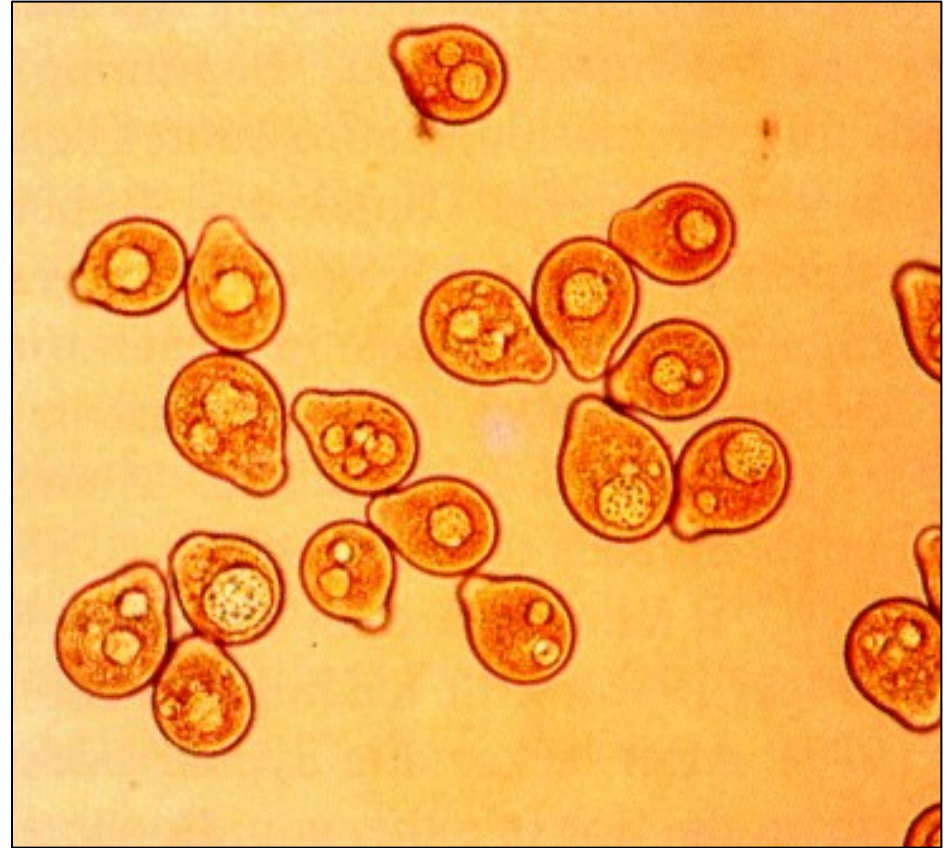
# ***Entomophaga maimaiga***

- In June 1989, several Experiment Station personnel noticed that dead and dying gypsy moth larvae were clinging to the sides of trees.
- Cause was the fungus *Entomophaga maimaiga*.
- This fungus had been introduced from Japan into the Boston area in around 1910, but failed to establish.
- The fungus was never recovered despite numerous surveys until 1989 by Drs. Ronald Weseloh and Theodore Andreadis and other scientists in the northeast. The appearance of the fungus in 1989 is a mystery.

# *Two Kind of Spores*



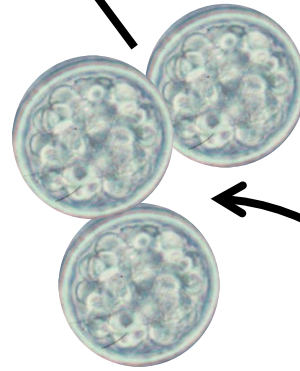
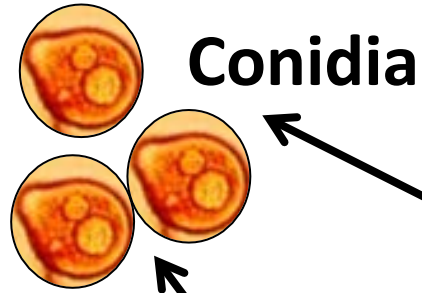
**Resting spores produced  
in larger caterpillars,  
found soil & tree trunks**



**Conidia actively ejected  
from gypsy moth cadavers  
and spread by wind**

**Germinating conidia**

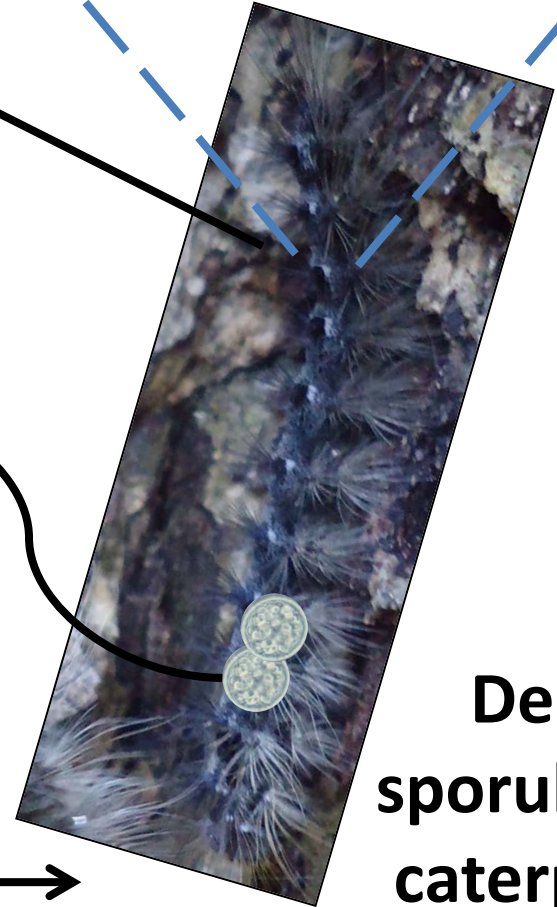
**External conidiophores  
release conidia**



**Uninfected  
caterpillar**

**Dead  
sporulating  
caterpillar**

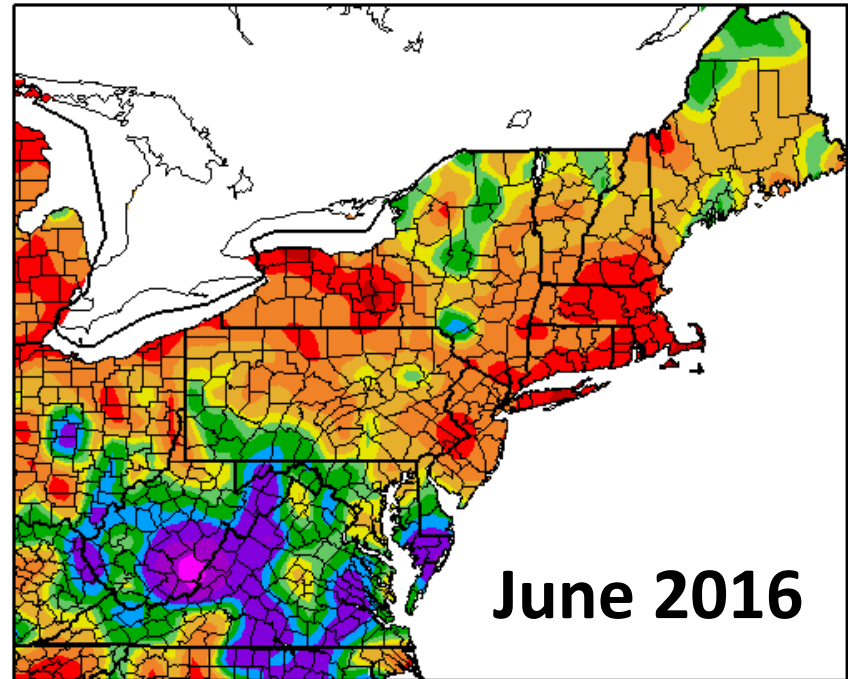
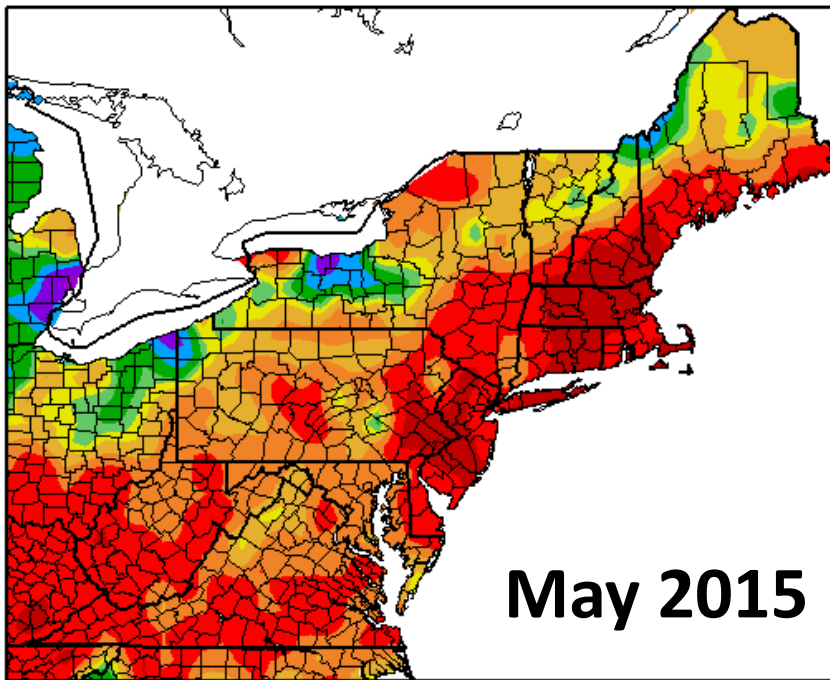
**~ 1 week**





# Germination of spores and infection by the fungus needs moisture and high humidity!

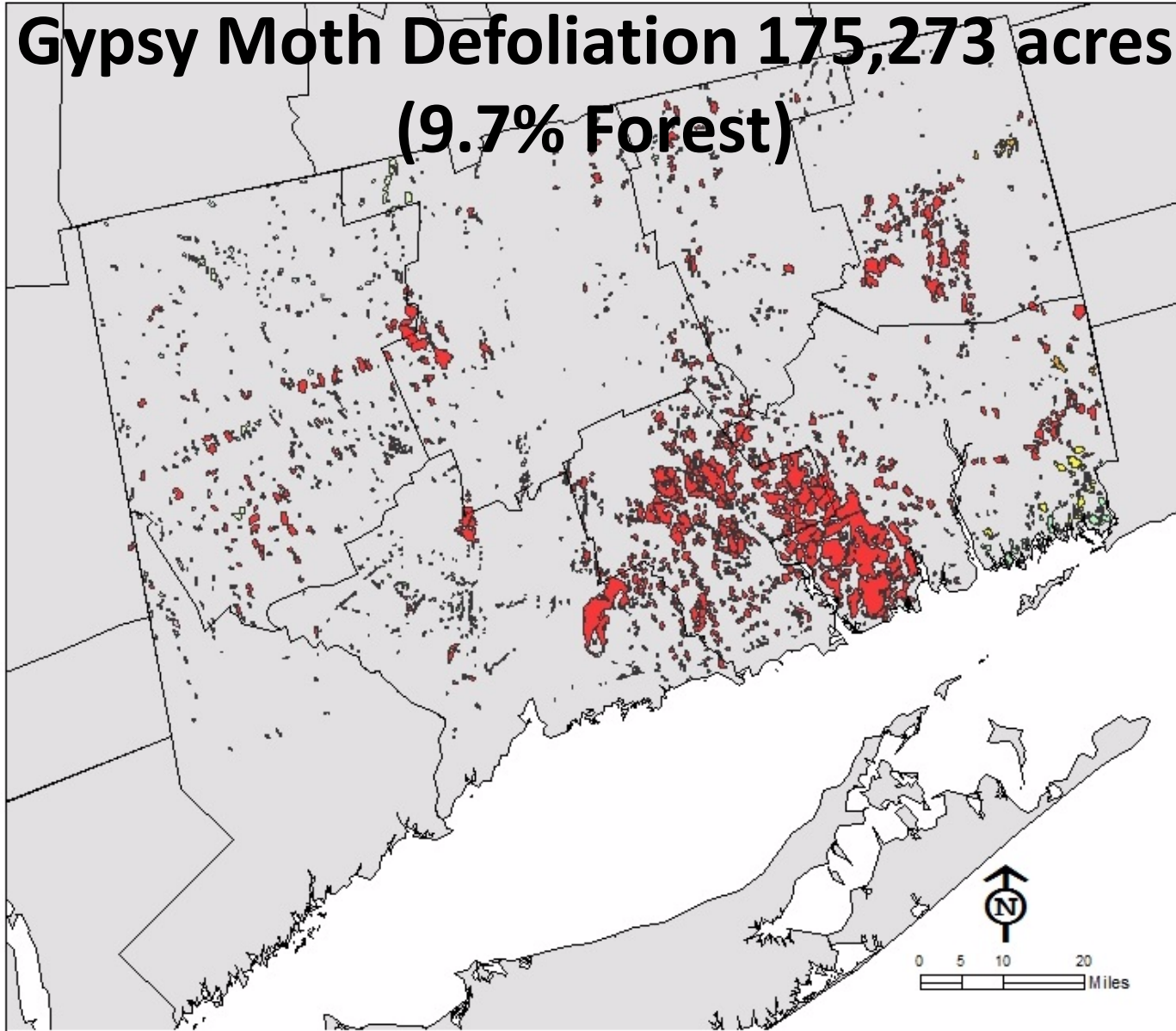
Percent of Normal Precipitation (%)



Therefore, Gypsy Moth Outbreak 2015-2017  
Largely Continued Due to Drought

# Aerial Survey Map for 2015

**Gypsy Moth Defoliation 175,273 acres  
(9.7% Forest)**

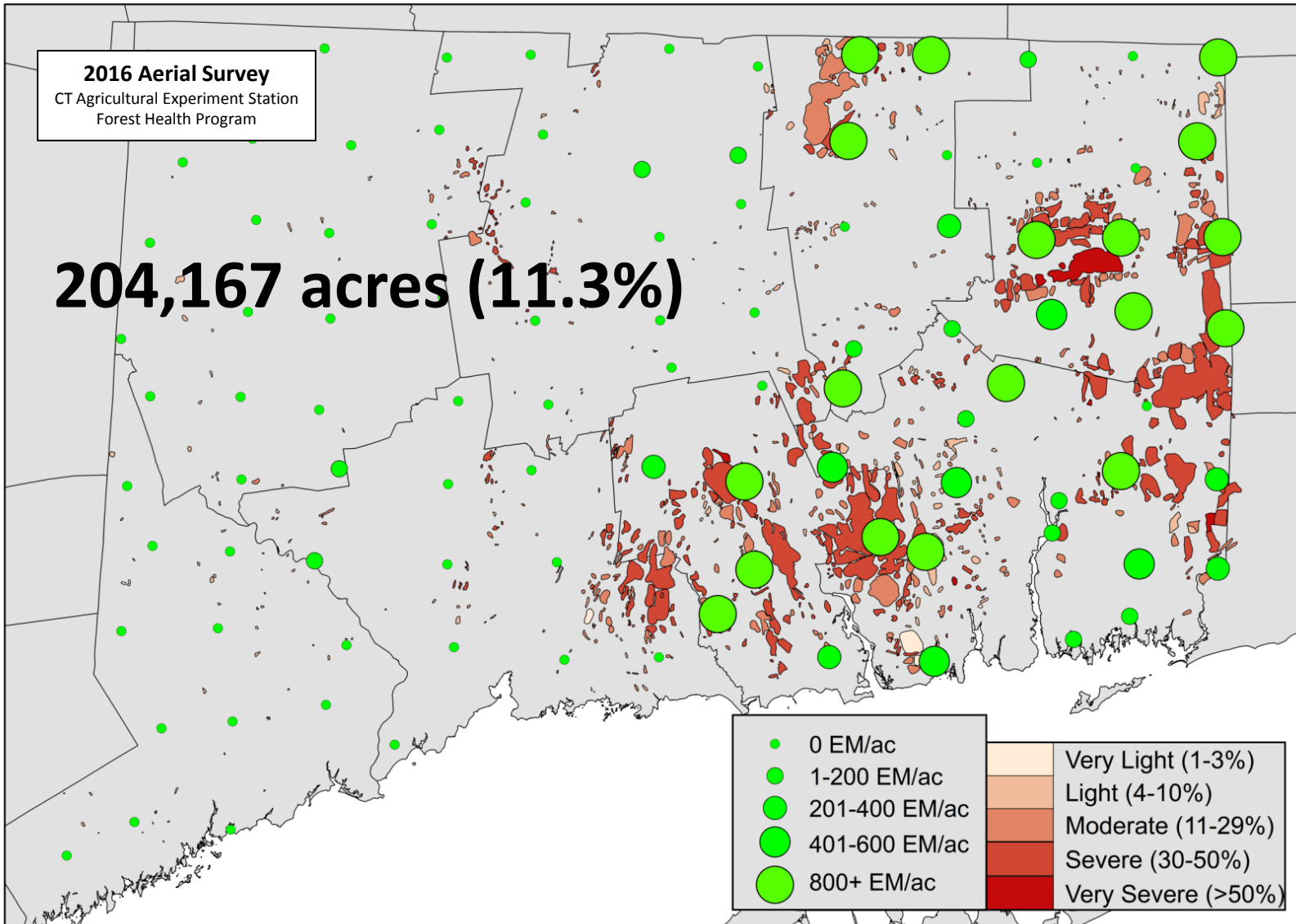


# Connecticut's Forest Aerial Survey

- CAES surveys for gypsy moth as required in the CT State Statutes.
- Connecticut's forest health assessment is conducted each year from late June to early August or as events and weather dictate (need clear skies, no haze).
- Funded by the U.S. Forest Service.
- With increased use of technology, (Digital Aerial Sketch mapping) survey has expanded to include all types of forest damage.

# 2016 Defoliation with Egg Mass Survey

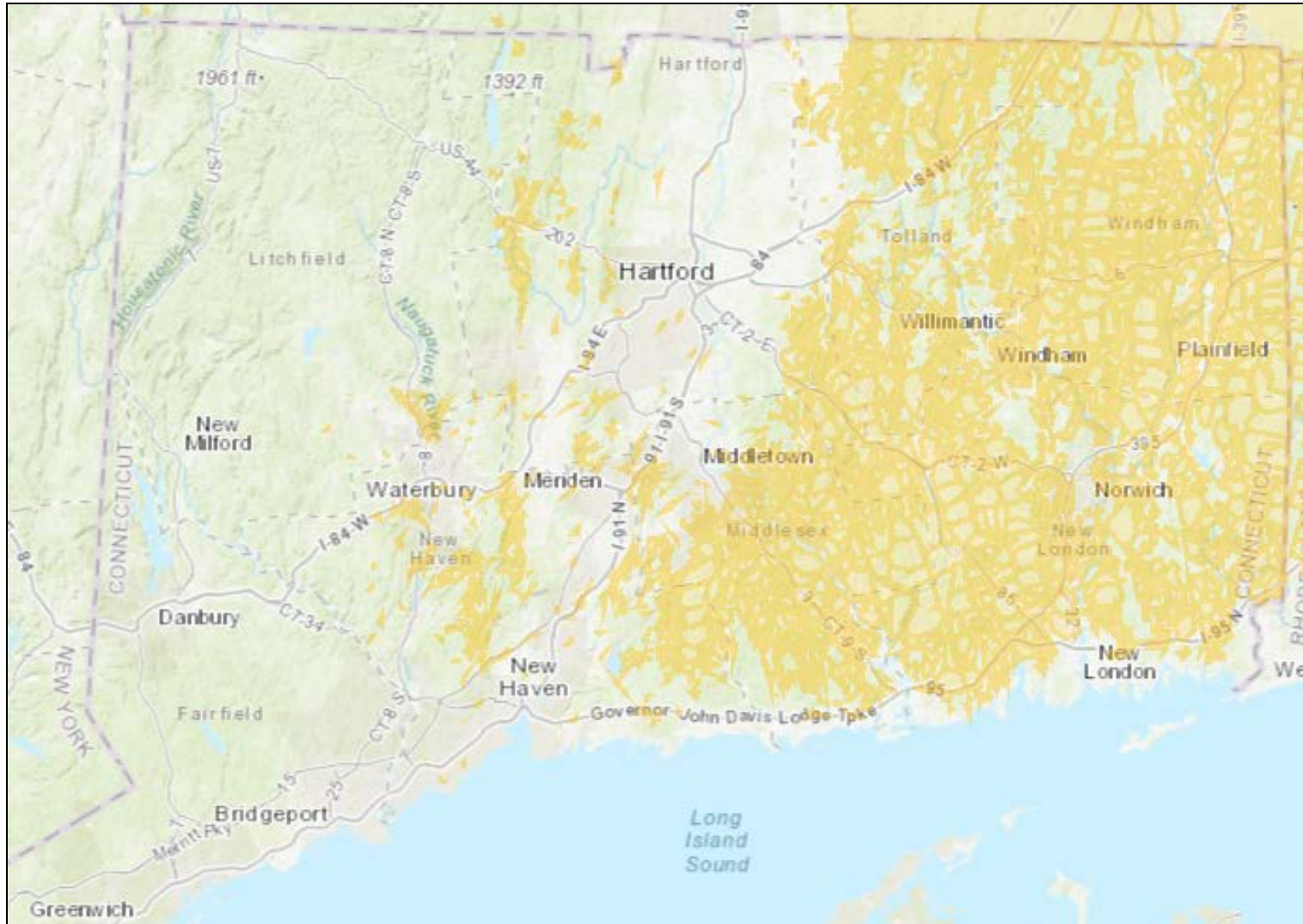
2016-2017 Gypsy Moth Egg Mass 7-Mile Grid Survey Results





# Aerial Survey Map for 2017

## Raw Data, unprocessed



# Defoliation around Green Fall Pond Voluntown, CT (30 June 2017)



# Defoliation Eastern CT (30 June 2017)





# Defoliation Quinebaug River Canterbury, CT (30 June 2017)



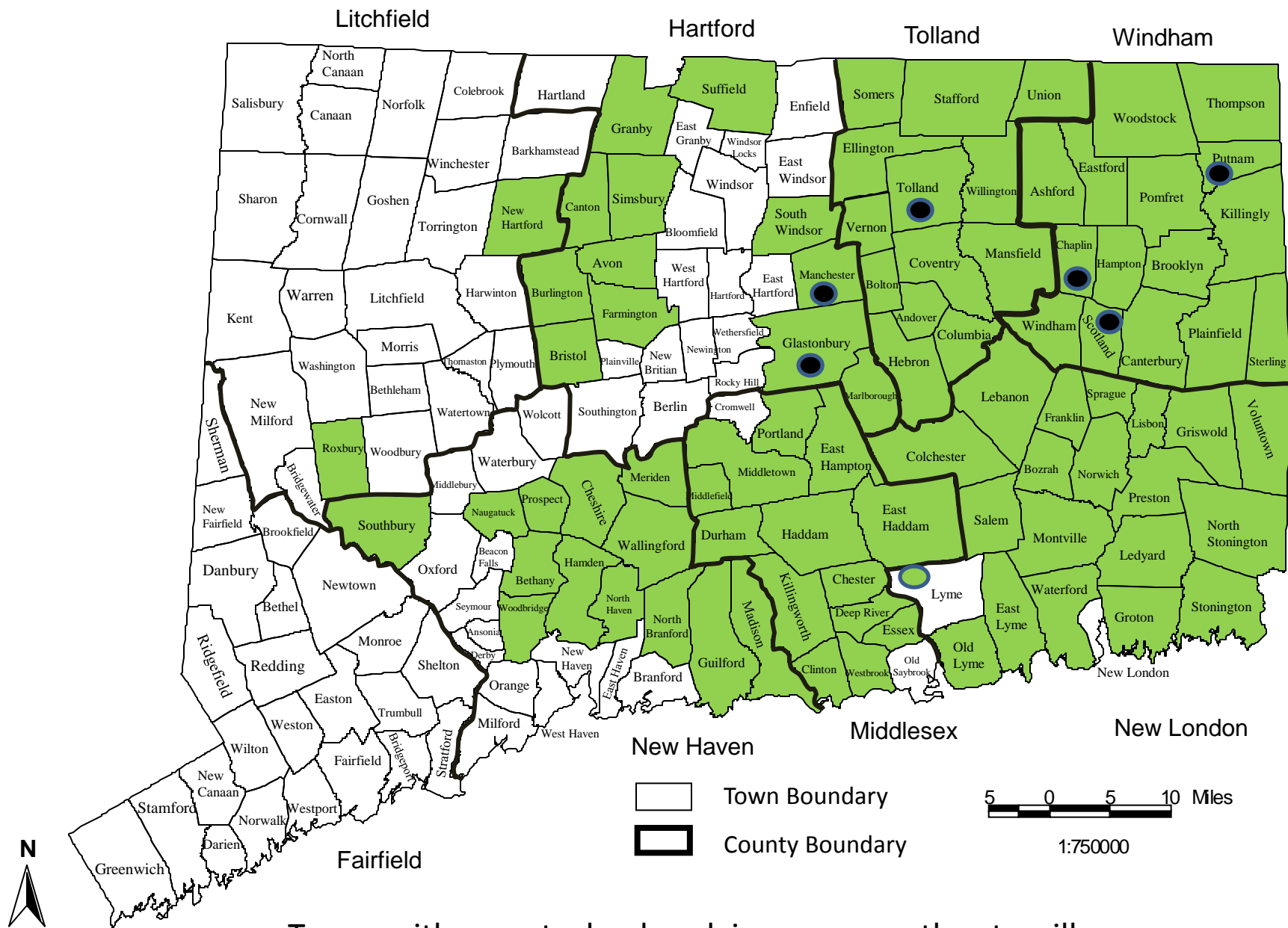
# Gypsy Moth Fungus



Chris Martin



**2017**



Towns with reports dead or dying gypsy moth caterpillars  
 June 2017; towns with reported adult moth activity ●



**Trees  
defoliated by  
gypsy moth  
& re-leafing  
out in  
Higganum, CT  
(2017)**



Photos courtesy  
Kim Syrel  
Arborcare Tree

# So What to Expect in 2018?

- There was widespread gypsy moth fungus activity in 2017 with 90+% caterpillars dying
- Significant reduction gypsy moth in 2018
- Some areas with adult moth activity; egg mass survey
- Lot of fungus present for next year
- There will be some pockets of high caterpillar activity in 2018



# Acknowledgements

- Plant inspectors Peter Trenchard (retired) and Tia Blevins, and Dr. Victoria Smith who have conducted the aerial surveys. Zachary Brown for the 2016 & 2017 maps.
- Plant inspectors, Dr. Gale Ridge, and various citizens for providing photographs.
- U.S. Forest Service for support for forest health surveys.

**The Gypsy Moth**  
Dr. Kirby C. Stafford III  
Department of Entomology  
The Connecticut Agricultural Experiment Station

**Introduction:**

The gypsy moth, *Lymantria dispar*, was introduced into the US (Medford, MA) around 1869 by Etienne Leopold Trouvelot. Some larvae escaped and small outbreaks became evident in the area around 1882. Populations increased rapidly and by 1889, the Massachusetts State Board of Agriculture began a campaign to eradicate the moth. It was first detected in Connecticut in Stonington in 1905 and had spread to all 169 towns by 1952. In 1981, 1.5 million acres were defoliated in Connecticut (Fig. 1). During an outbreak in 1989, CAES scientists discovered that the entomopathogenic fungus *Entomophaga maimaiga* was killing the caterpillars. Since then, the fungus has been the most important agent suppressing gypsy moth activity.

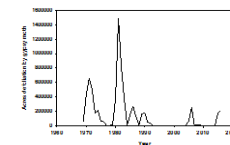


Figure 1. Number of acres defoliated by the gypsy moth in Connecticut, 1969-2015.

However, the fungus cannot prevent all outbreaks, due largely during drought conditions, and hot spots in some areas continue to be reported. There was an outbreak in 2005-2006 and a more severe outbreak again in 2015-2016 (see page 7).

**Life Cycle:**

There is one generation of the gypsy moth each year. Caterpillars hatch from buff-colored egg masses in late April to early May. An egg mass may contain 100 to more than 1000 eggs and may be laid in several layers.



Figure 2. Gypsy moth egg masses on a tree and a close-up of single egg mass (inset).

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