



FOREST INSECTS AND DISEASES

DEPT. OF CONSERVATION AND RECREATION
FOREST HEALTH PROGRAM

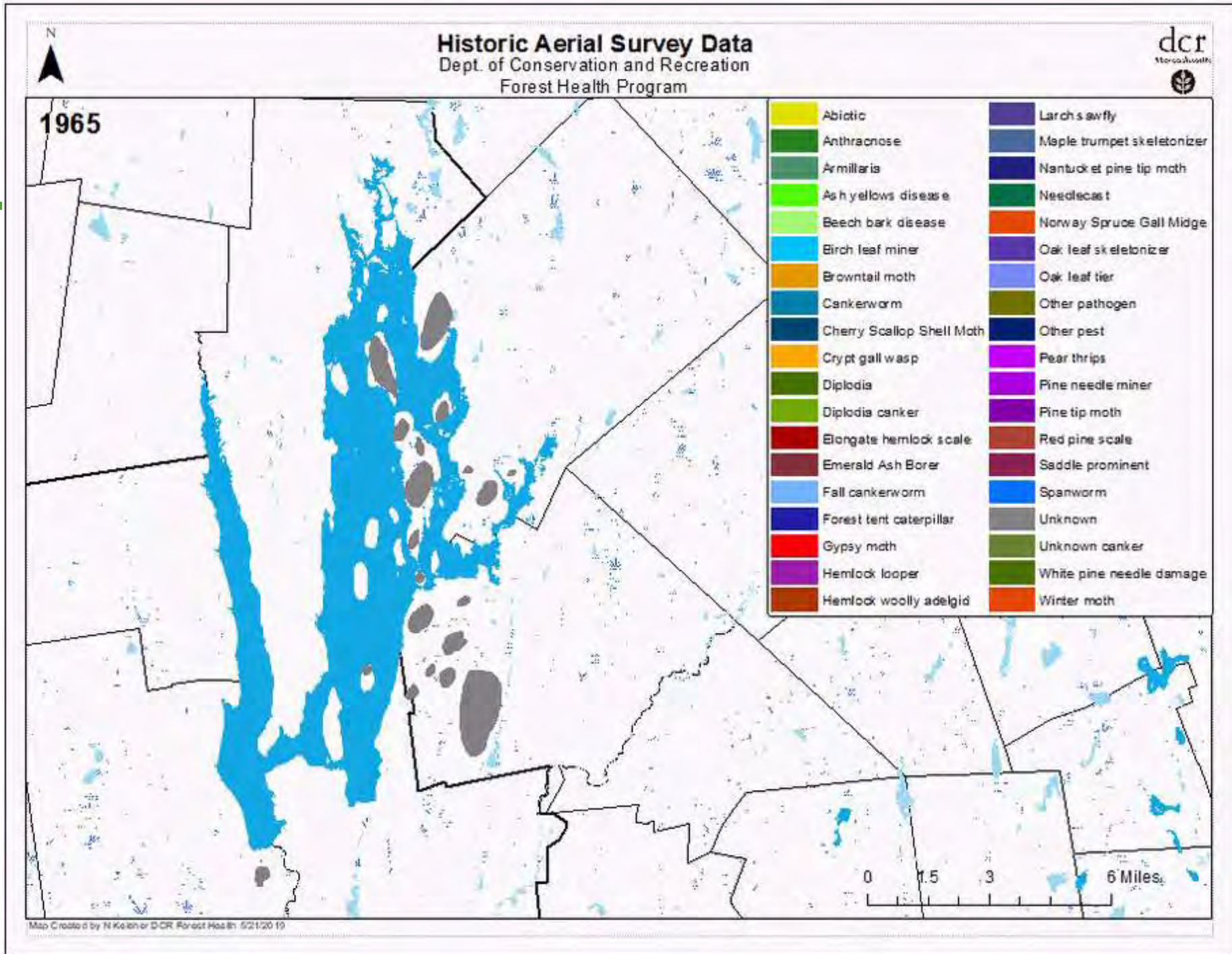




AERIAL SURVEY DATA



The DCR Forest Health Program performs a state-wide aerial forest disturbance detection survey. This gives state foresters a broad view the major insects and diseases impacting Massachusetts forests.

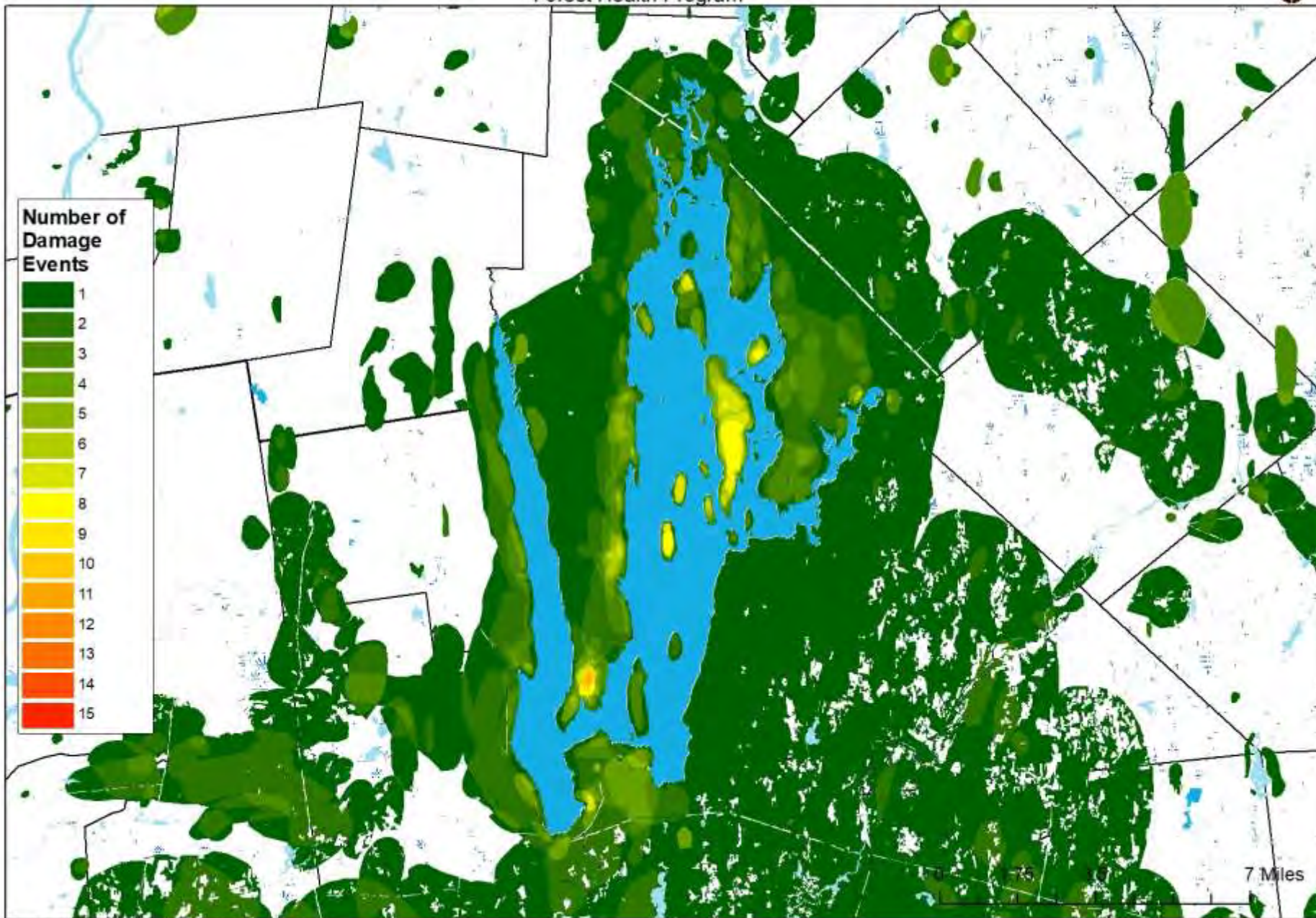




Forest Damage Events 1997-2018

Dept. of Conservation and Recreation

Forest Health Program

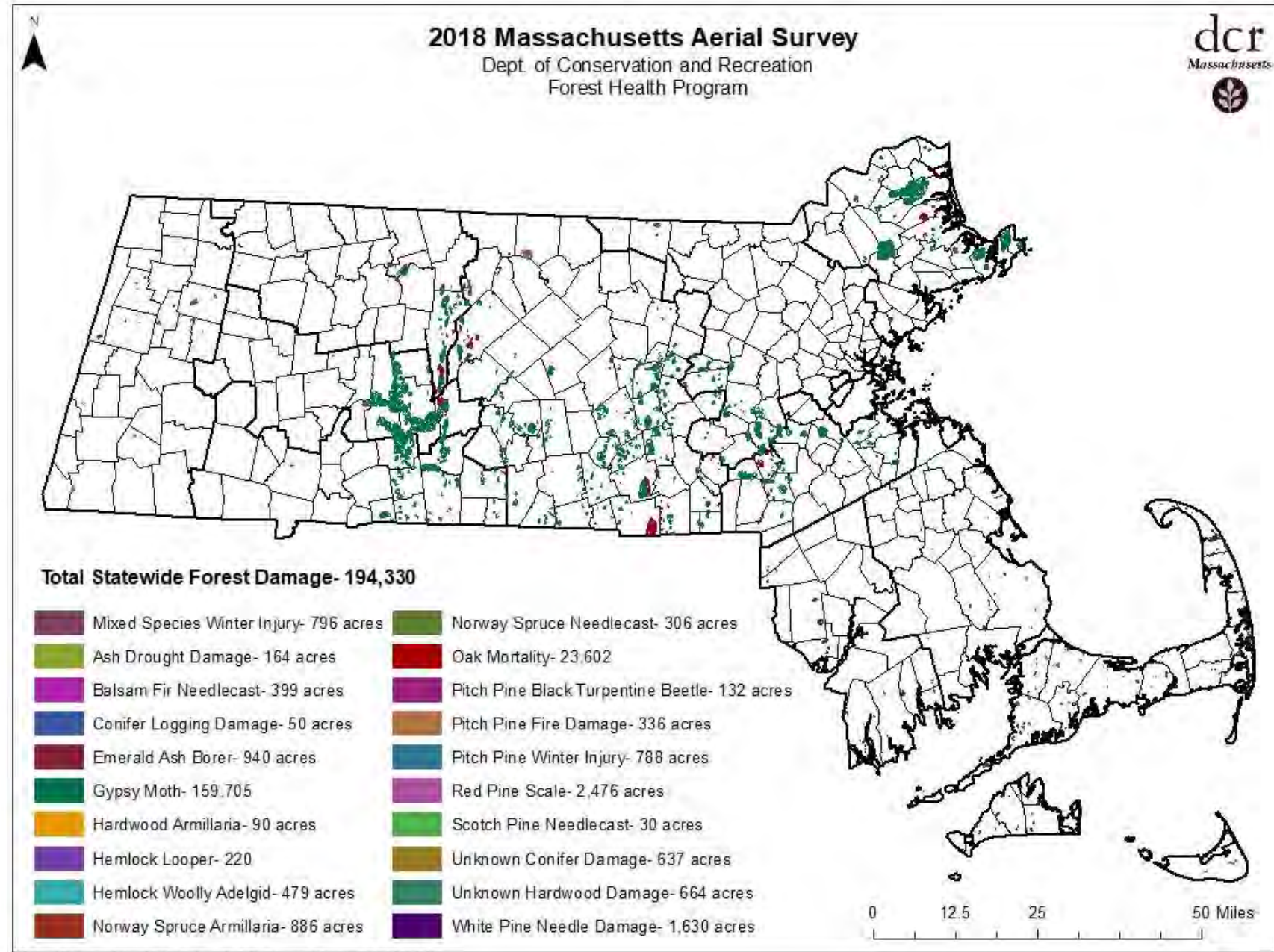




AERIAL SURVEY RESULTS

Approximately 194,000 acres of forest damage statewide

- 159,700 acres of gypsy moth defoliation
- 23,600 acres of oak mortality
- 940 acres of ash mortality caused by emerald ash borer



Map Created by N Keleher DCR Forest Health 10/4/2018



CURRENT FOREST HEALTH THREATS



GYPSY MOTH

LYMANTRIA *DISPAR*





OAK AND HARDWOOD DEFOLIATION





EXTREME OUTBREAK FEEDING



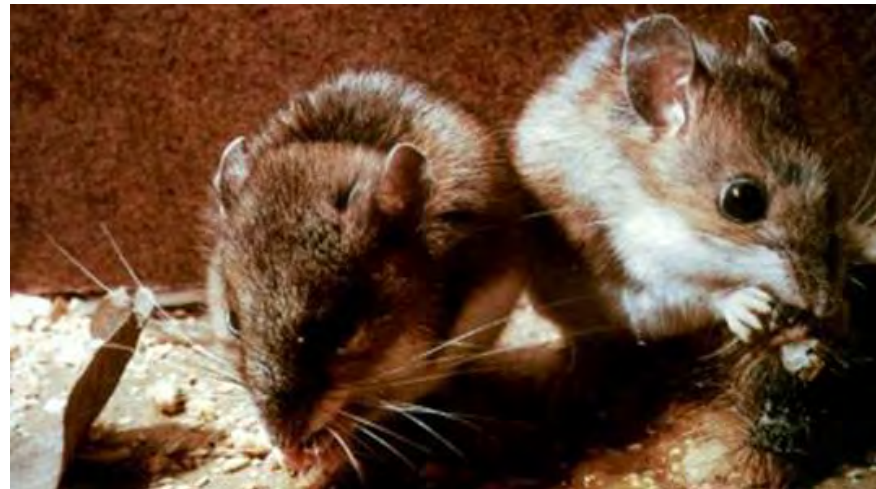


NATURAL CATERPILLAR MORTALITY

Predators: birds, small mammals, and insects attack moths, caterpillars, and egg masses

NPV: nucleopolyhedrois virus affects caterpillar life stage

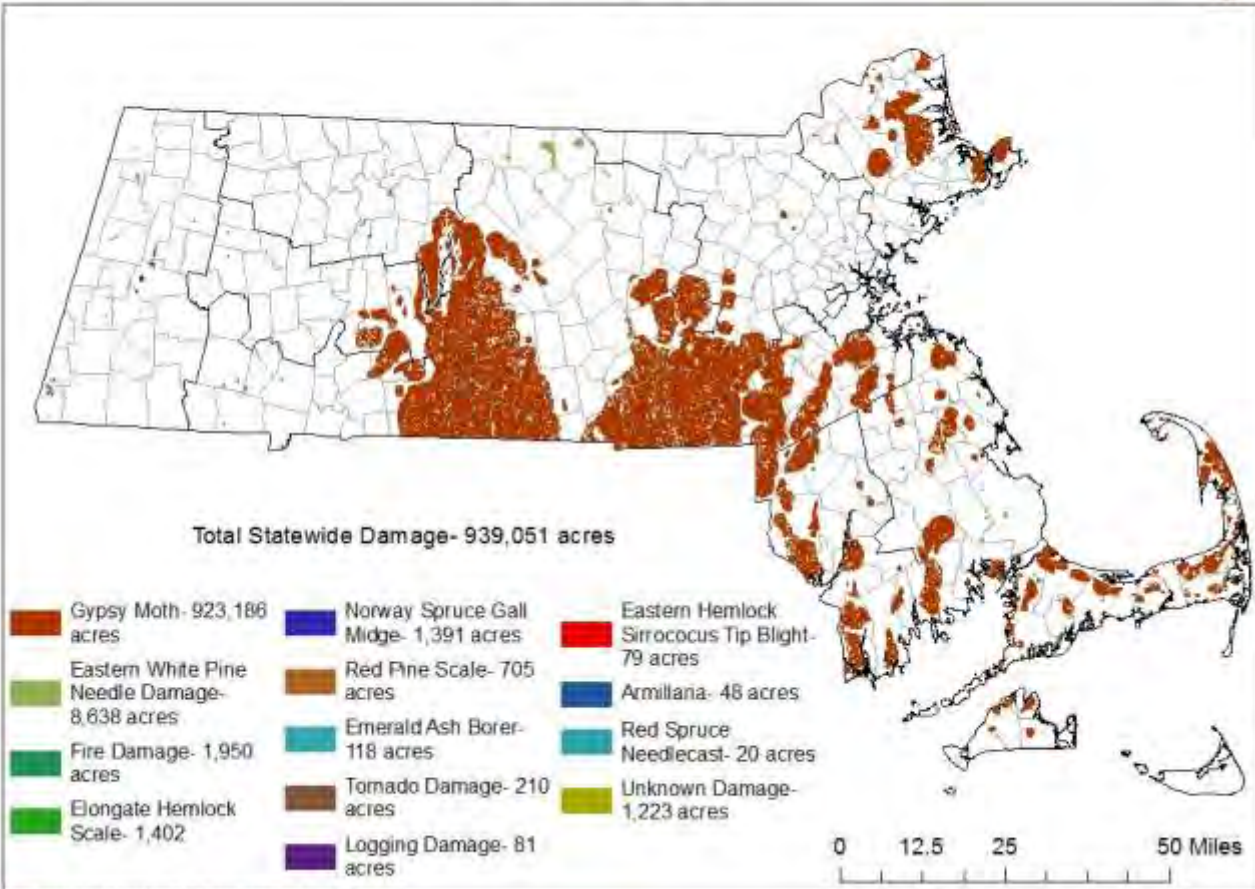
Em: *Entomophaga maimaiga* fungal disease affects caterpillar life stage



2017 VS. 2018

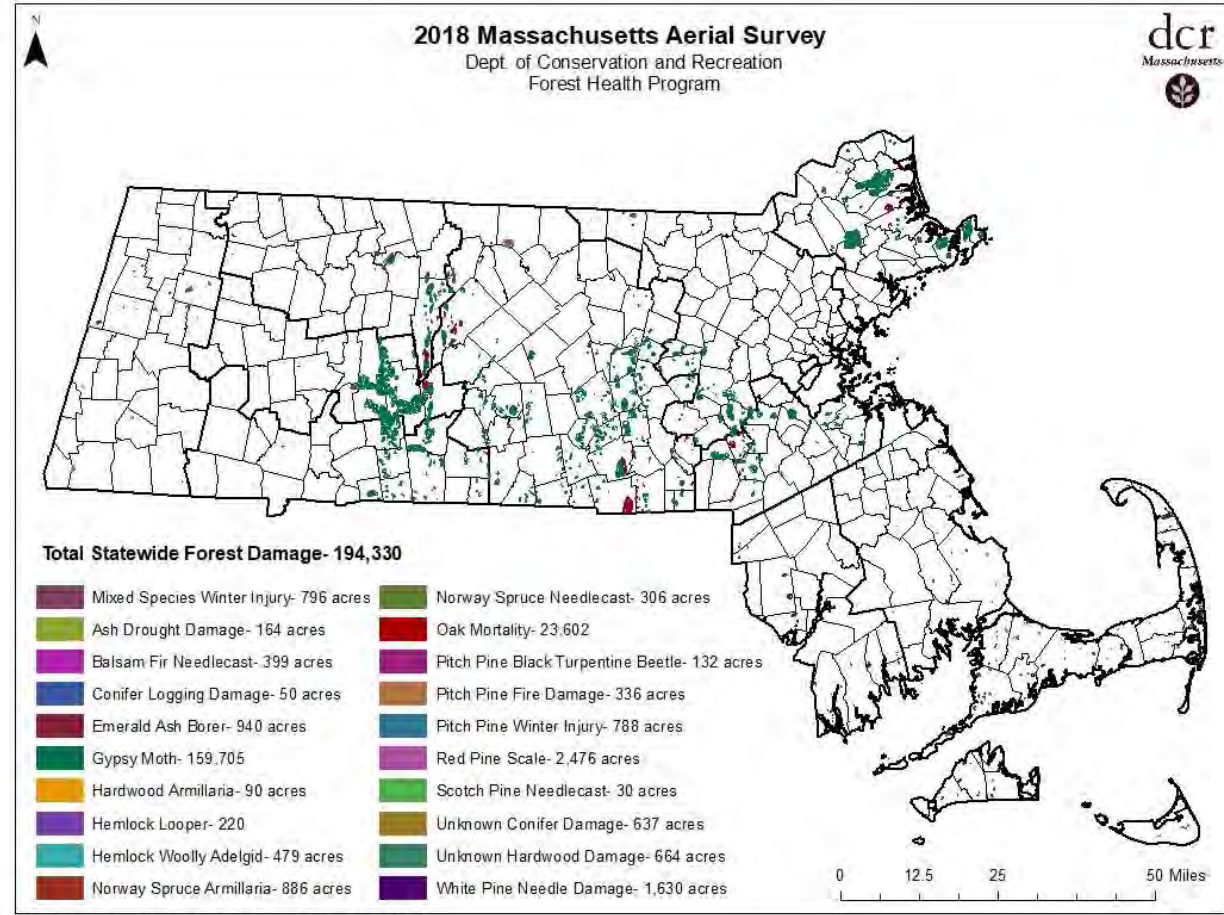
Massachusetts Aerial Survey 2017

Dept. of Conservation and Recreation
Forest Health Program



2018 Massachusetts Aerial Survey

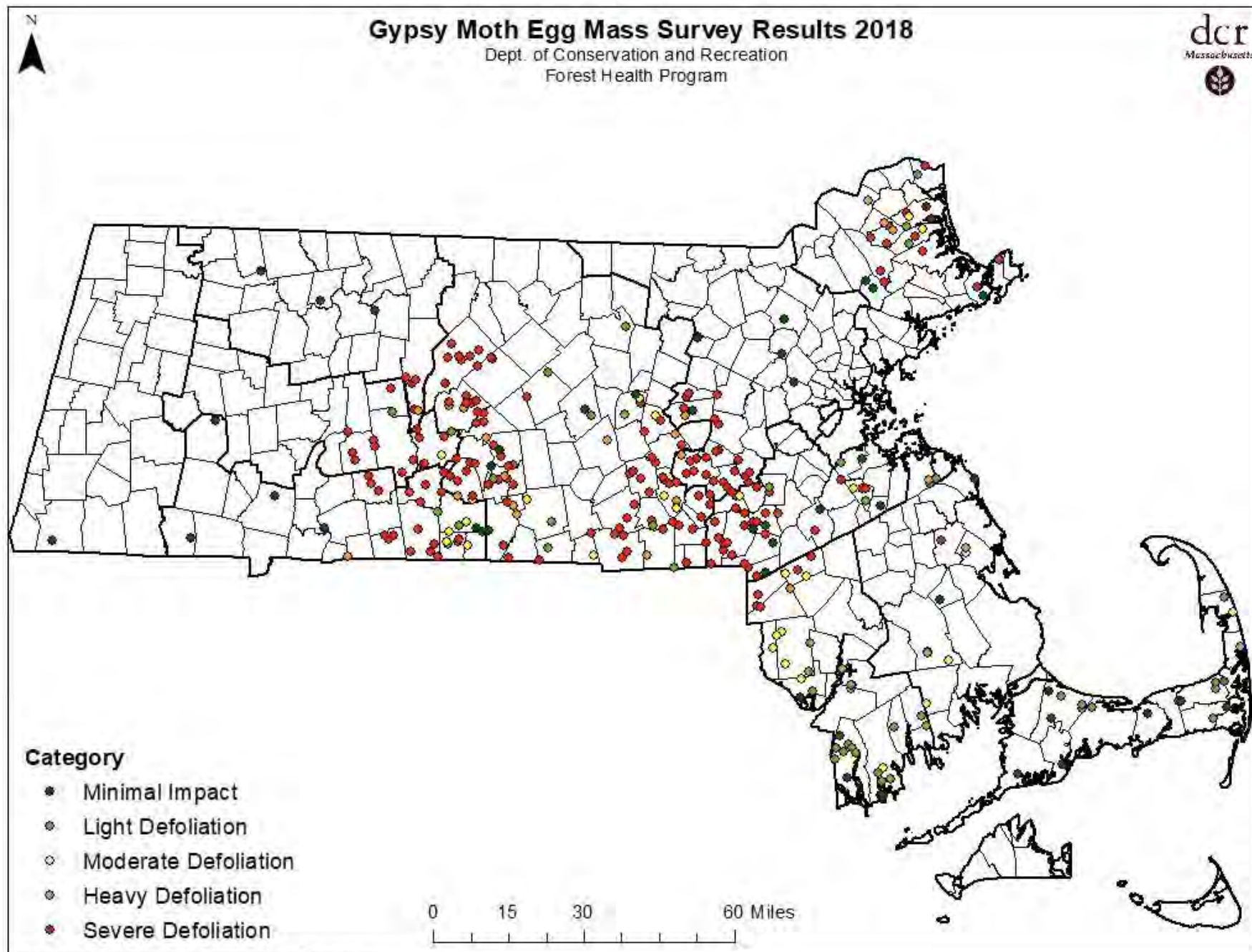
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Forest Health Program



Map Created by N Keleher DCR Forest Health 10/4/2018

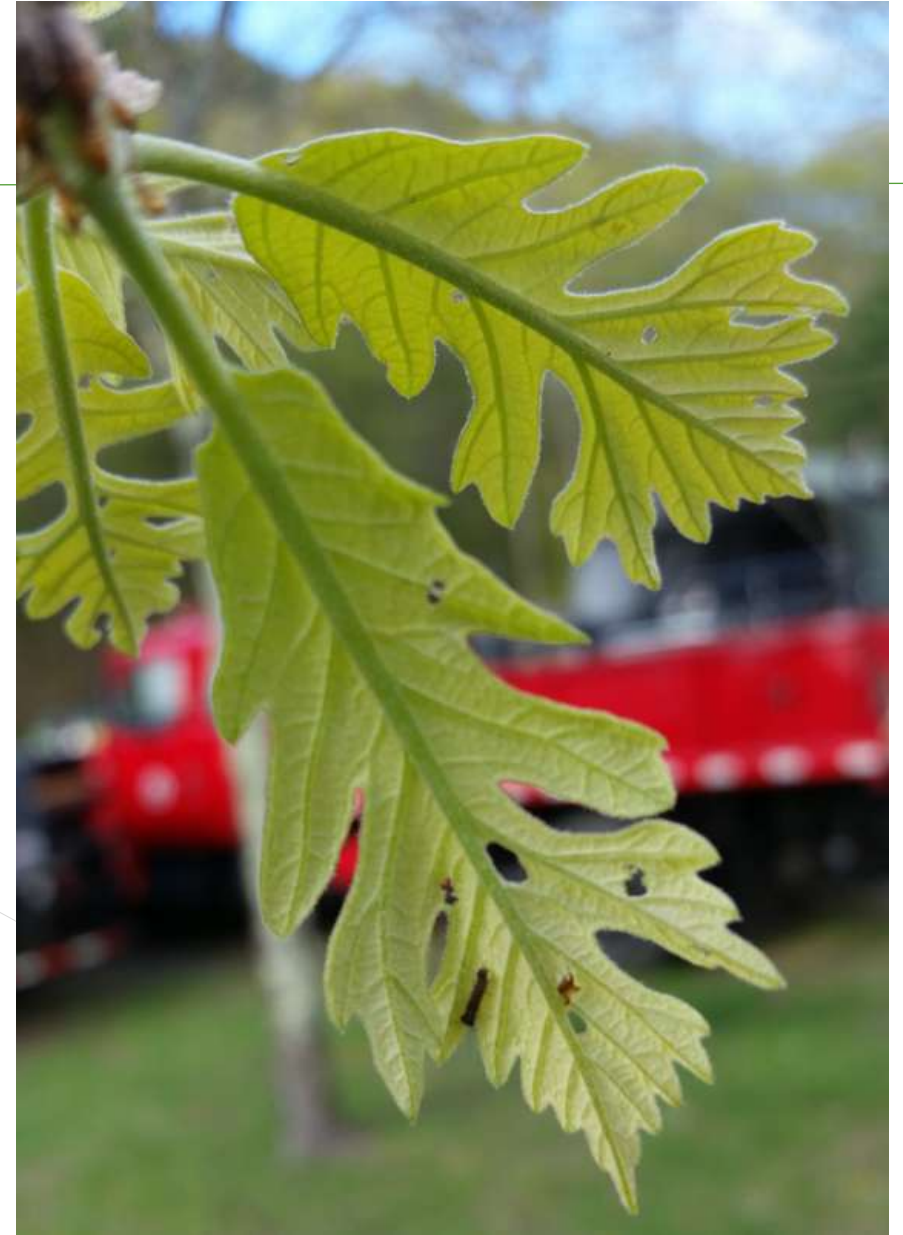


EGG MASS SURVEY



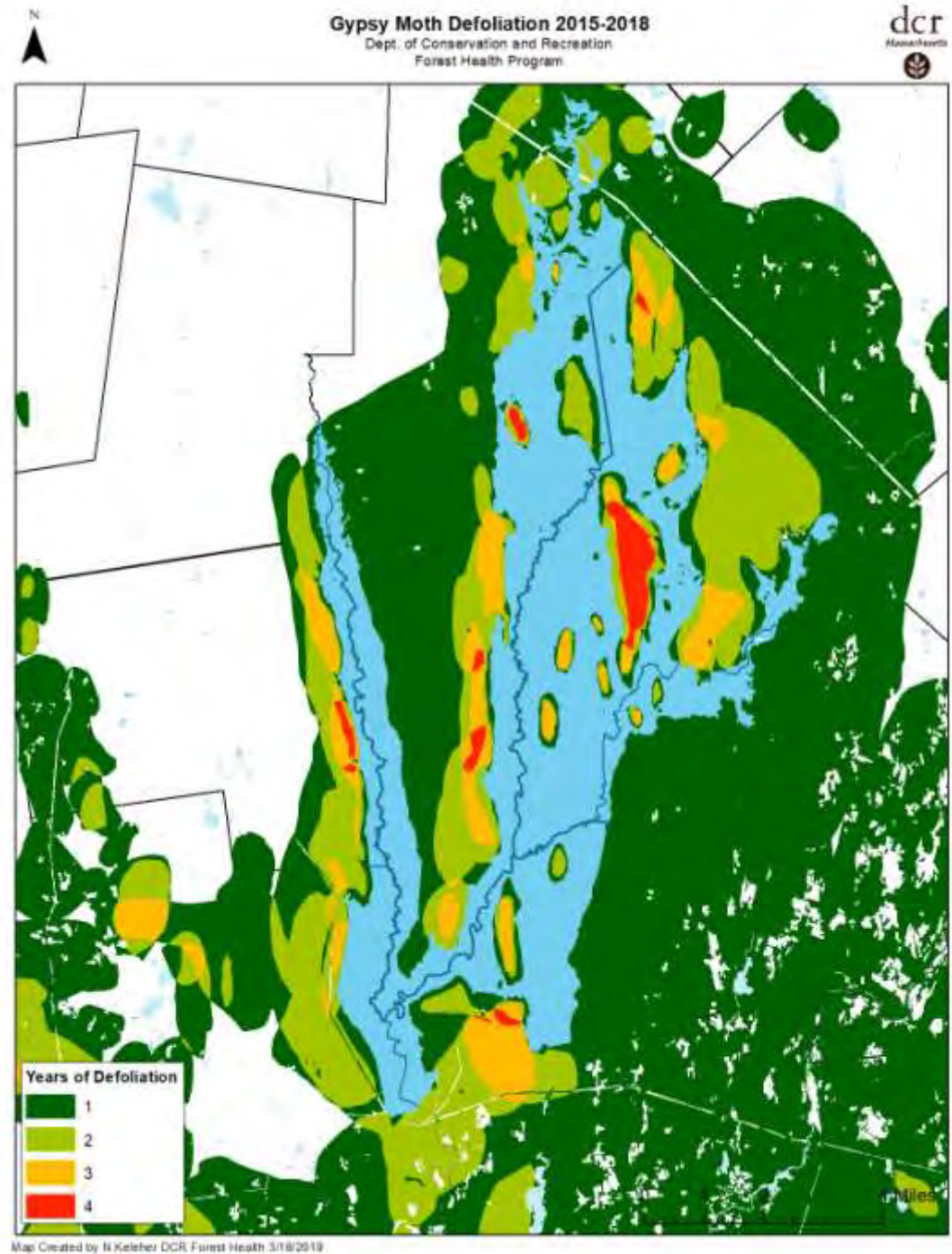


2019 SO FAR





IMPACT OF MULTIPLE YEARS OF DEFOLIATION





OAK MORTALITY

There are pockets of oak mortality across the state, approximately 24,000 acres in total caused by the compounded stress of gypsy moth defoliation and drought.



●●●● SECONDARY INVADERS

Trees weakened and stressed by gypsy moth defoliation are susceptible to native insects and fungi. The extreme drought of 2016 caused additional stress to our forests.





ARMILLARIA AND FUNGAL PATHOGENS





NATIVE BORERS





Quabbin Reservoir

EMERALD ASH BORER

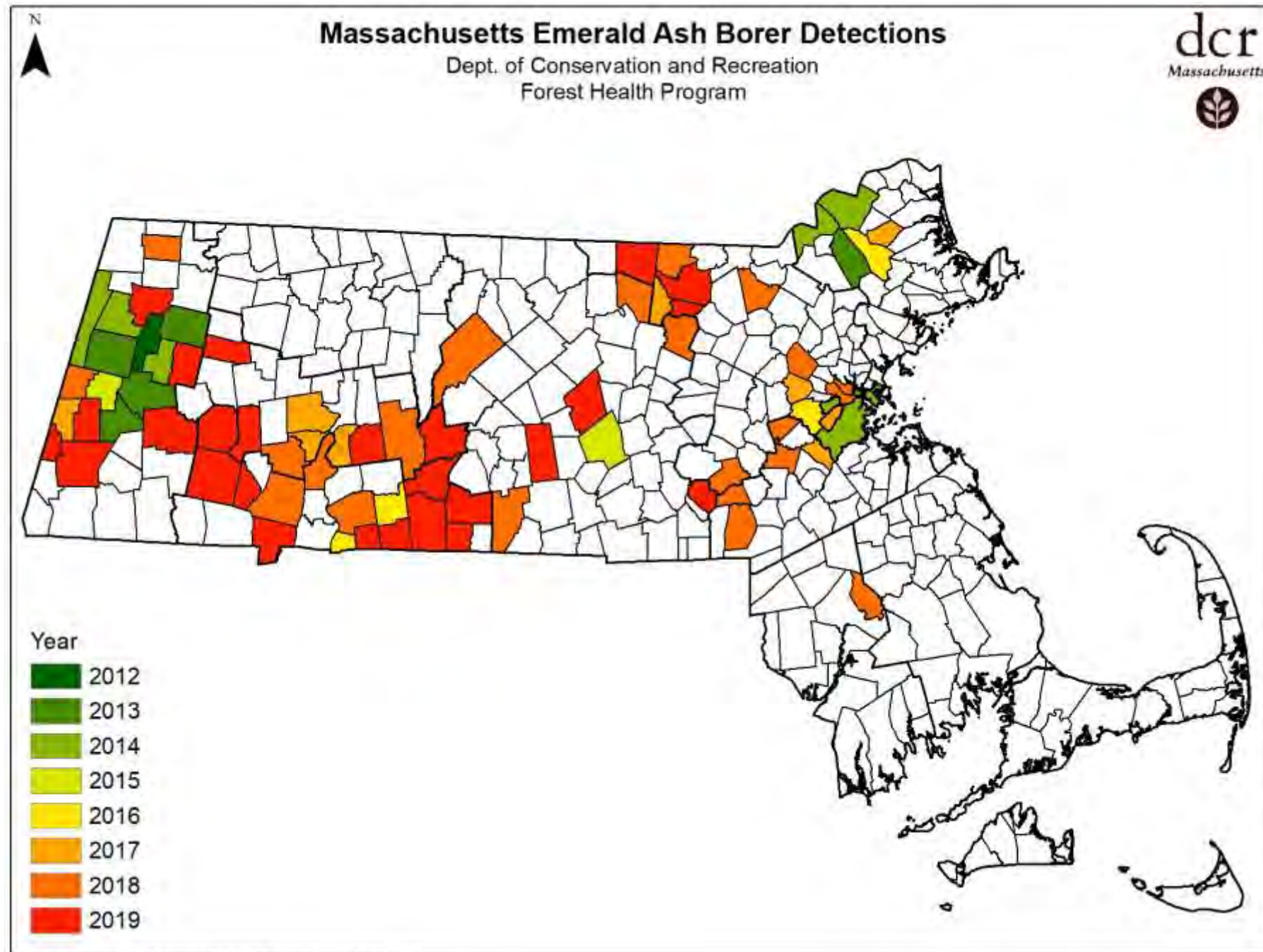
AGRILUS PLANIPENNIS





EAB DETECTIONS

- First detection in MA in 2012- Dalton, MA
- Currently detected in 78 communities in 9 Counties
- Rapidly expanding range through human assisted movement



Map Created By N Keleher, DCR Forest Health 5/7/2019



IDENTIFYING INFESTED TREES





EAB MONITORING METHODS





BIOCONTROL PROGRAM

Biocontrol wasp species released at 5 sites in 2018

Spathius galinae
1,867 adults

Oobius agrili
378 adults
6,900 larvae

Tetrastichus planipennisi
450 adults
6,441 larvae







ASH DECLINE AND LOOK-ALIKE DAMAGE



HEMLOCK PESTS AND DISEASES



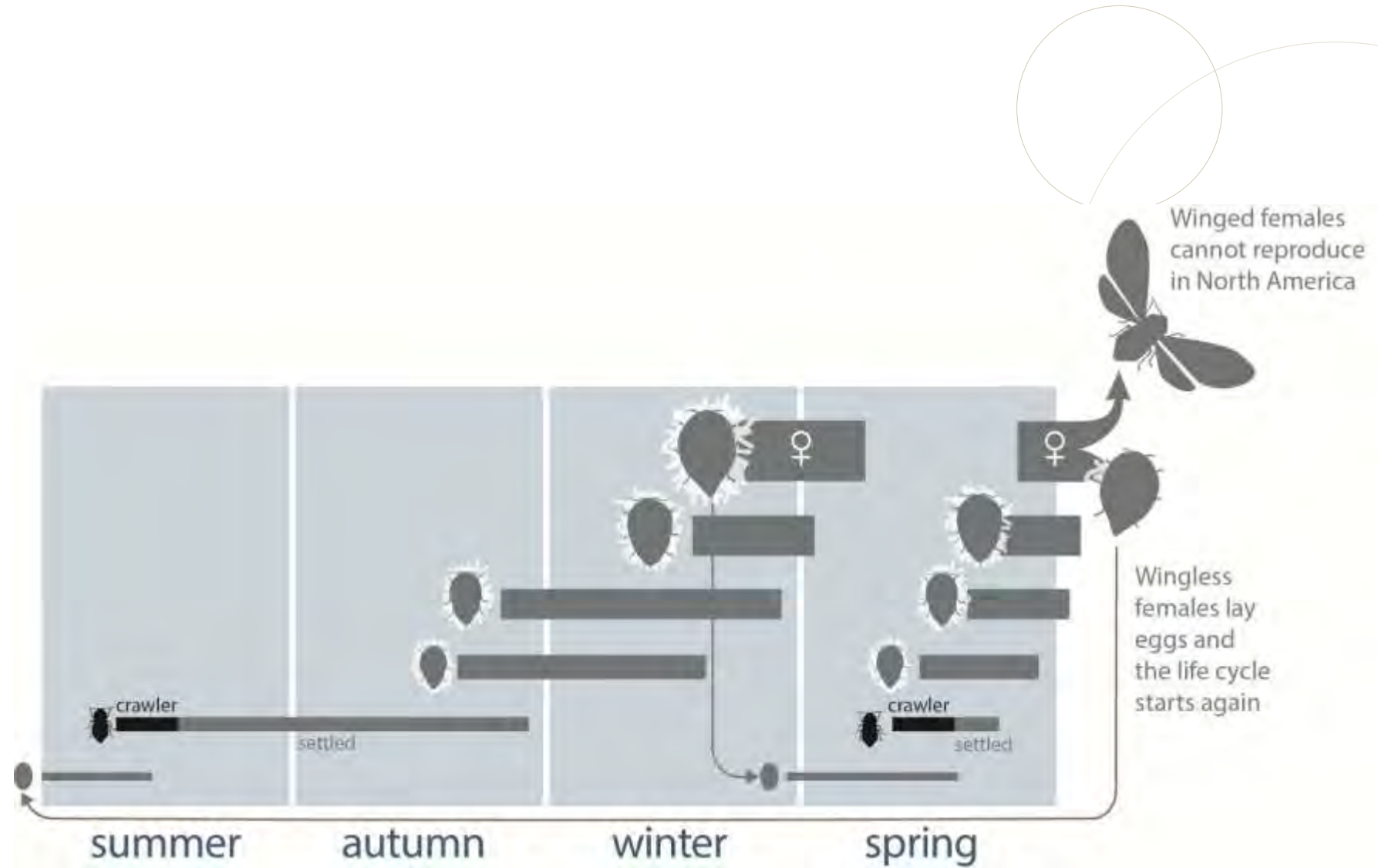


HEMLOCK WOOLLY ADELGID

Adelges tsugae



●●●●
**HWA WINTER
MORALITY**



●●●●

BIOCONTROL PROGRAM

Two species released in MA:

Sasajiscymnus tsugae
Laricobius nigrinus

2018 *L. Nigrinus* releases:

- Walden Pond- Concord, MA
- Mt. Tom- Holyoke, MA
- Purgatory Chasm- Sutton, MA





ELONGATE HEMLOCK SCALE

Fiorinia externa





EASTERN HEMLOCK LOOPER





FUNGAL DISEASES

Hemlocks in Massachusetts undergo periodic outbreaks of multiple fungal pathogens, including:

- ***Fabrella tsugae***
needle blight
- ***Sirococcus tsugae***
tip blight
- ***Melampsora farlowii***
twig rust



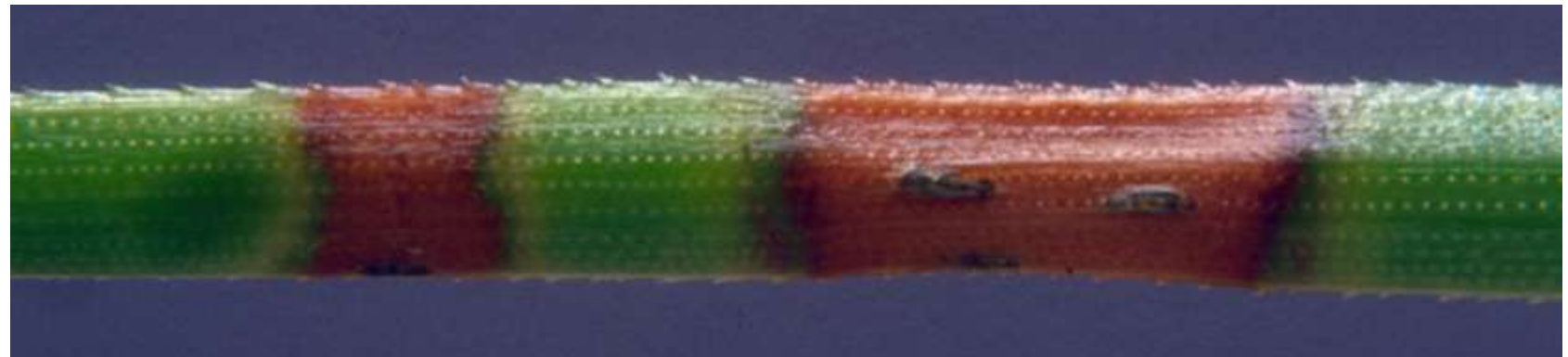
EASTERN WHITE PINE DECLINE





NEEDLECAST DISEASE

Fungal needle infections caused by multiple native fungal pathogens. Majority of defoliation is caused by the needle blight, *Lecanosticta acicula*.

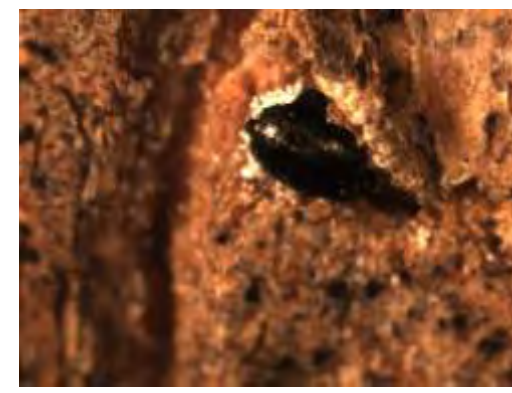


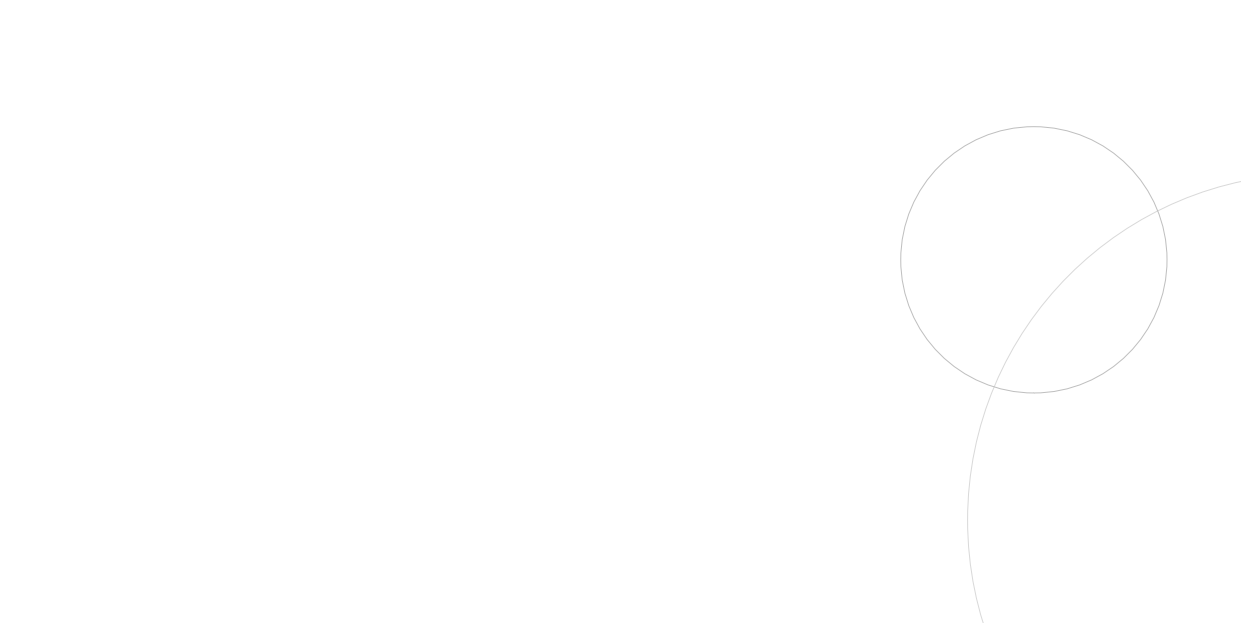
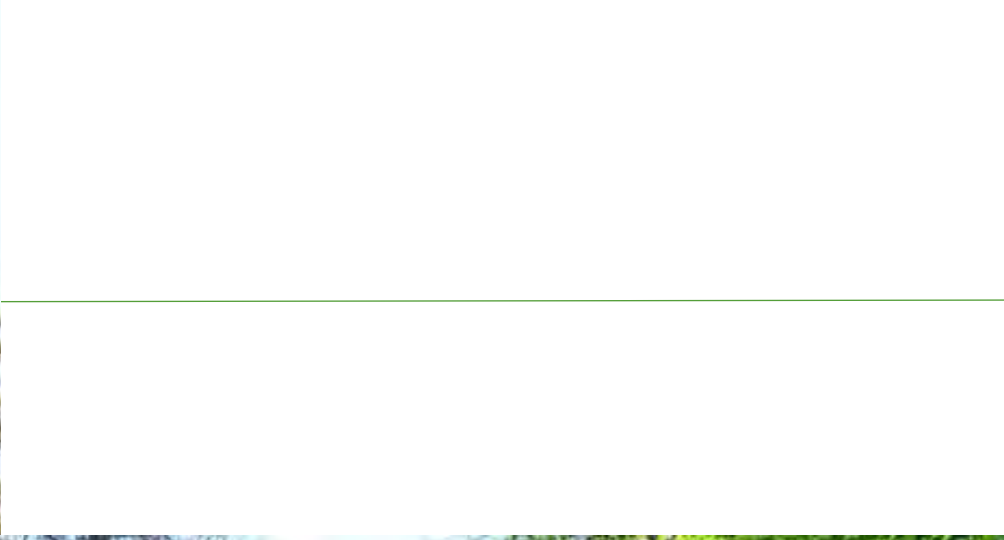


CALICIOPSIS CANKER

Stem cankers caused by the native fungal pathogen *Caliciopsis pinea*. *Caliciopsis* is common in younger white pines and regeneration stands.

The eastern white pine bast scale is commonly found in correlation with the cankers.







THE THREAT OF CLIMATE CHANGE



In Massachusetts, we can expect climate to change to increase temperatures, alter precipitation patterns, and increase major storm events. These changes will have direct and indirect impacts on forest health.



INCREASED TEMPERATURE



Climate change is predicted to cause increased temperatures in Massachusetts- this will include more days of extreme heat in the summers, less days below freezing in the winter, and increased length to the growing season.

DIRECT IMPACT

CHANGES TO FOREST COMPOSITION





LOSS OF SPECIES AND FOREST TYPES





DISPLACEMENT OF NATIVE TREES BY INVASIVE SPECIES



INDIRECT IMPACT

ALTERED INSECT AND DISEASE VULNERABILITY



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POTENTIAL NEW INVADERS

Warming conditions can make our forests vulnerable to new species that were previously unable to survive our hardiness zone.





INCREASED DENSITIES AND DAMAGE FROM EXISTING FOREST PESTS



HEMLOCK WOOLLY ADELGID





SOUTHERN PINE BEETLE





CHANGES TO PRECIPITATION PATTERNS



Climate change will cause deviation to our typical precipitation regime. There is a chance for both longer dry periods and increased flooding events.

DIRECT IMPACT

DROUGHT STRESS AND FLOOD DAMAGE





DECLINE IN DROUGHT SENSITIVE SPECIES





SECONDARY INVADERS



INDIRECT IMPACT

ALTERING NATURAL PEST CONTROL PROCESSES



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**ALTERED IMPACT OF
FUNGAL PATHOGENS**





OTHER NATIVE AND INVASIVE LEPIDOPTERA

Brown Tail Moth



Hemlock Looper



EASTERN WHITE PINE DECLINE

Range wide decline is being caused by multiple native fungal pathogens. Infection rates are heavily dependent upon precipitation and moisture levels.





INCREASED STORM EVENTS



Climate change will cause an increase in the number and severity extreme weather events. There will be a notable increase in year-round storm events.

DIRECT IMPACT

STORM DAMAGE



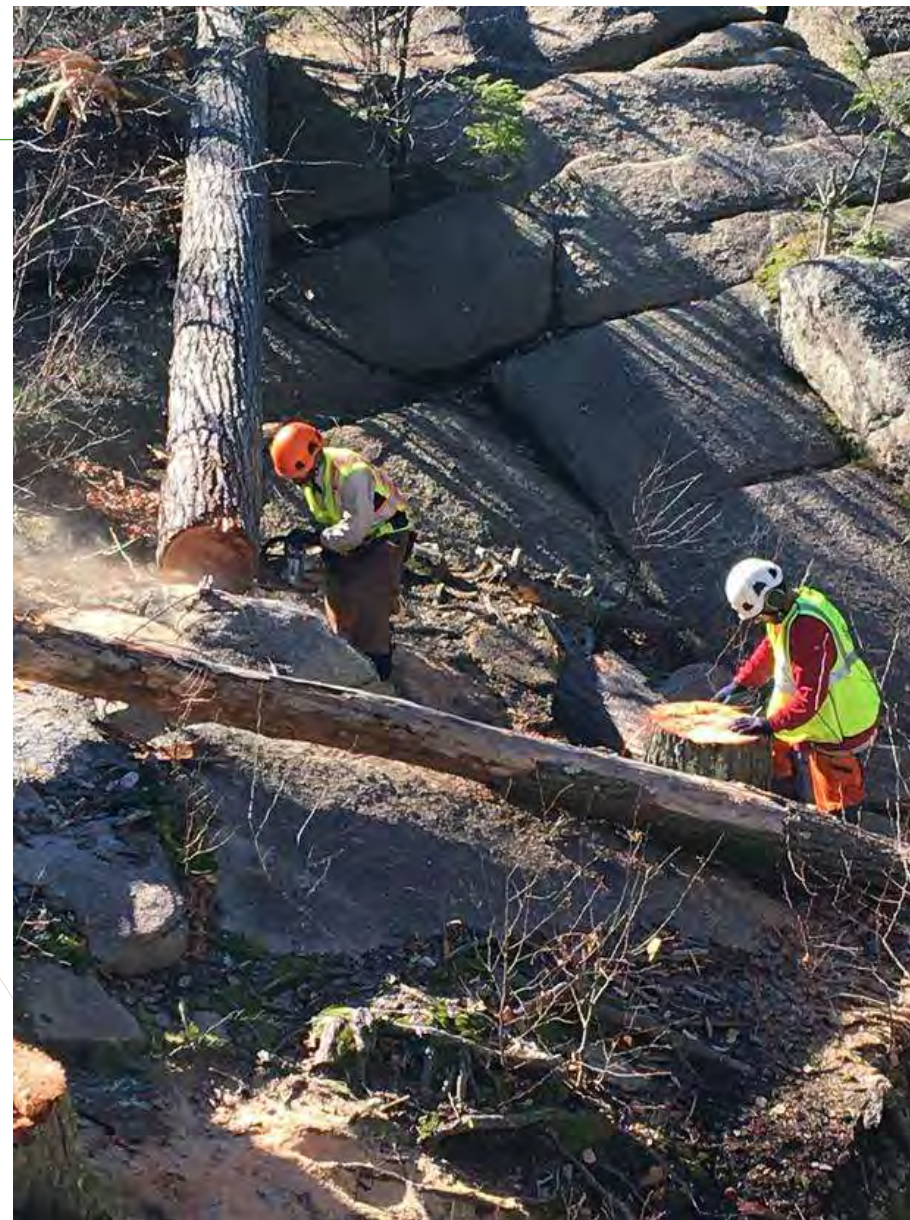


TREE DAMAGE AND MORTALITY

Tree limb breakage, foliage damage, trunk injury, and mortality can occur from the increased occurrence and severity of:

- Tornados and microburst events
- Winter snow and ice storms
- Thunder storms and lightning strikes







INDIRECT IMPACT

INCREASED INSECT AND DISEASE VECTORS





OAK WILT AND OTHER VASCULAR FUNGAL PATHOGENS





BARK BEETLE INVASIONS





QUESTIONS?



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<https://www.mass.gov/service-details/forest-health-program>

