

# Ash, and Oak, and Southern Pine Beetles, Oh My!

Claire Rutledge

CAES

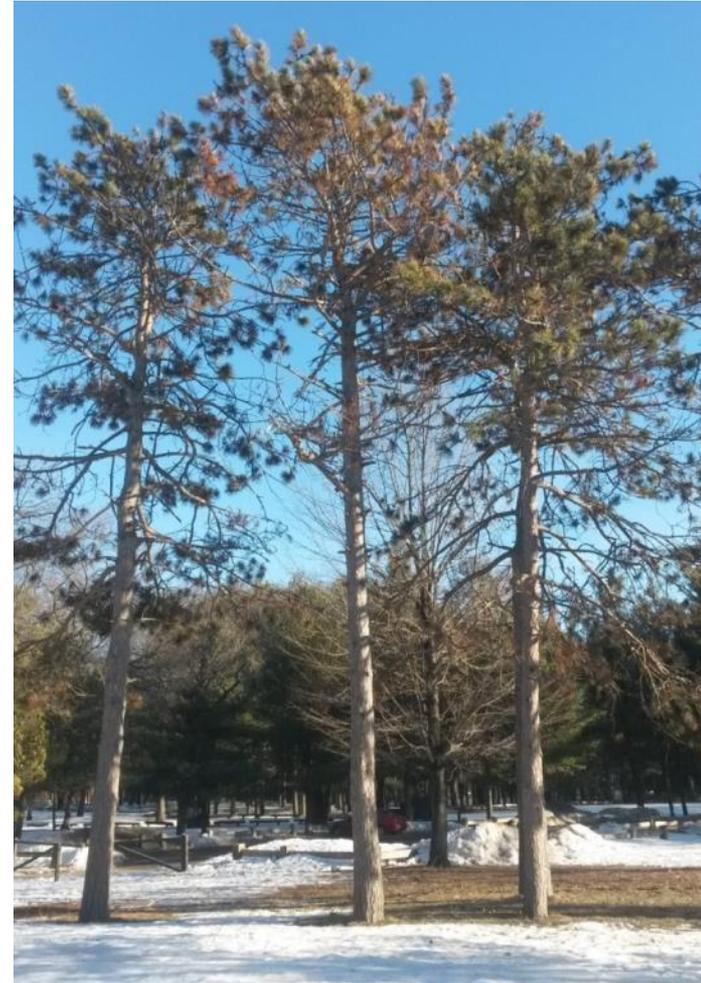
FHW 2019

# Southern pine beetle (SPB)

*Dendroctonus frontalis*



# Signs and Symptoms of Southern Pine Beetle



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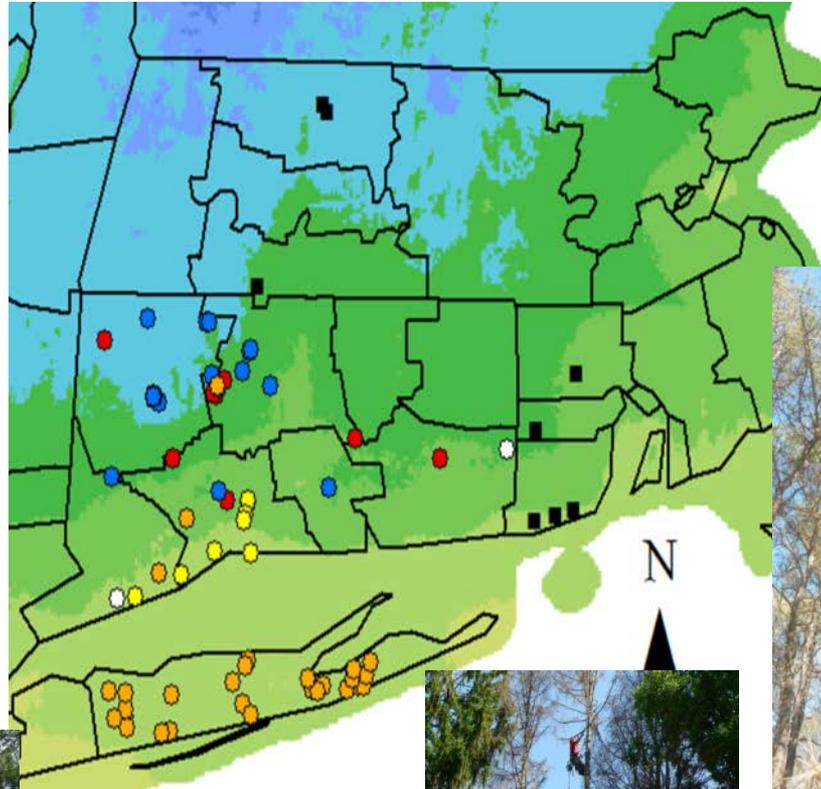
# Signs and Symptoms of Southern Pine Beetle



# Southern Pine Beetle Distribution and Hosts Connecticut 2015



Scots Pine,  
Hamden CT



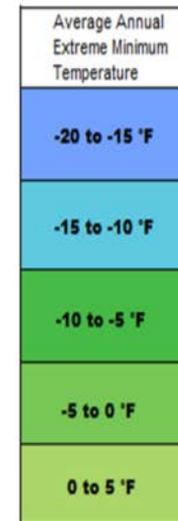
- (+) SPB Traps
- Norway Spruce
- Pitch Pine
- Red Pine
- Scots Pine
- White Pine



Red Pine,  
Wharton Brook  
State Park



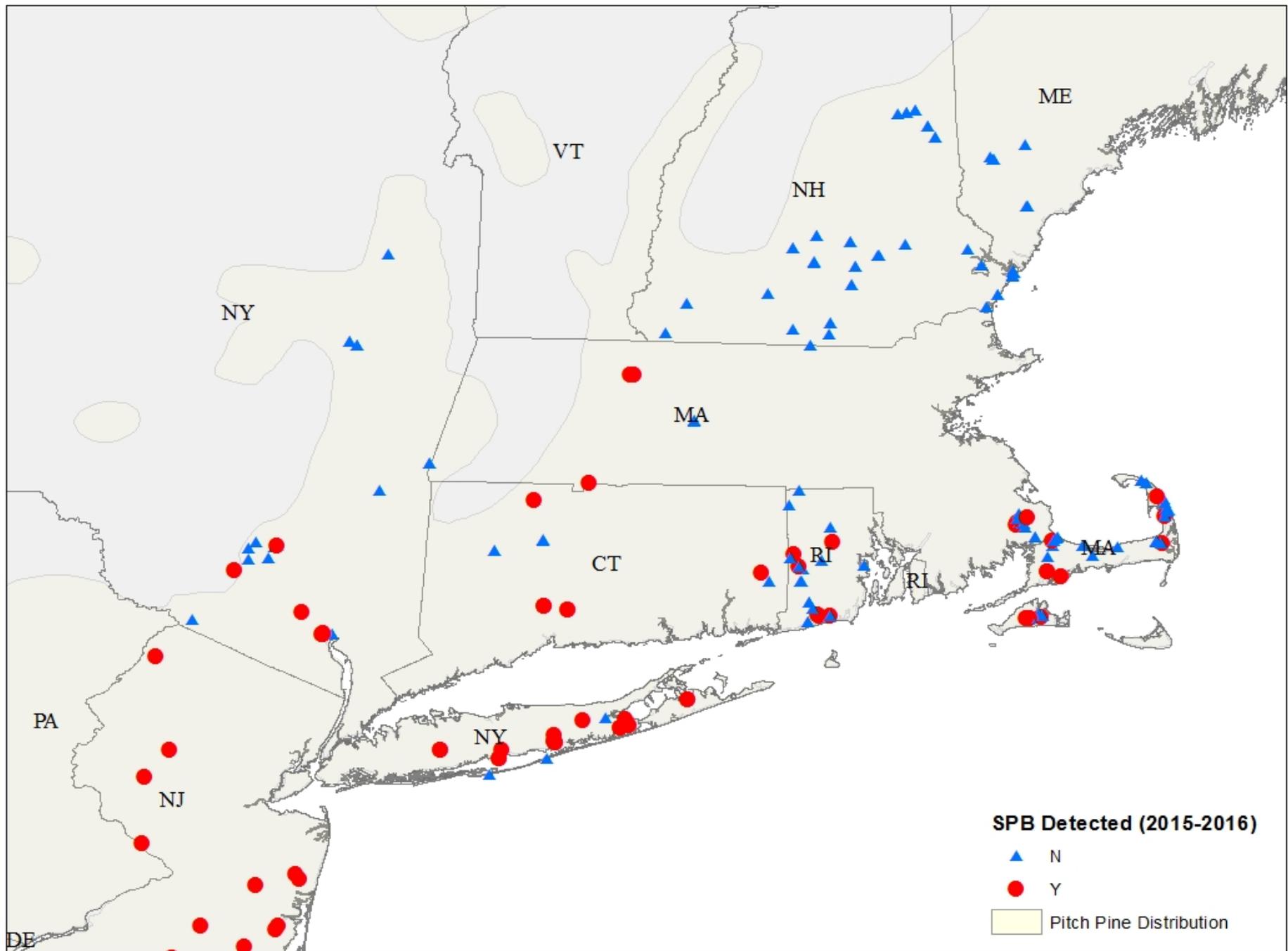
Pitch Pine,  
North Haven CT



White Pine, Westport CT



Norway Spruce, North Haven CT



■ Towns where attacked trees were detected in 2015

■ Towns with Traps

■ Town with SPB trapped

2015

2016

2018

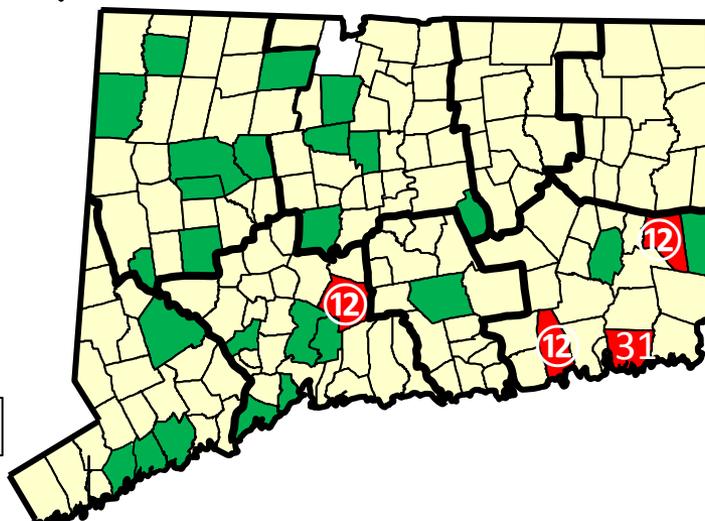
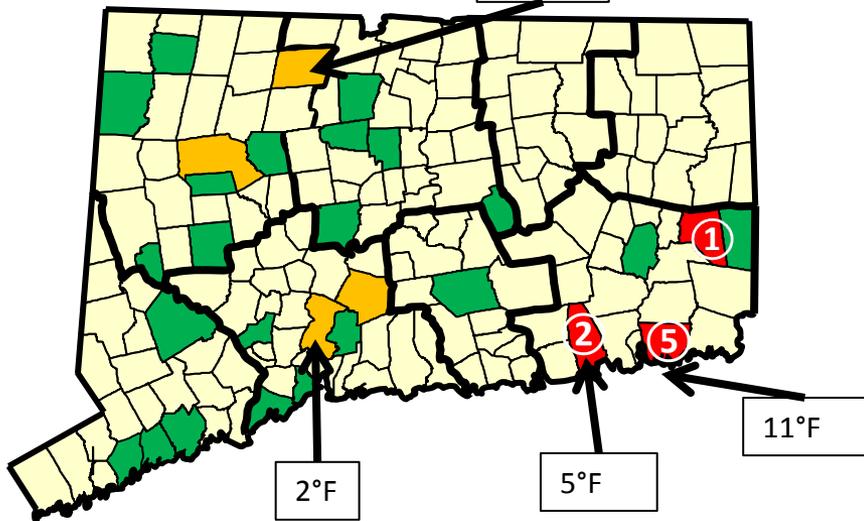
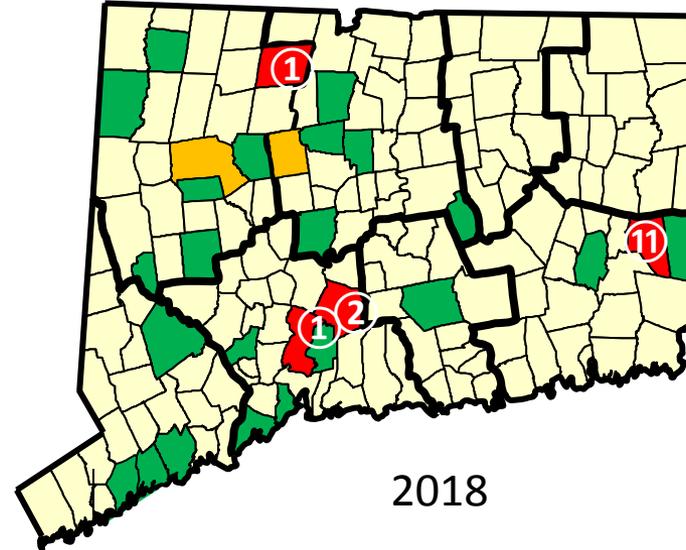
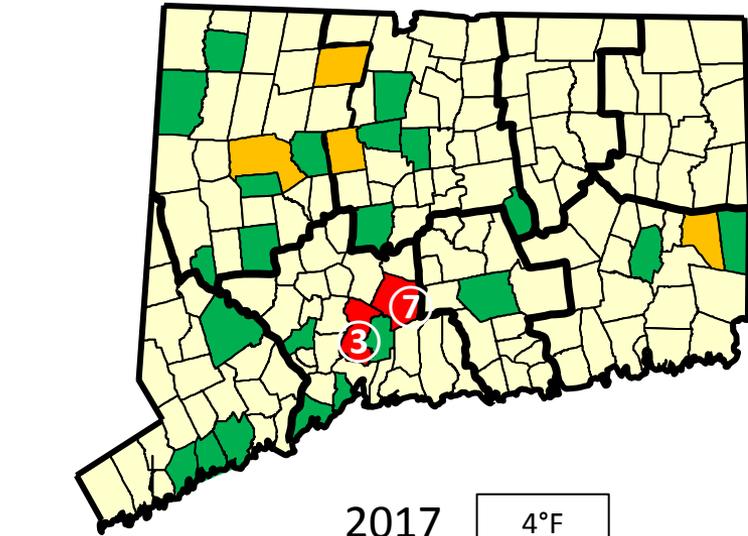
2017

4°F

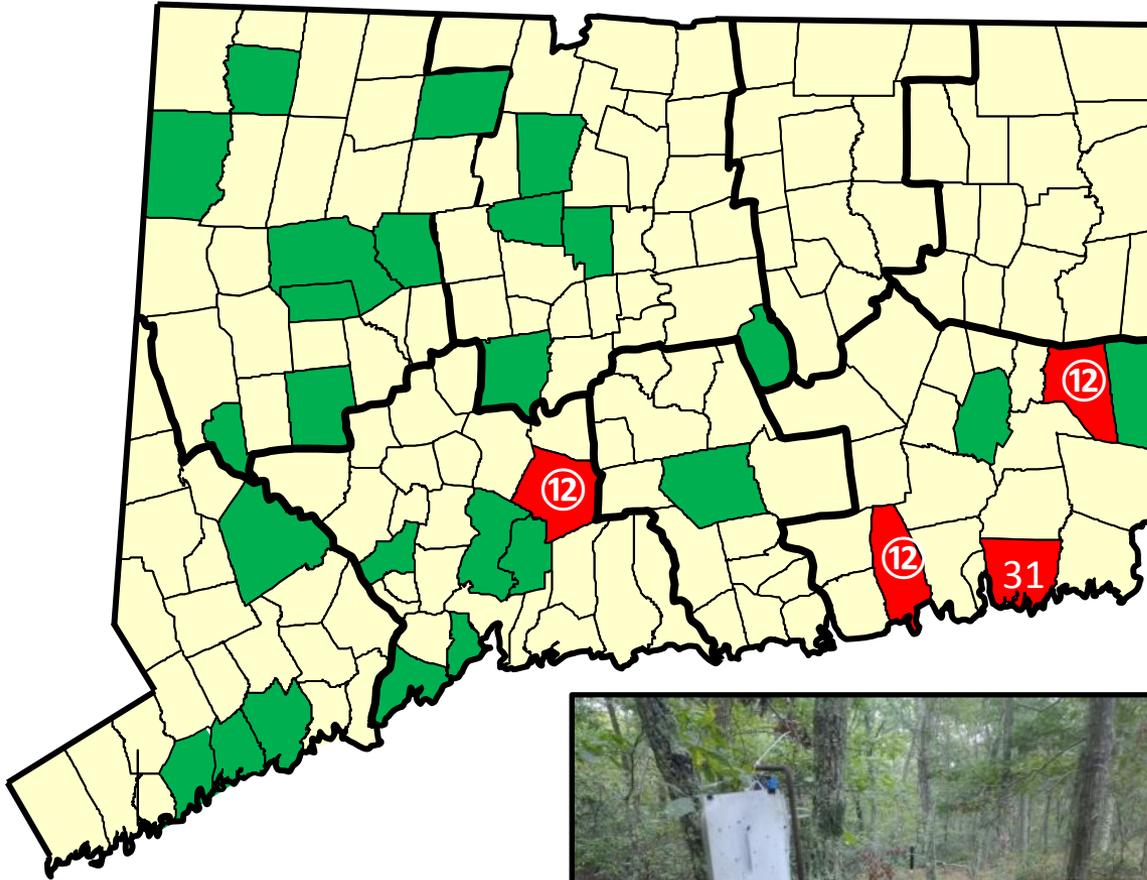
2°F

5°F

11°F



# SPB Trapping 2018

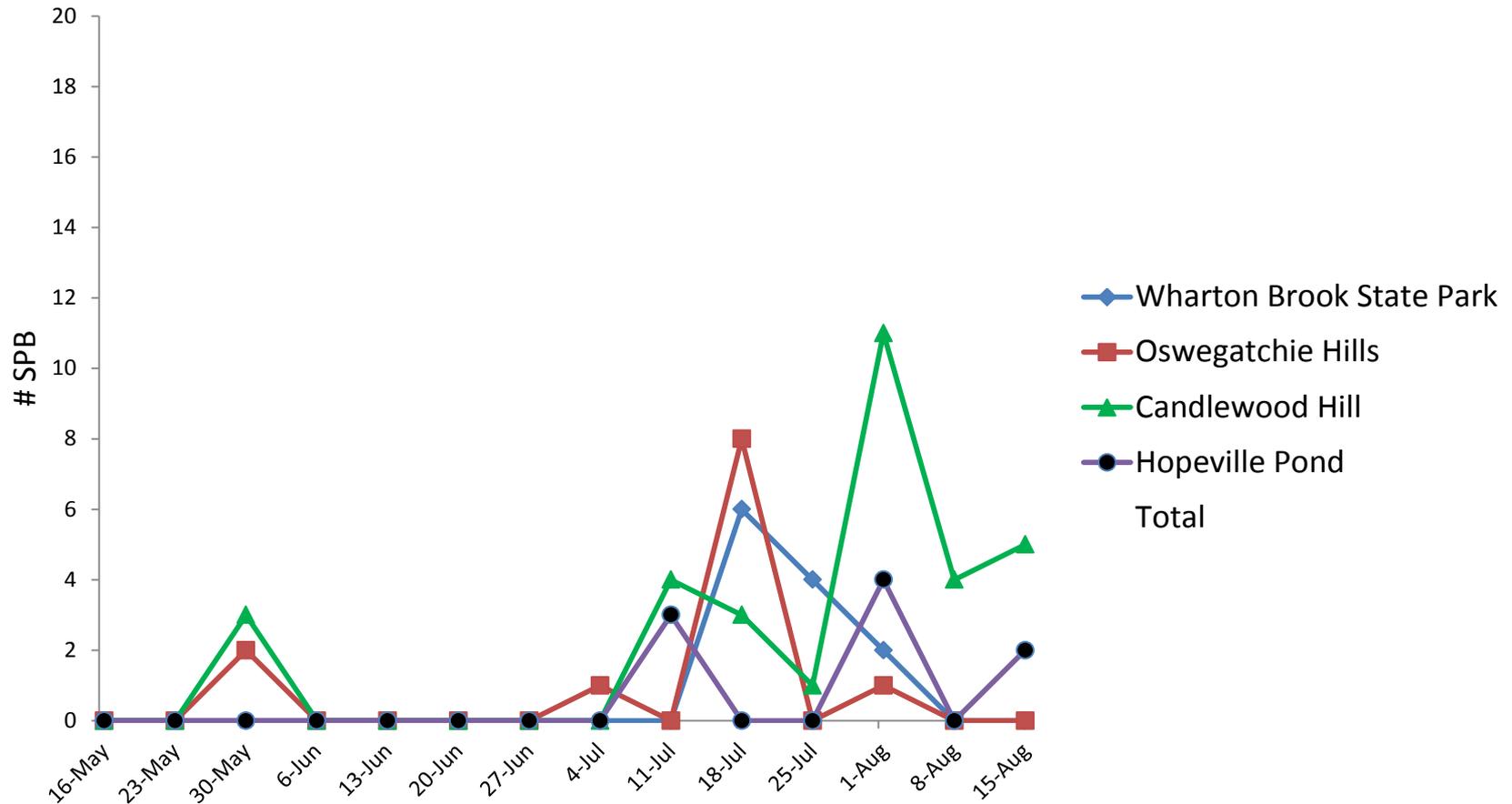


- 4 sites
- 21 sample dates May 16 – October 3
- 3 each of 2 trap types per site
- 1 graduate student, Niklas Lowe - CCSU



# SPB Trapping 2018

Thus far... results still being tallied

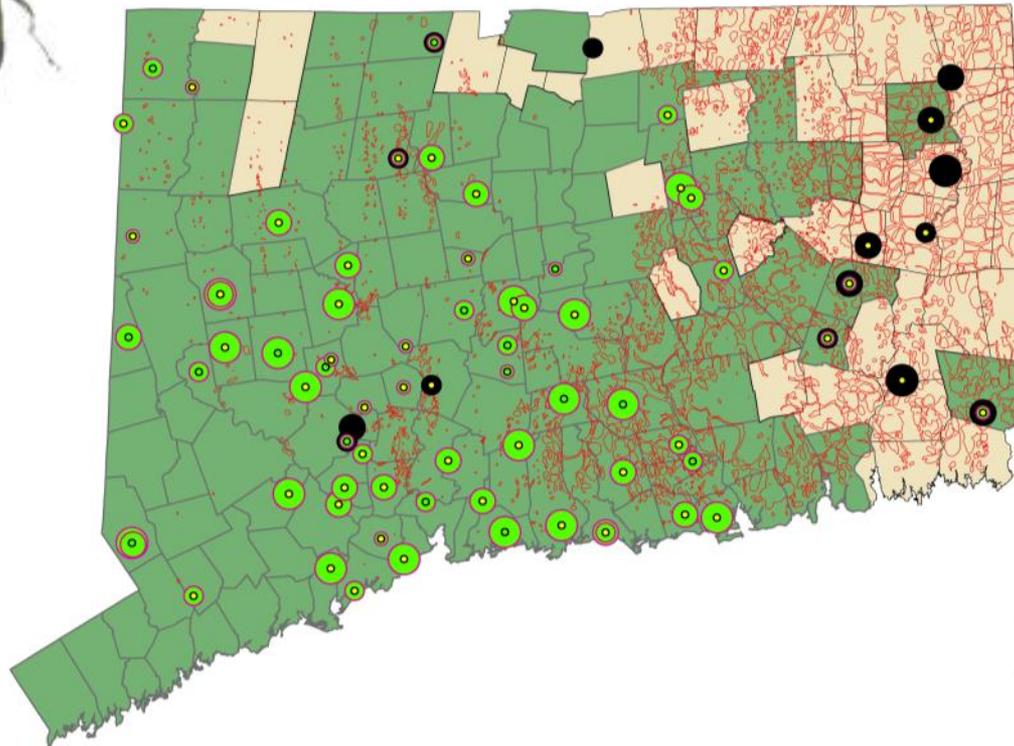


# Ash and Oak

## The Summer Of Two Beetles



M. Quinn



-  EAB
-  TLCB

*Cerceris fumipennis*



# Buprestidae

## Buprestinae

### *Anthaxia*



M Quinn

*quercata*

2 mm

### *Chrysobothris*



JP Basham

*azurea*



JP Basham

*sexsignata*

### *Actenodes*



JP Basham

*acornis*

### *Phaneops*



S Luk

*fulvoguttata*

## Agrilinae

### *Brachys*



M. Quinn

*ovatus*

### *Agrilus*



S. Nelson

*planipennis*



K. Hillig

*anxius*



M. Quinn

*bilineatus*



JP Basham

*obsoleguttata*

## Chrysochroinae

### *Dicerca*



JP Basham

*divericata*



*lurida*

# How to Get Beetles

- Hunt – use net to intercept wasps
- Gather- any beetles on ground



# *Cerceris fumipennis*

- *Cerceris* is an optimal forager, the prey collected from the wasp is reflective of the abundance of buprestids in the environment
- In 2018 we collected 4,546 beetles
  - 2607 EAB
  - 689 TLCB

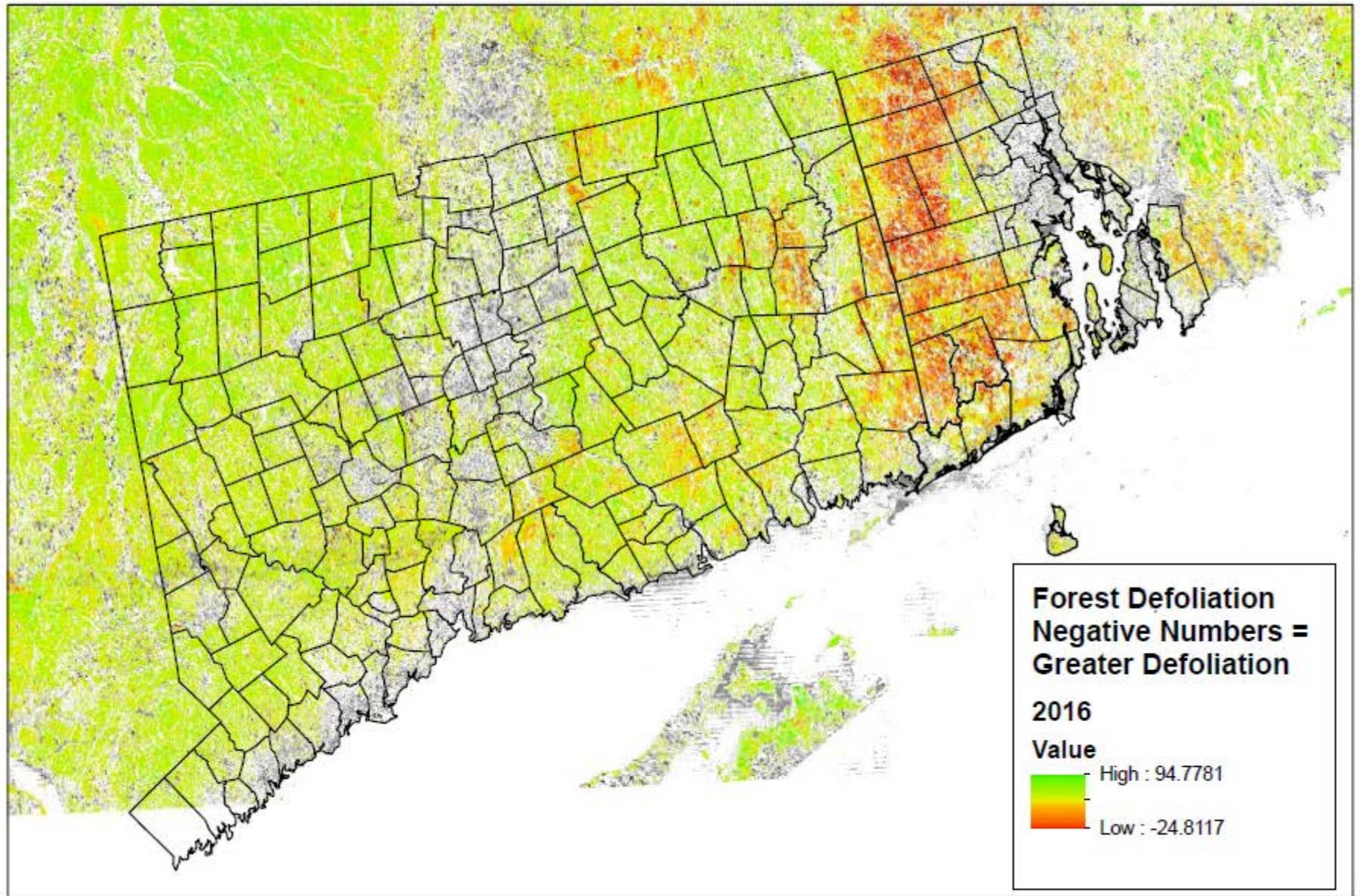


# Two-Lined Chestnut Borer

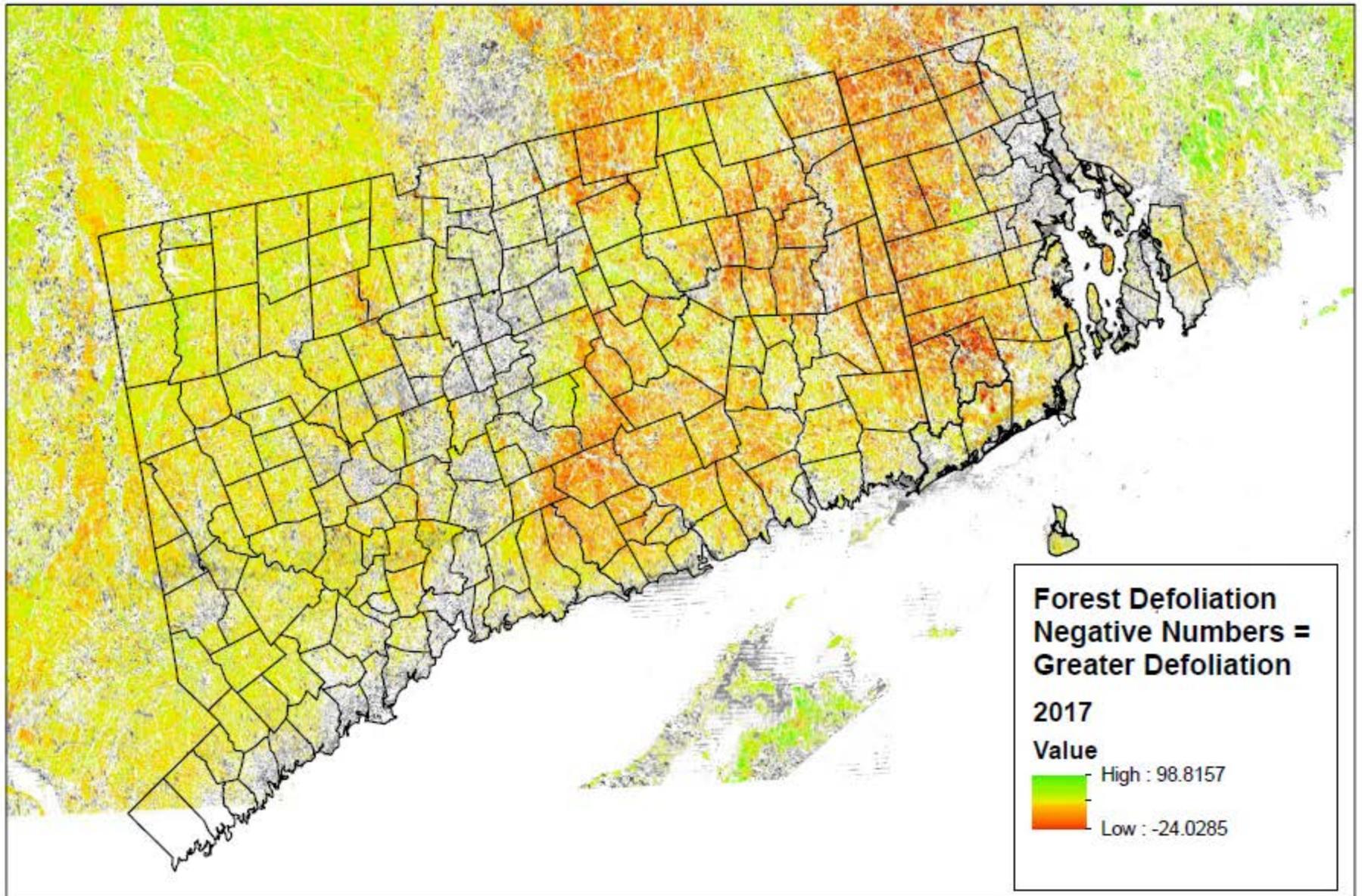


- Native to NA
- Feeds on Chestnut and Oak
- Secondary Pest of both
- Common after Gypsy Moth Outbreaks

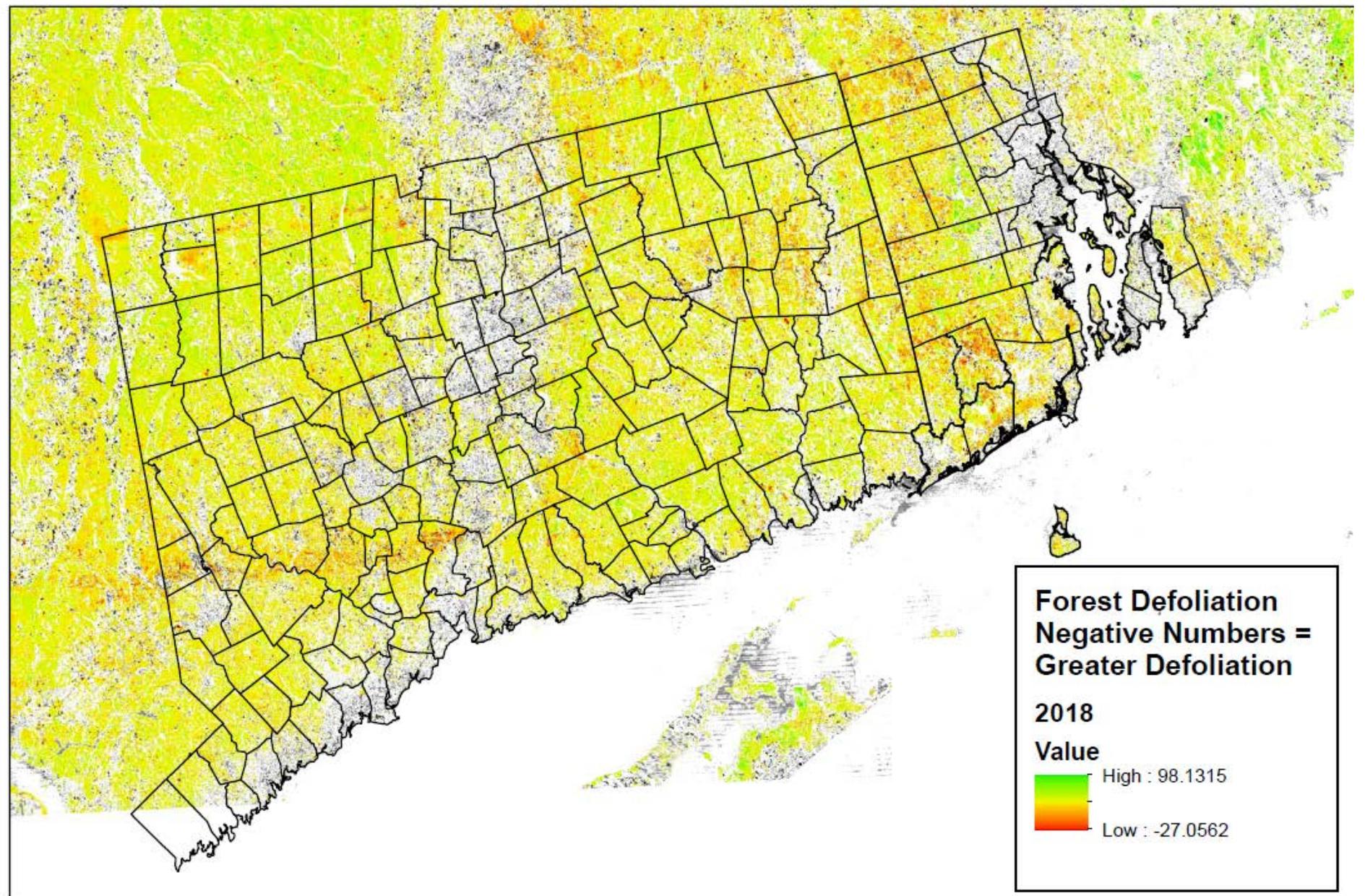
# Defoliation in Southern New England - 2016



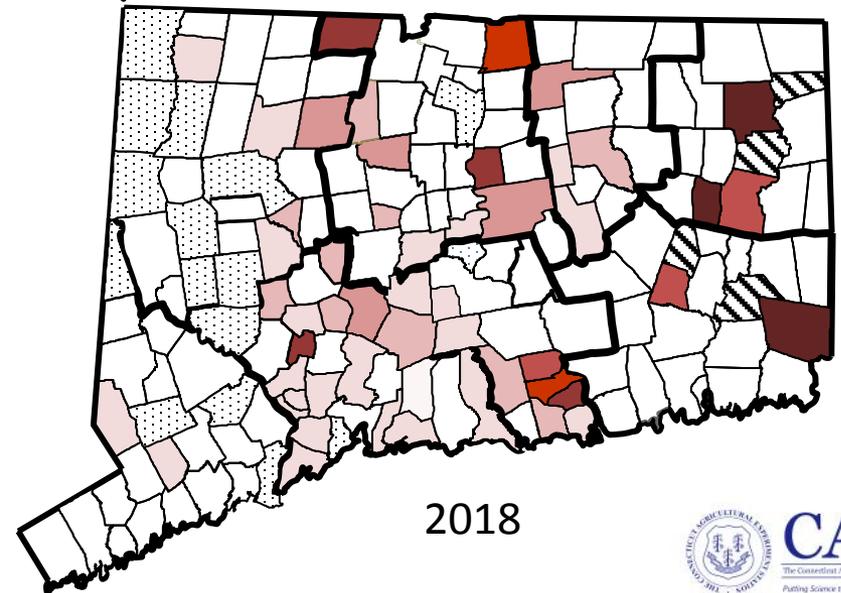
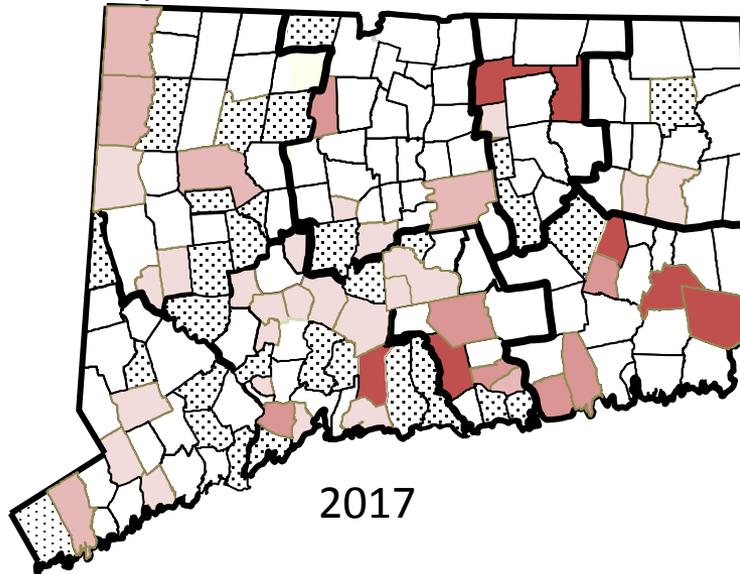
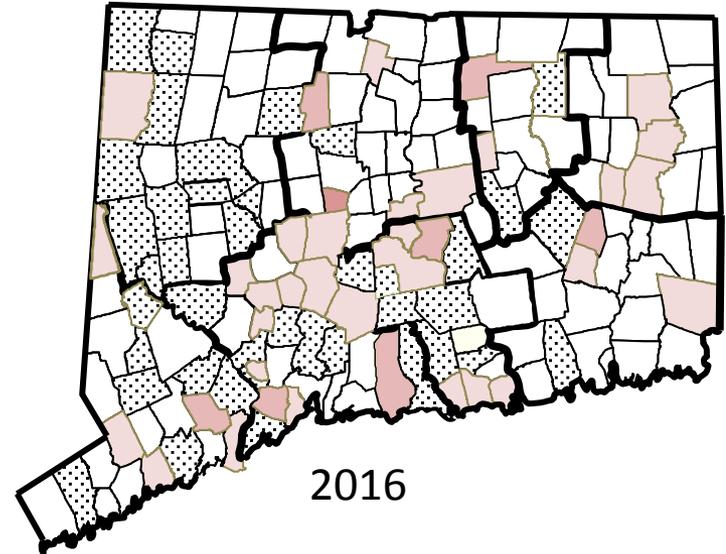
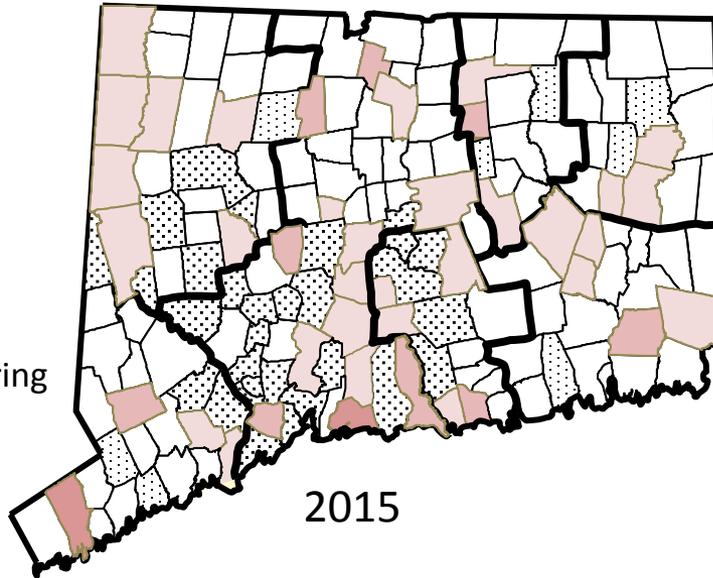
# Defoliation in Southern New England - 2017



# Defoliation in Southern New England - 2018



# Two-Lined Chestnut Borers as Proportion of *Cerceris fumipennis* Catch, 2015-2018







# Cooperative Emerald Ash Borer Project

Initial county EAB detections in North America

October 1, 2018



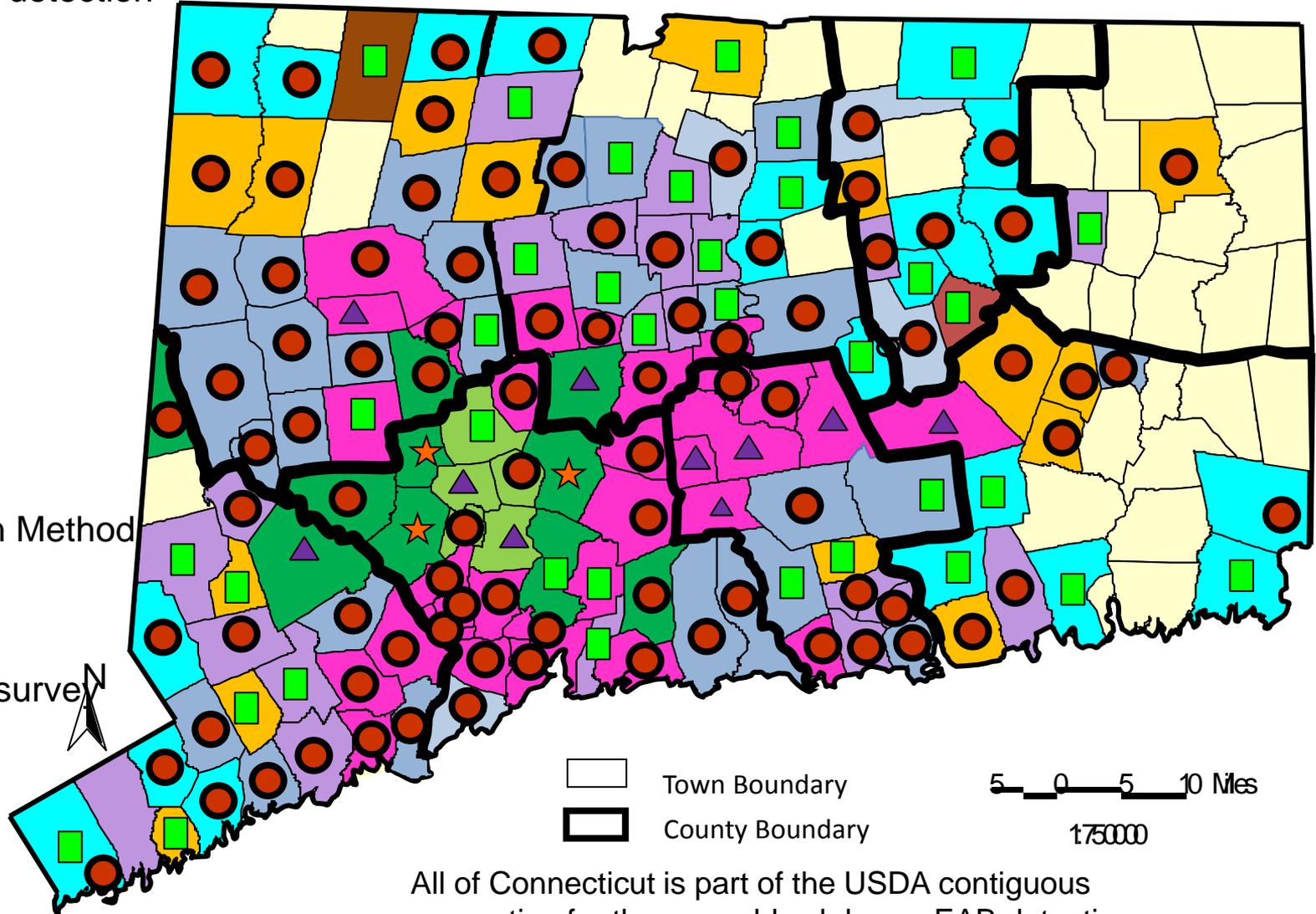


# Year EAB detection

- 2012
- 2013
- 2014
- 2015
- 2016
- 2017
- 2018
- 2019

# 1<sup>st</sup> Detection Method

- wasp
- trap
- DEEP survey
- visual



134 towns  
8 counties

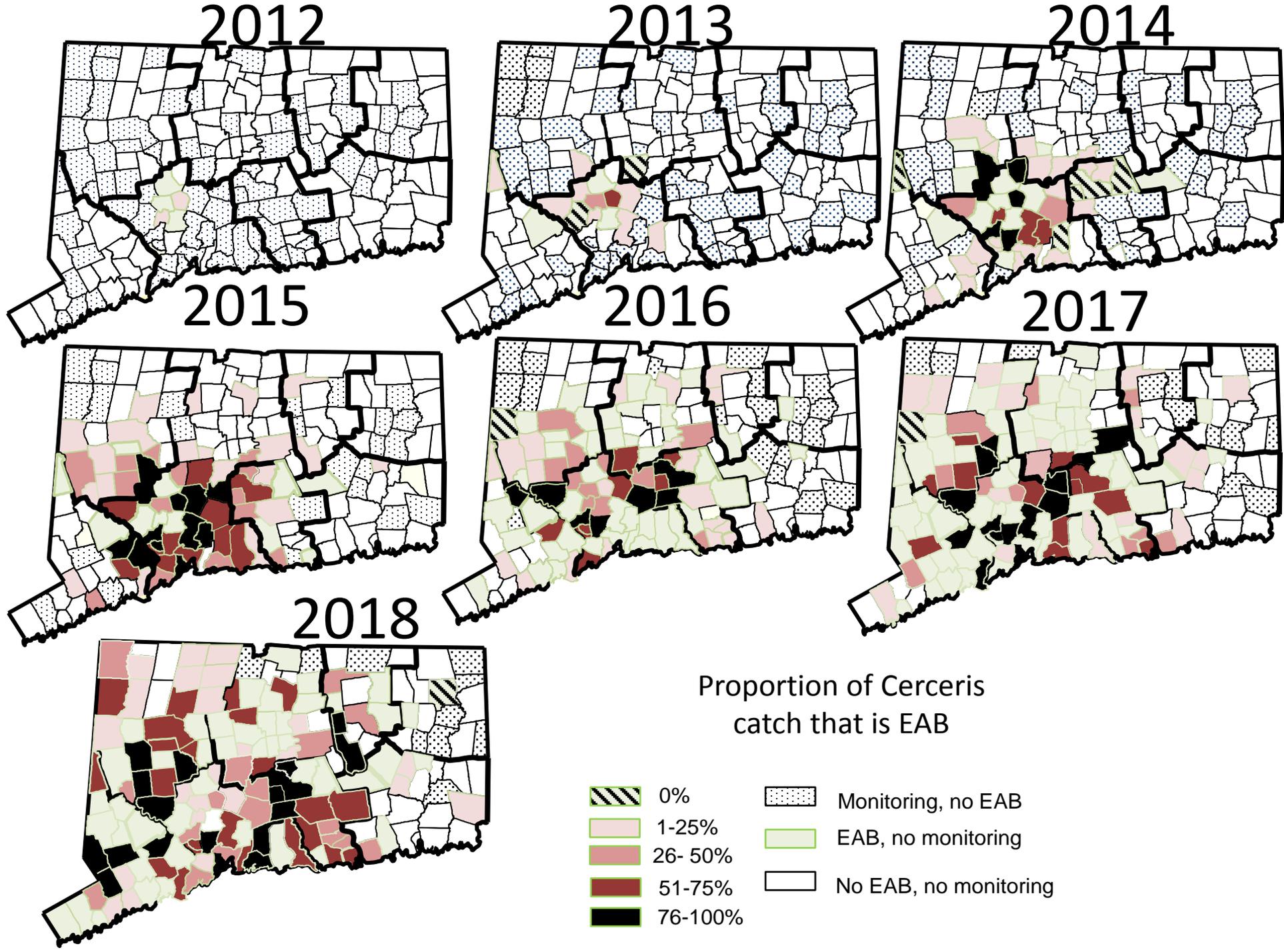
Town Boundary  
 County Boundary

5 0 5 10 Miles  
1:75000

All of Connecticut is part of the USDA contiguous quarantine for the emerald ash borer. EAB detections by town, year, and method shown.



January 22, 2018

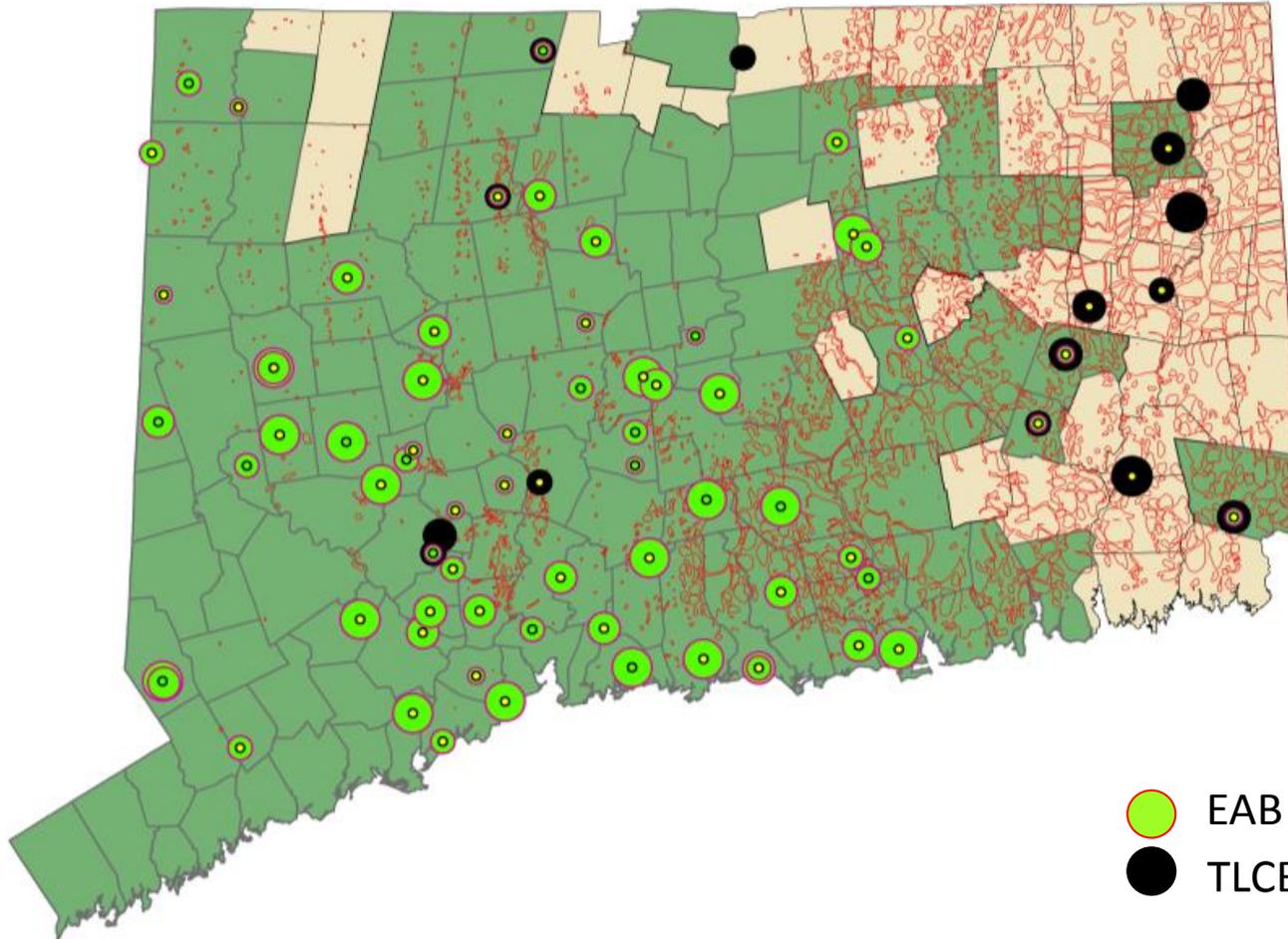




# 2018



M. Quinn



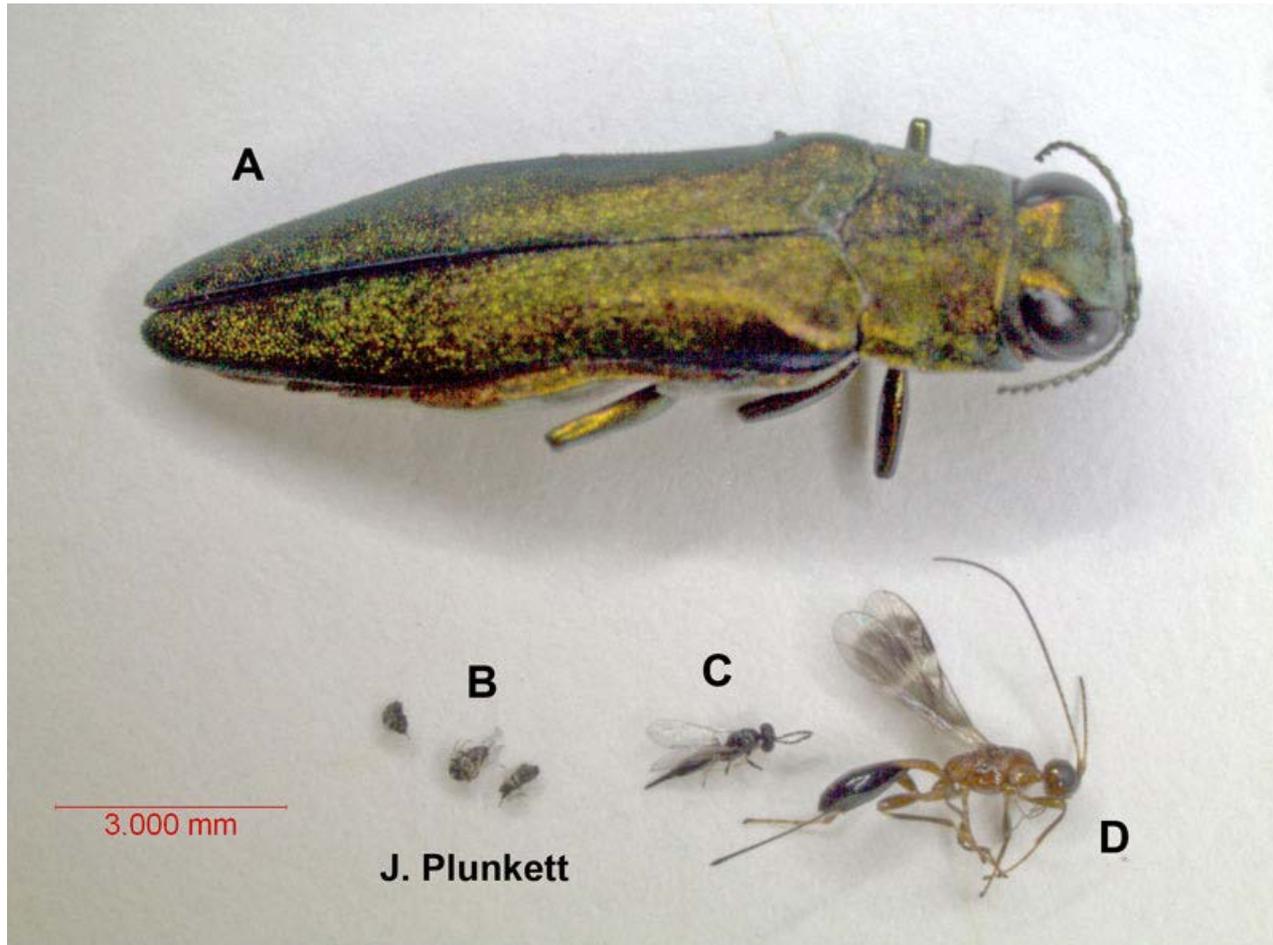
-  EAB
-  TLCB

# Classical Biological Control

- Return to country of origin to find natural enemies
- Find most specific natural enemies
  - No vertebrates
  - No generalist insect predators
  - Parasitic wasps generally considered promising



# Emerald Ash Borer Parasitoids



"The parasitoids were produced and supplied by the USDA EAB Parasitoid Rearing Facility in Brighton, MI."

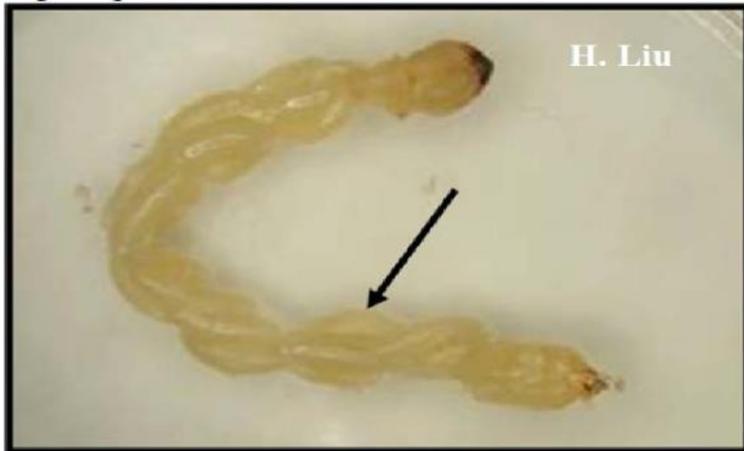
# Emerald Ash Borer Parasitoids

## *Tetrastichus planipennis*



*Tetrastichus planipennis*

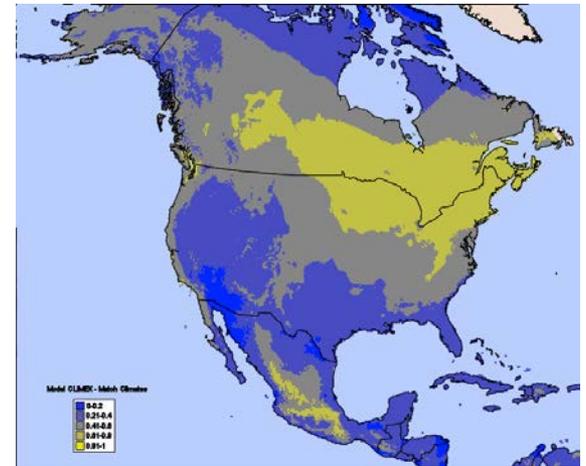
*T. planipennis* larvae mature inside an EAB larva



- Endoparasitoid of EAB from China
- Attacks and kills up to 50 percent of EAB larvae.
- The female parasitoid lays eggs inside EAB larvae
- *Tetrastichus* completes at least four generations each year
- One EAB larva can produce up to 127 *Tetrastichus* adults.
- They survive the winter as larvae inside their host or host gallery under the bark of ash trees.
- Established in at least 8 CT towns

# *Spathius galinae*

- *Spathius* spp. have a longer ovipositor than *Tetrastichus*, can parasitize larvae in bigger trees
- *Spathius galinae* - collected from EAB populations infesting *Fraxinus pennsylvanica* trees in the Vladivostok area (Duan et al., 2012a).
- *Spathius galinae* - ectoparasitoid attacking 2nd to 4th instar EAB larvae
- Have released since 2016
- Established in at least 2 CT towns



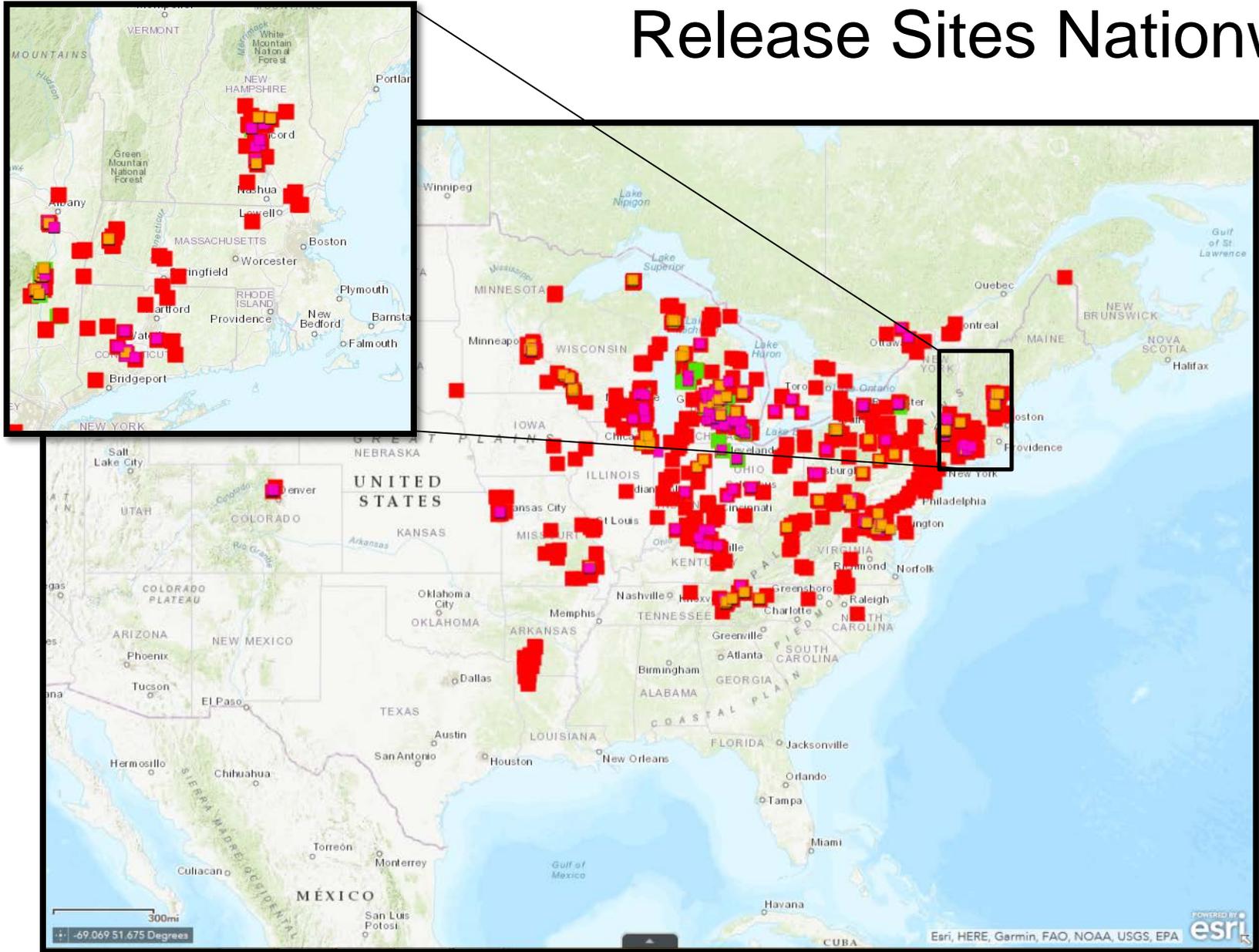
# Emerald Ash Borer Parasitoids



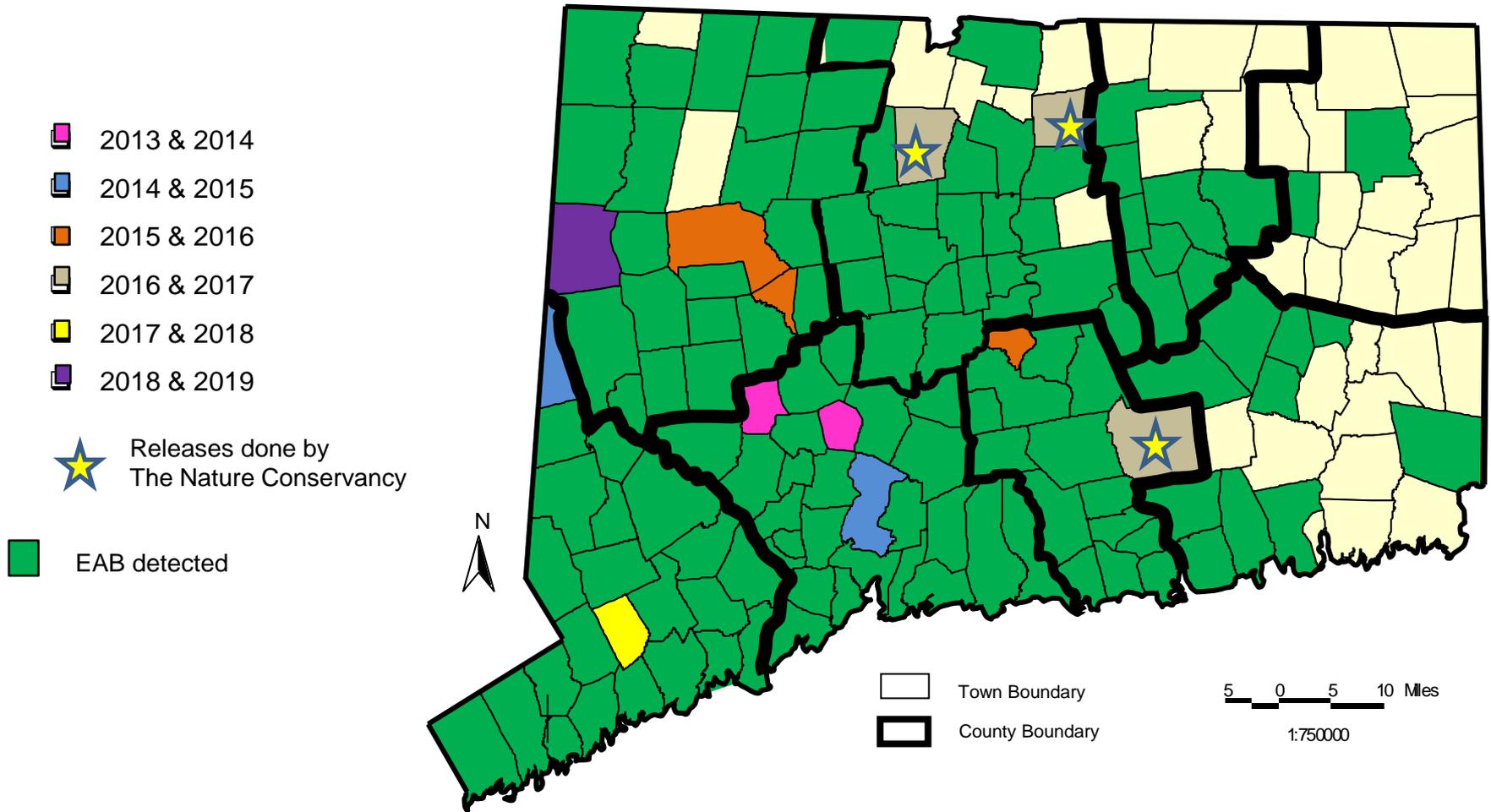
## *Oobius agrili*

- Kills up to 60 percent of EAB eggs laid
- Search the bark of ash trees for EAB eggs, it injects its own egg inside where it will hatch, grow, and kill the host egg.
- At least two generations during the EAB egg-laying season.
- Each *Oobius* adult can parasitize up to 62 EAB eggs during its life time.
- *Oobius* spends the winter as larvae inside EAB eggs and emerge the following spring as adults.
- Established in CT?

# Release Sites Nationwide



# Parasitoid Releases Connecticut



Town	Year	Tets	Oobius	Spathius
Middlebury	2013	4,663	1,702	
	2014	14,580	4300	
Prospect	2013	5,582	1,176	
	2014	14,580	4550	
Hamden	2014	14,580	4550	
	2015	11427	2220	
Sherman	2014	312	450	
	2015	6592	1040	
Cromwell	2015	11511	2220	
Litchfield	2015	11511	2120	
	2016	4754	3700	305
East Haddam	2016	4754	3700	305
	2017	6864	2800	1522
East Windsor	2016	4753.75	3700	305
	2017	6864	2800	1522
Simsbury	2016	4753.75	3700	305
	2017	6864	2800	1097
Weston	2017	6864	2800	1522
	2018	5382	1662	1701
Kent	2018	10139	2800	2483
		147,191	51,990	8,584



# Parasitoid Recovery



- Wait 1 year after last release
- “Tets” & Spathius - peel trees in fall looking for larvae and parasitoids
- Oobius – collect bark and wait for parasitoids to emerge



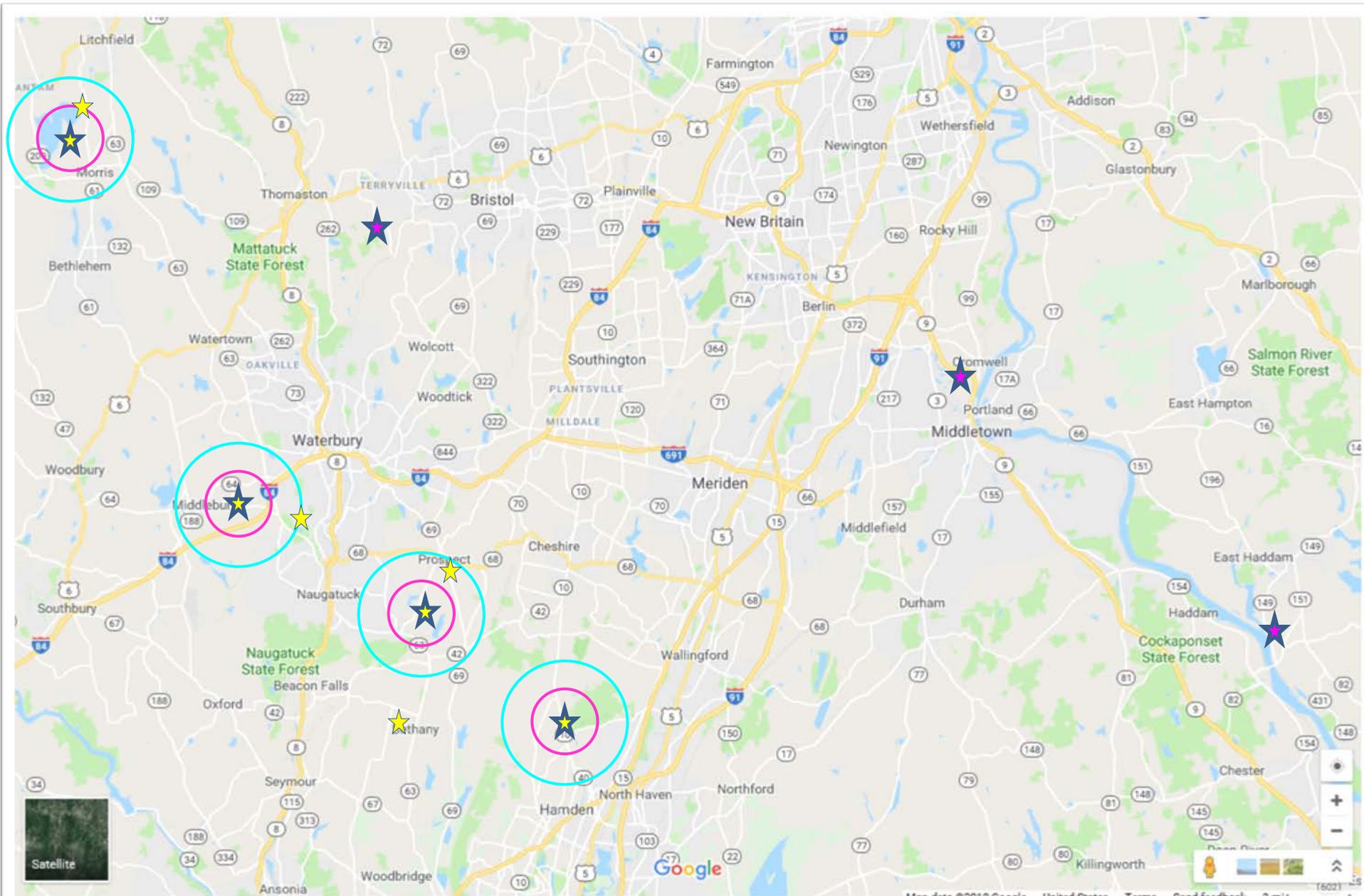
# Parasitoid Recovery



Whittemore Rd.  
Middlebury, CT

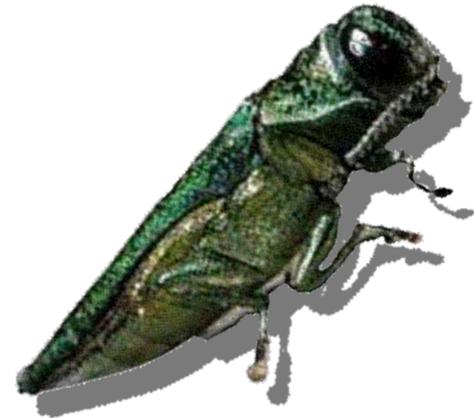


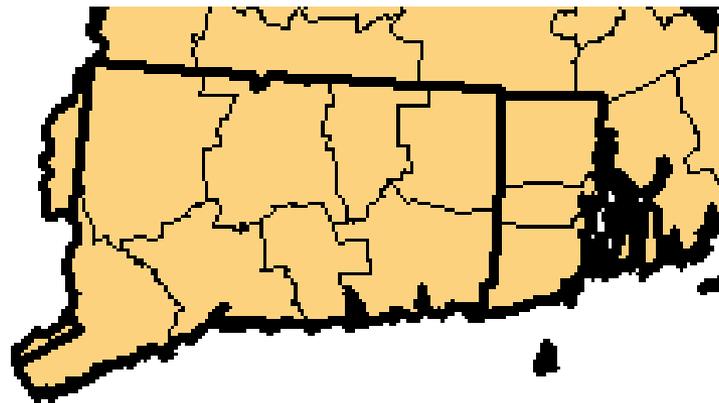
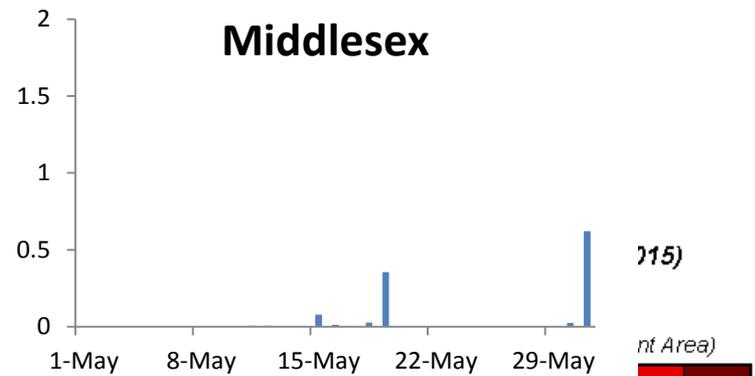
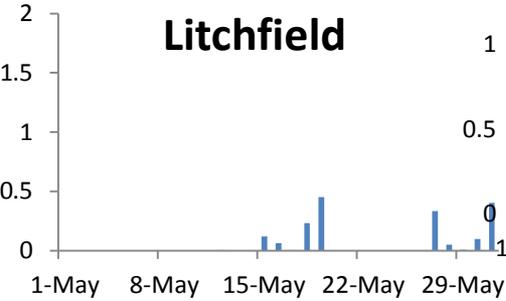
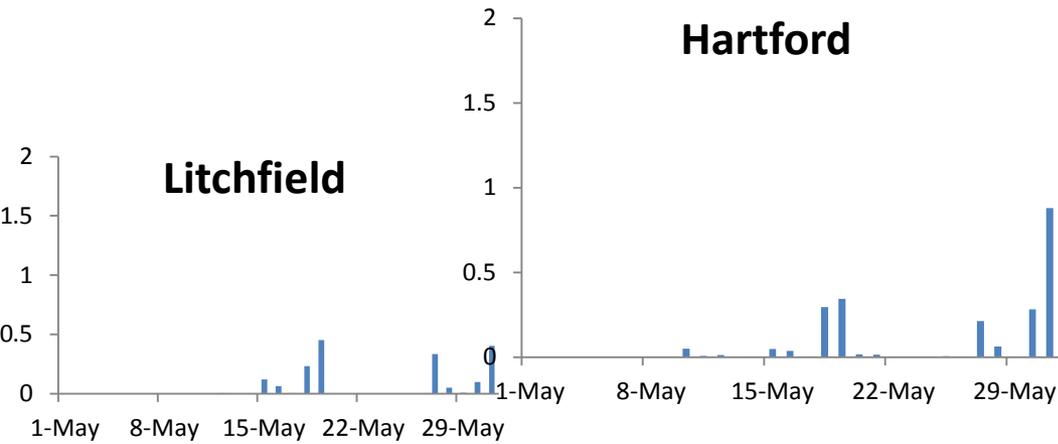
Prospect, CT



# Acknowledgments

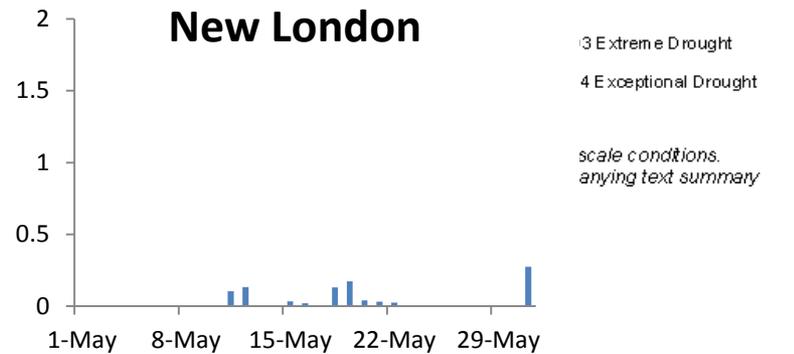
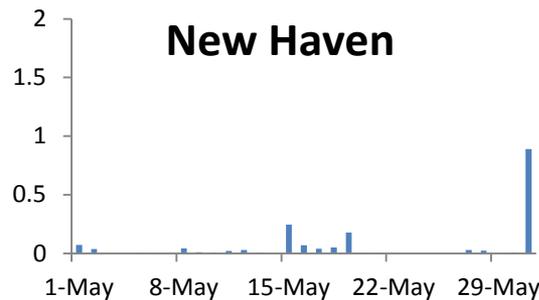
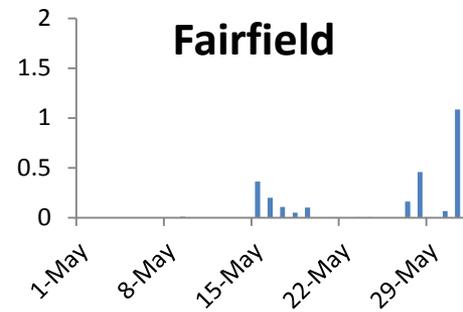
- Niklas Lowe – CCSU
- Alicia Bray - CCSU
- Chris Donnelly – DEEP
- Lisa Tewksbury - URI
- Vicki Smith –CAES
- Dennis Hicks – CAES
- Jillian Tate – CAES
- Jian Duan – USDA ARS
- Mioara Scott – CAES



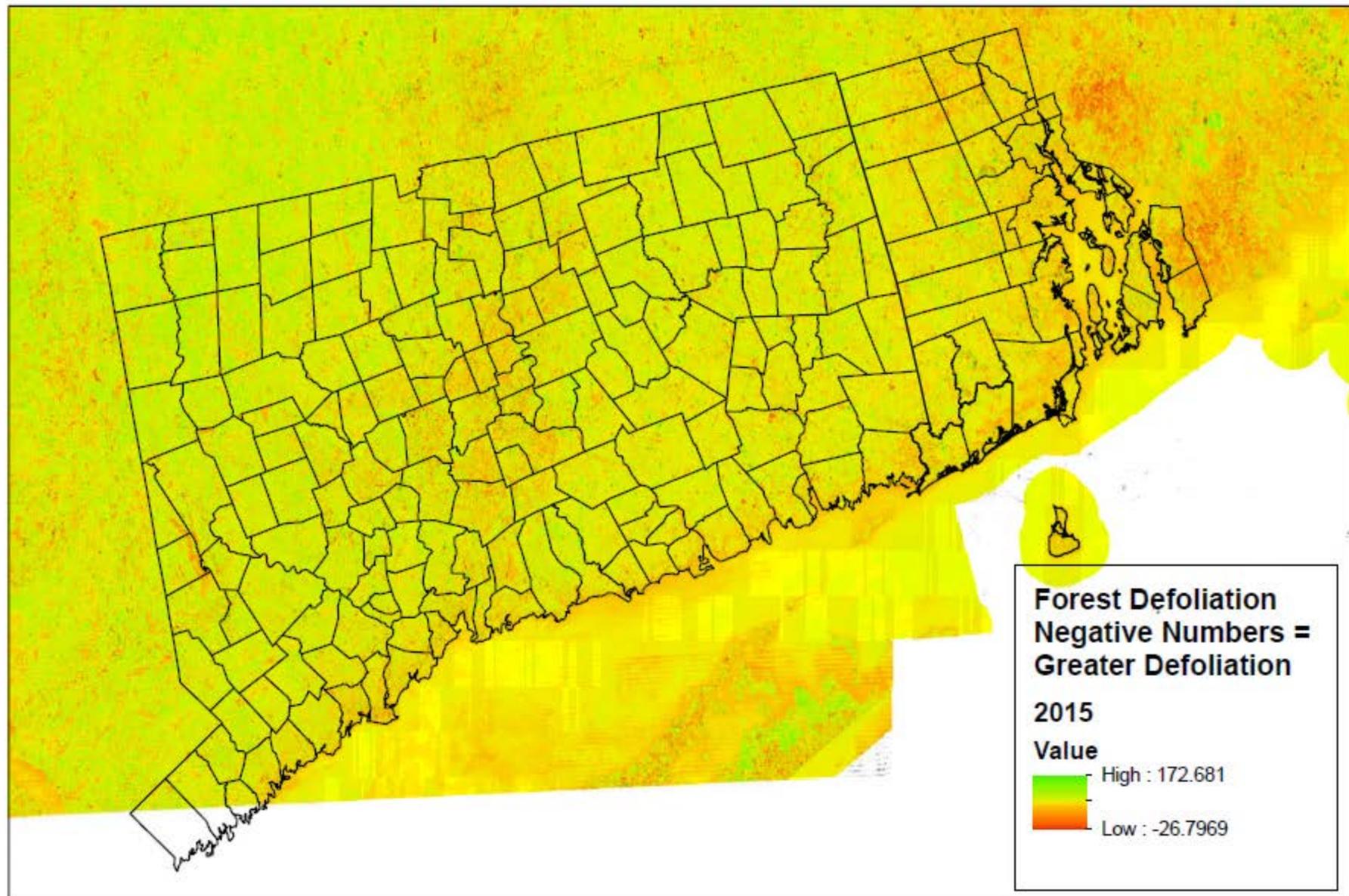


Windham

	Current	100.00	40.98	0.00	0.00	0.00
One Year Ago	0.00	100.00	40.98	0.00	0.00	0.00
5/27/2014	0.00	100.00	40.98	0.00	0.00	0.00

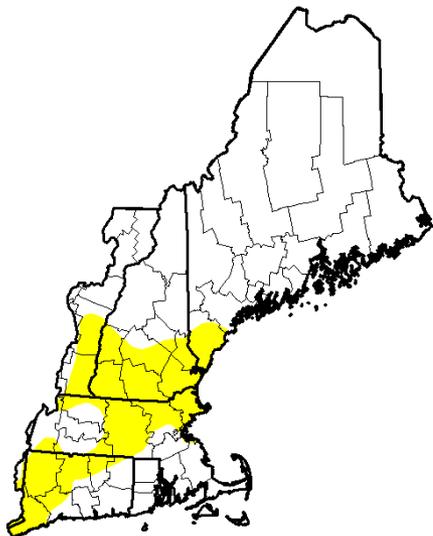


# Defoliation in Southern New England - 2015





## U.S. Drought Monitor New England Watershed



**May 17, 2016**

(Released Thursday, May, 19, 2016)  
Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	79.47	20.53	0.00	0.00	0.00	0.00
<b>Last Week</b> 5/10/2016	85.21	14.79	0.00	0.00	0.00	0.00
<b>3 Months Ago</b> 2/15/2016	55.64	44.36	9.39	0.00	0.00	0.00
<b>Start of Calendar Year</b> 12/29/2015	55.73	44.27	15.85	0.00	0.00	0.00
<b>Start of Water Year</b> 9/29/2015	49.31	50.69	20.91	0.00	0.00	0.00
<b>One Year Ago</b> 5/16/2015	0.00	100.00	40.98	0.00	0.00	0.00

Intensity



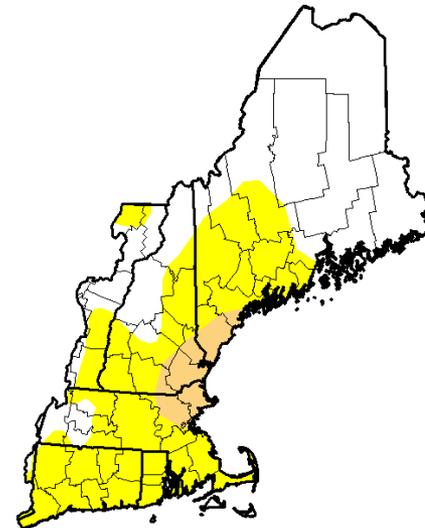
The Drought Monitor focuses on broad-scale conditions.  
Local conditions may vary. See accompanying text summary  
for forecast statements.

**Author:**  
David Simeral  
Western Regional Climate Center



<http://droughtmonitor.unl.edu/>

## U.S. Drought Monitor New England Watershed



**June 14, 2016**

(Released Thursday, Jun. 16, 2016)  
Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	51.64	48.36	5.56	0.00	0.00	0.00
<b>Last Week</b> 6/7/2016	64.73	35.27	5.56	0.00	0.00	0.00
<b>3 Months Ago</b> 3/15/2016	92.19	7.81	0.00	0.00	0.00	0.00
<b>Start of Calendar Year</b> 12/29/2015	55.73	44.27	15.85	0.00	0.00	0.00
<b>Start of Water Year</b> 9/29/2015	49.31	50.69	20.91	0.00	0.00	0.00
<b>One Year Ago</b> 6/16/2015	37.12	62.88	27.60	0.00	0.00	0.00

Intensity



The Drought Monitor focuses on broad-scale conditions.  
Local conditions may vary. See accompanying text summary  
for forecast statements.

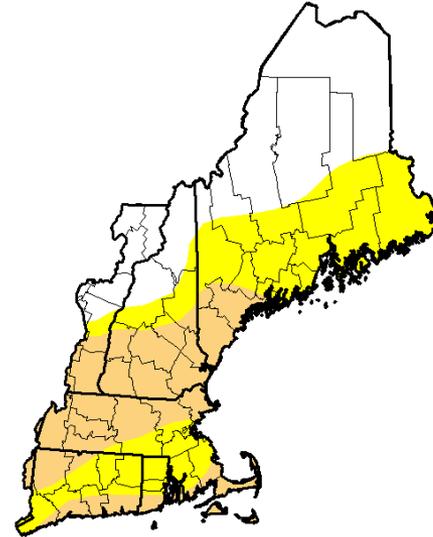
**Author:**  
Chris Fenimore  
NOAA/NESDIS/NCEI



<http://droughtmonitor.unl.edu/>

# U.S. Drought Monitor New England Watershed

**June 16, 2015**  
(Released Thursday, Jun. 18, 2015)  
Valid 8 a.m. EDT



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	37.12	62.88	27.60	0.00	0.00	0.00
<b>Last Week</b> 6/9/2015	37.12	62.88	27.60	0.00	0.00	0.00
<b>3 Months Ago</b> 3/17/2015	100.00	0.00	0.00	0.00	0.00	0.00
<b>Start of Calendar Year</b> 12/02/2014	100.00	0.00	0.00	0.00	0.00	0.00
<b>Start of Water Year</b> 9/23/2014	44.42	55.58	8.51	0.00	0.00	0.00
<b>One Year Ago</b> 6/17/2014	97.06	2.94	0.00	0.00	0.00	0.00

Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

*The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.*

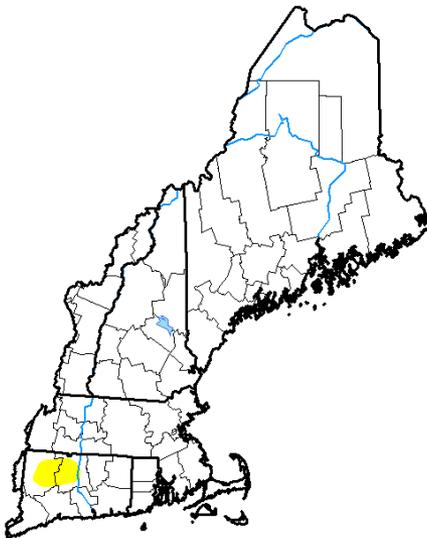
**Author:**  
Richard Tinker  
CPC/NOAA/NWS/NCEP



<http://droughtmonitor.unl.edu/>

# U.S. Drought Monitor New England Watershed

**May 16, 2017**  
(Released Thursday, May. 18, 2017)  
Valid 8 a.m. EDT



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	98.74	1.26	0.00	0.00	0.00	0.00
<b>Last Week</b> 05-09-2017	97.99	2.01	0.00	0.00	0.00	0.00
<b>3 Months Ago</b> 02-14-2017	33.54	66.46	41.65	19.31	2.36	0.00
<b>Start of Calendar Year</b> 01-02-2017	14.64	85.36	73.47	24.24	4.63	0.00
<b>Start of Water Year</b> 09-27-2016	26.77	73.23	58.78	40.14	14.56	0.00
<b>One Year Ago</b> 05-17-2016	79.25	20.75	0.00	0.00	0.00	0.00

Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

*The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.*

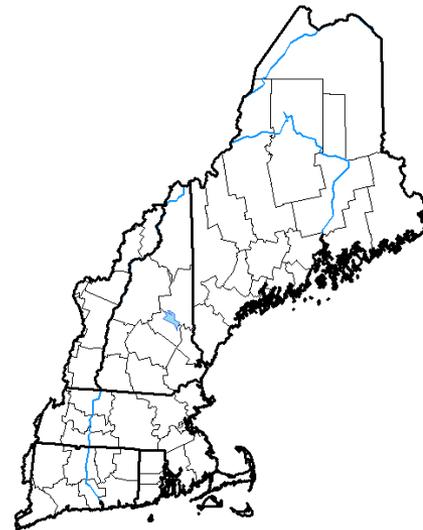
**Author:**  
Brad Rippey  
U.S. Department of Agriculture



<http://droughtmonitor.unl.edu/>

# U.S. Drought Monitor New England Watershed

**June 13, 2017**  
(Released Thursday, Jun. 15, 2017)  
Valid 8 a.m. EDT



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	100.00	0.00	0.00	0.00	0.00	0.00
<b>Last Week</b> 06-06-2017	100.00	0.00	0.00	0.00	0.00	0.00
<b>3 Months Ago</b> 03-14-2017	33.55	66.45	37.48	19.31	0.00	0.00
<b>Start of Calendar Year</b> 01-03-2017	14.64	85.36	73.47	24.24	4.63	0.00
<b>Start of Water Year</b> 09-27-2016	26.77	73.23	58.78	40.14	14.56	0.00
<b>One Year Ago</b> 06-14-2016	51.93	48.07	5.60	0.00	0.00	0.00

Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

*The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.*

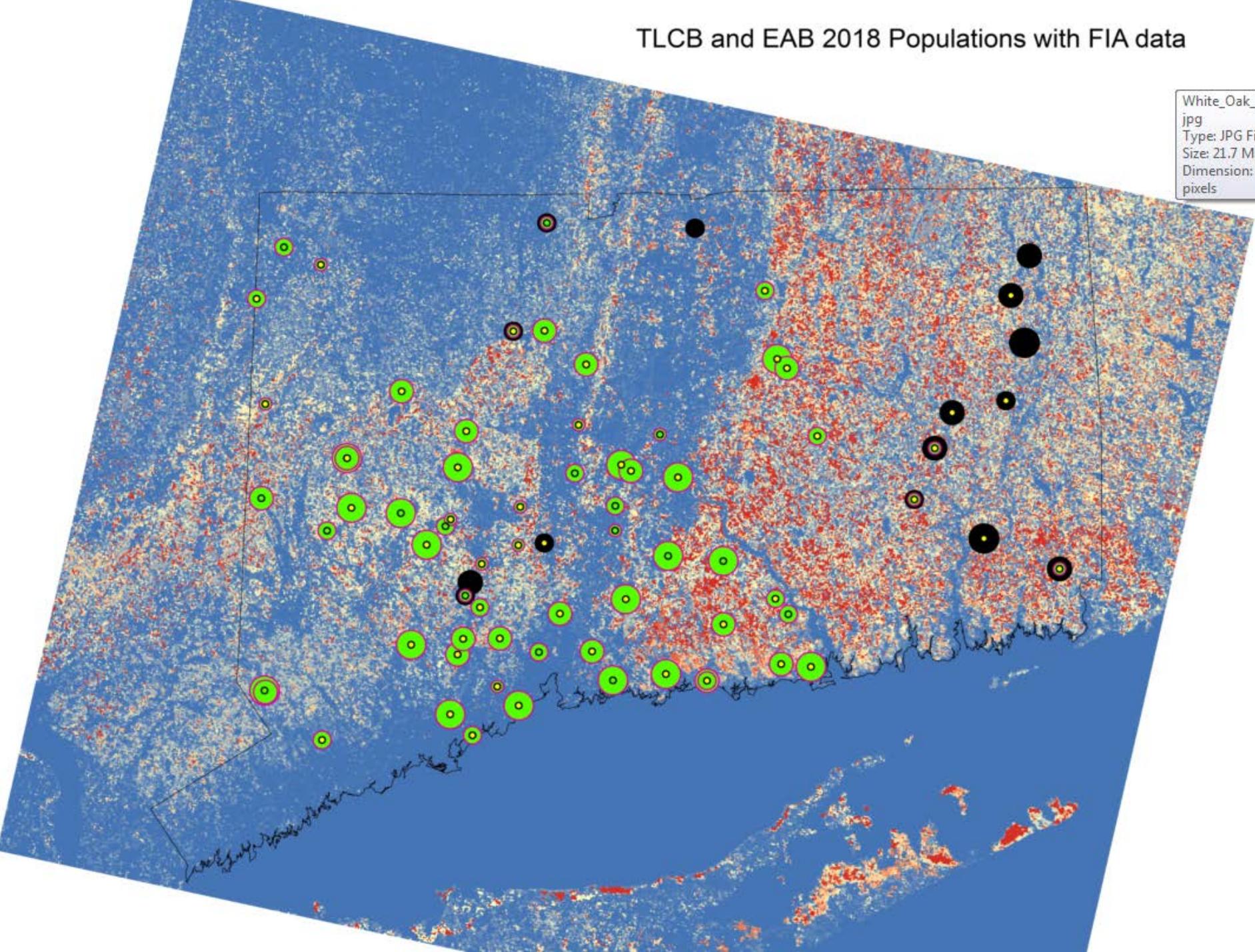
**Author:**  
David Miskus  
NOAA/NWS/NCEP/CPC



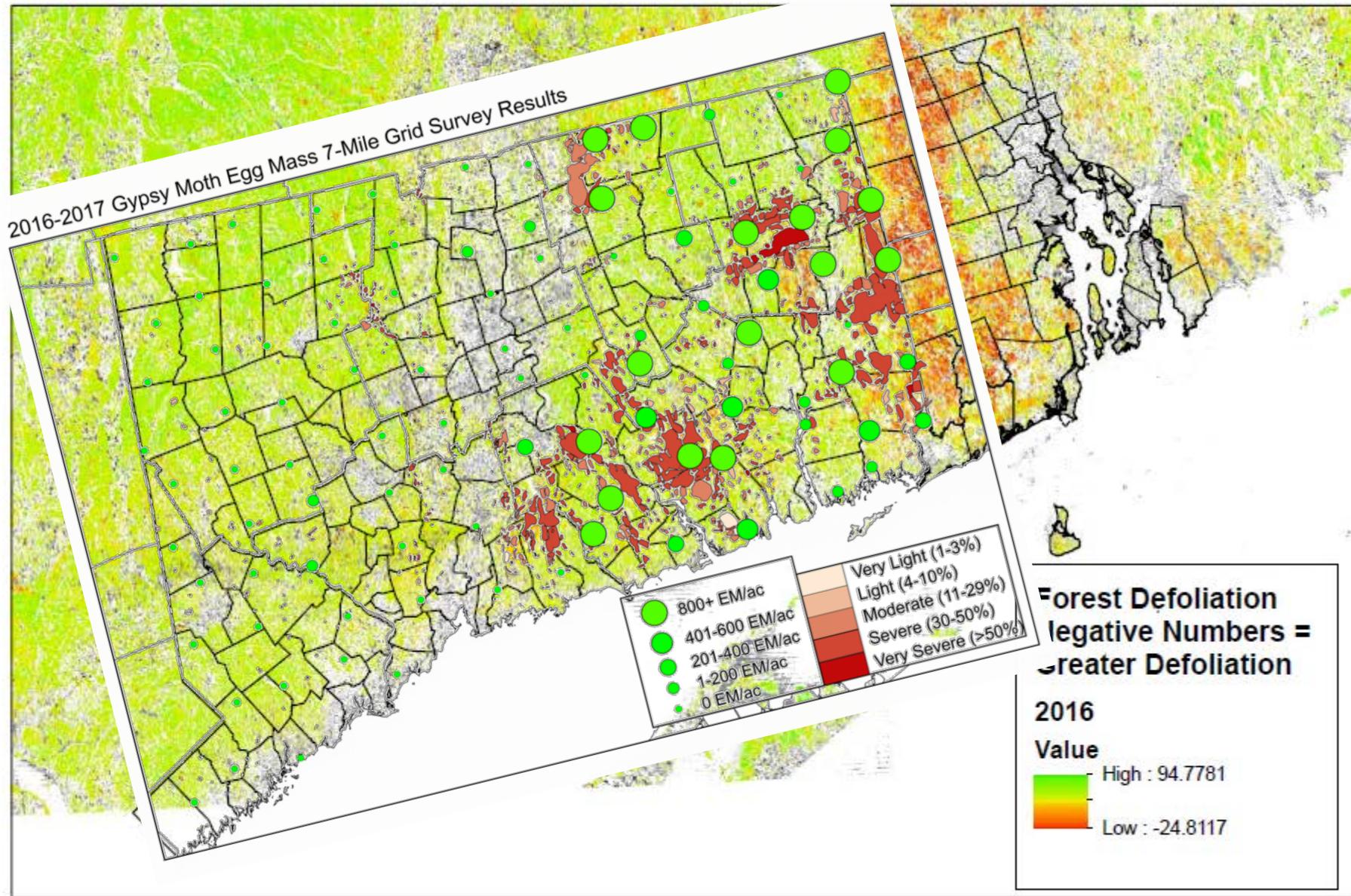
<http://droughtmonitor.unl.edu/>

# TLCB and EAB 2018 Populations with FIA data

White\_Oak\_TLE  
jpg  
Type: JPG File  
Size: 21.7 MB  
Dimension: 660  
pixels



# Defoliation in Southern New England - 2016



# JIGSAW PUZZLE

MAIN MENU CHANGE BACKGROUND SHOW EDGES TOGGLE DEPTH HIDE COVER 00:00:11 HELP X



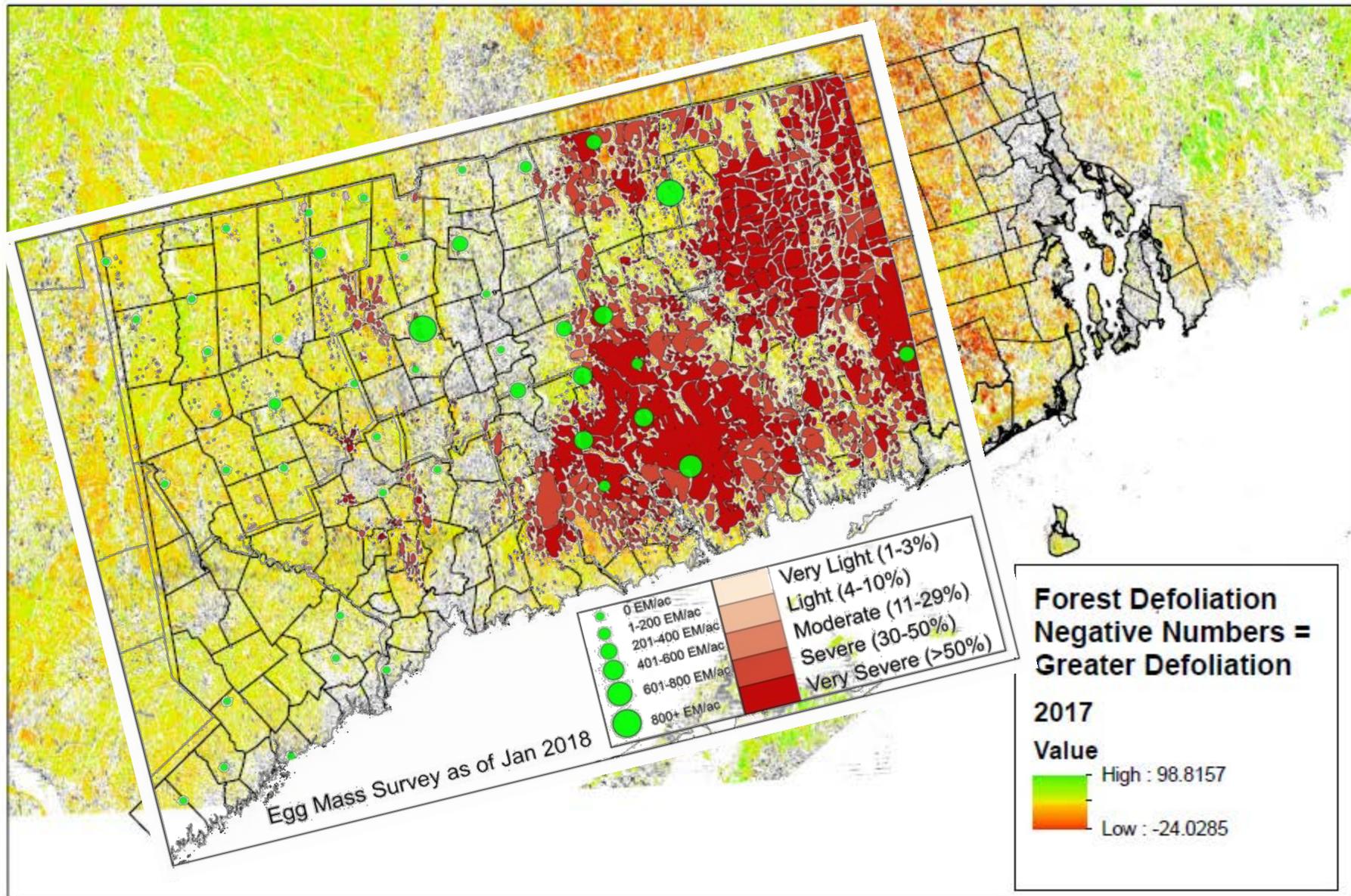
Enter e-mail address

## MOST

1. The Making of White House

2. Alexandria

# Defoliation in Southern New England - 2017



# Defoliation in Southern New England - 2018

