

THE OBSERVABLE RELATIONSHIP BETWEEN FOREST PESTS AND MOSQUITOS

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Content

- Background
- Common forest pests of Virginia and their damage
- Increasing mosquito habitat due to forest disturbances
- Site studies looking at forest disturbances and how that is impacting mosquito populations



Background

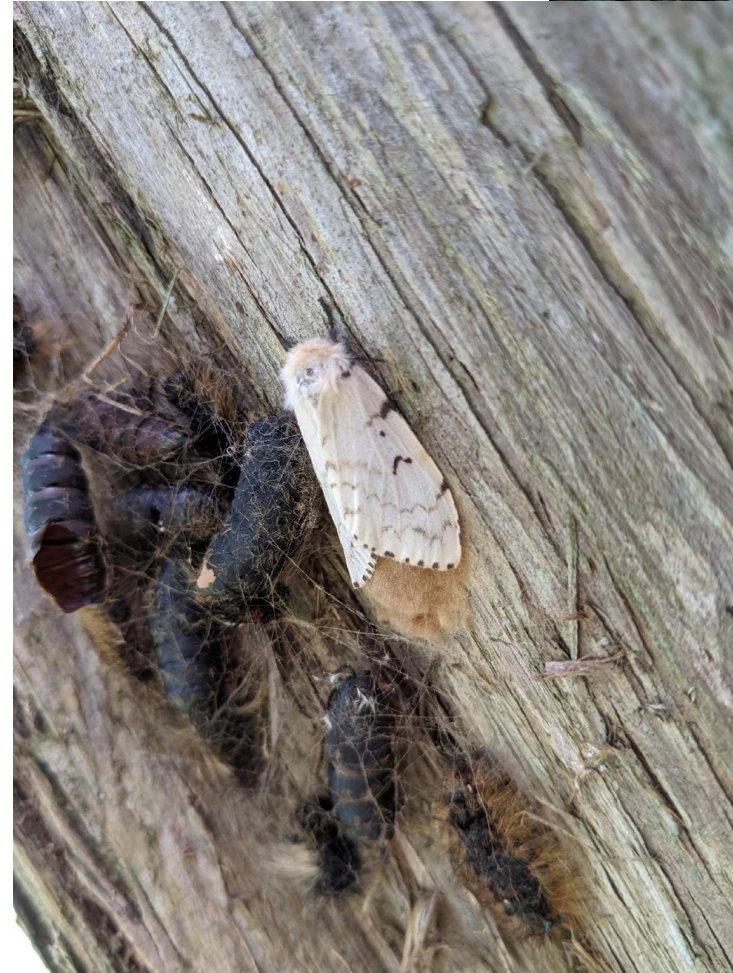
- We differ from other Virginia jurisdictions because we handle both mosquitos, their diseases, and forest pests
- A unique view regarding the inter-relatedness of the two professions
- Observable increase in tree falls is leading to new mosquito habitat forming
- What will the effects be on mosquitoes and their diseases?



Spongy Moth

(*Lymantria dispar dispar*)

- Introduced to Massachusetts in 1869 by Leopold Trouvelot to produce disease resistant silk moth hybrids.
- Will cause oak mortality after years of defoliation or when combined with additional factors
- Egg Masses are brown, fuzzy and round/ovular.
- Larvae are hairy with red and blue lumps
- Adults are relatively bland brown and tan



Female spongy moth
laying eggs

Caterpillar likely died from
nucleopolyhedrosis virus

Moderate/heavy
defoliation of the chestnut
oaks canopy.

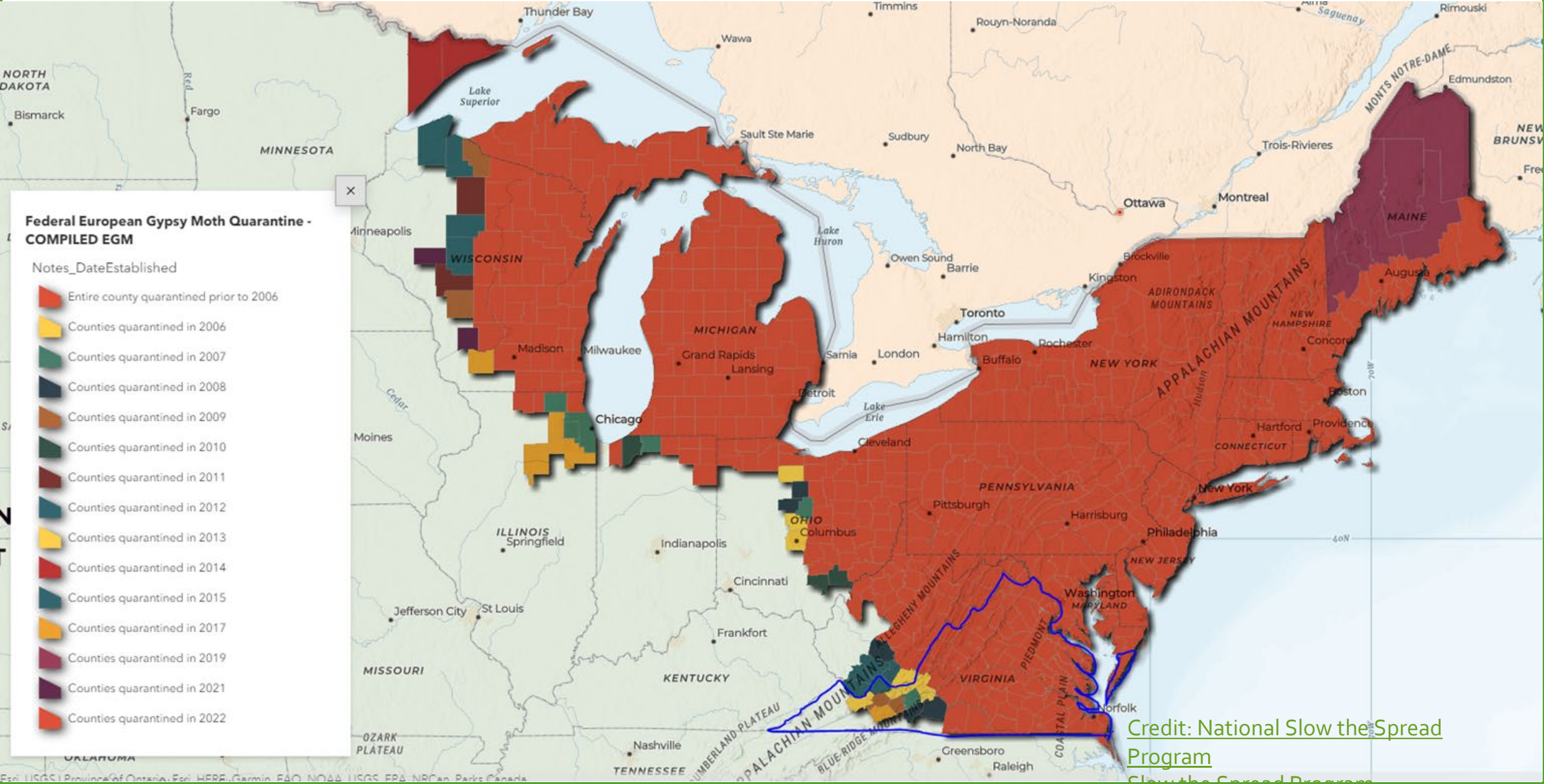
New leaves are attempting
to emerge as caterpillars
die off or complete
metamorphosis

This has been going on for
years and the forest is
beginning to show the toll
it has taken.





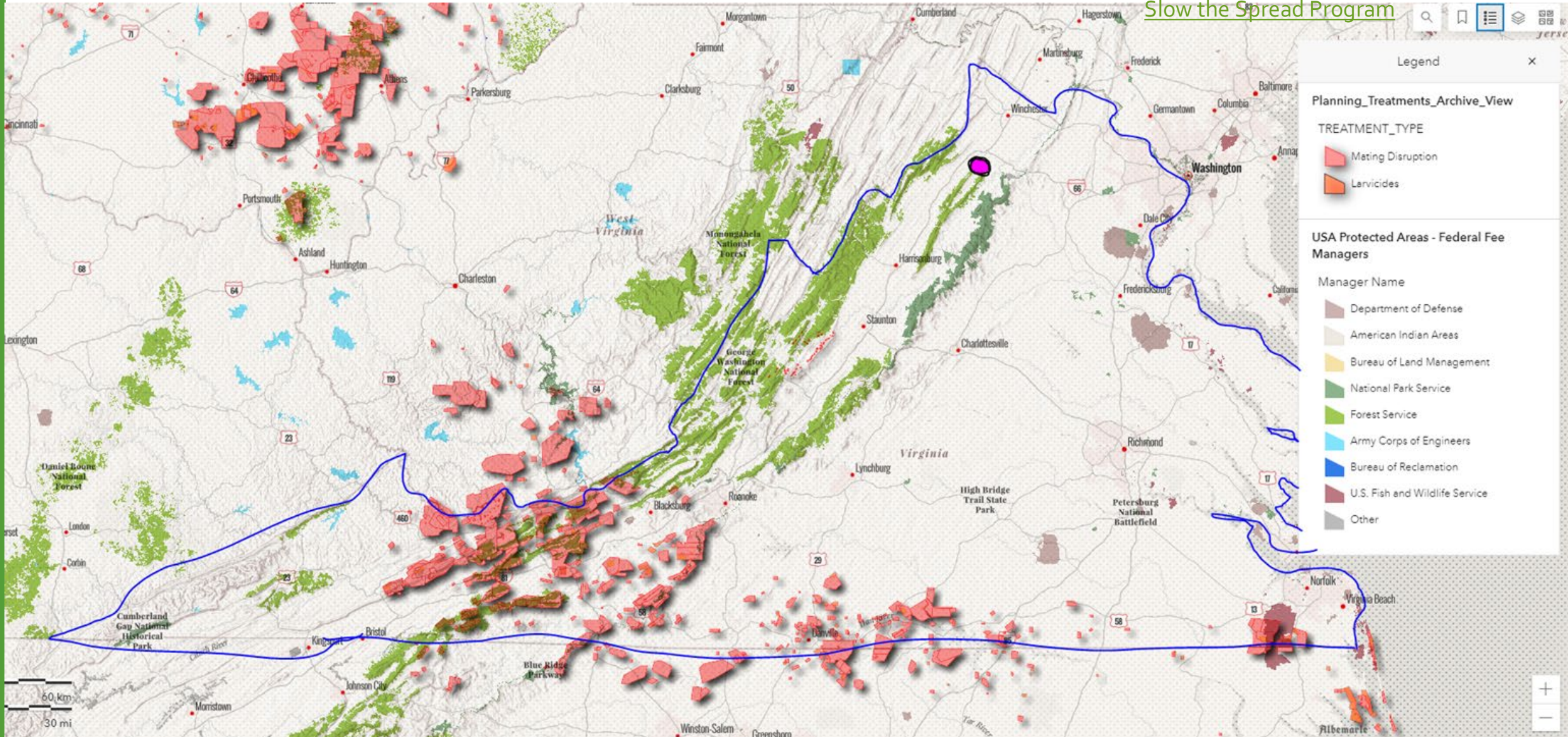
Spongy moth quarantined counties as of 2022



Credit: National Slow the Spread Program
Slow the Spread Program

Spongy moth treatments as of 2022

Credit: [National Slow the Spread Program](#)
[Slow the Spread Program](#)



Emerald Ash Borer (*Agrilus planipennis*)

- Discovered in Michigan in 2002 but may have been present since the late 1980s.
- Rapidly destroys ash trees in a few years.
- Millions of tree lost so far and eventually the billions of ash trees in North America without intervention
- “D” shaped exit holes on ash trees, top-down dieback, flaking bark, galleries under bark, epicormic shoots
- Feeds nearly exclusively on ash trees
- Adults are green, about 0.3” long and .06” wide.



Photo: Rachel Kempf



Asian Longhorned Beetle (*Anoplophora glabripennis*)

- First discovered in Brooklyn, New York in 1996. Not found in Virginia, yet.
- Successfully eradicated within some regions thanks to early and drastic interventions.
- High tree mortality in host trees. Maples are commonly infected but will infest elm, birch, poplar, willow and others.
- Top-down dieback, large exit hole you can stick a pen/pencil into, gnaw marks at oviposit sites, leaves of stems chewed.
- Adults are large (0.7-1.5") with antennae 1.5 to 2 times the length of the body



Asian Longhorned Beetle Infestations in North America



Other Pests

- Spotted Lanternfly:

Sapsucker, loves tree of heaven, grapes, fruiting trees and many more

- Hemlock Woolly Adelgid

Feeds on Eastern and Carolina Hemlock by eating the starches at the base of the needles

- Sudden Oak Death

A flagellated water mold found only in California and Oregon currently. It can not be diagnosed by symptoms, only lab confirmation.

- Thousand Canker Disease

Disease complex spread by an ambrosia beetle and its symbiotic fungus. Causes death by a thousand infected cuts to walnut trees.

- Fall Cankerworms

A native moth which heavily defoliates oak trees during outbreak years.



Hemlock Woolly Adelgid: Steven Katovich, Bugwood.org



Sudden Oak Death: Sandra Jensen, Cornell University, Bugwood.org



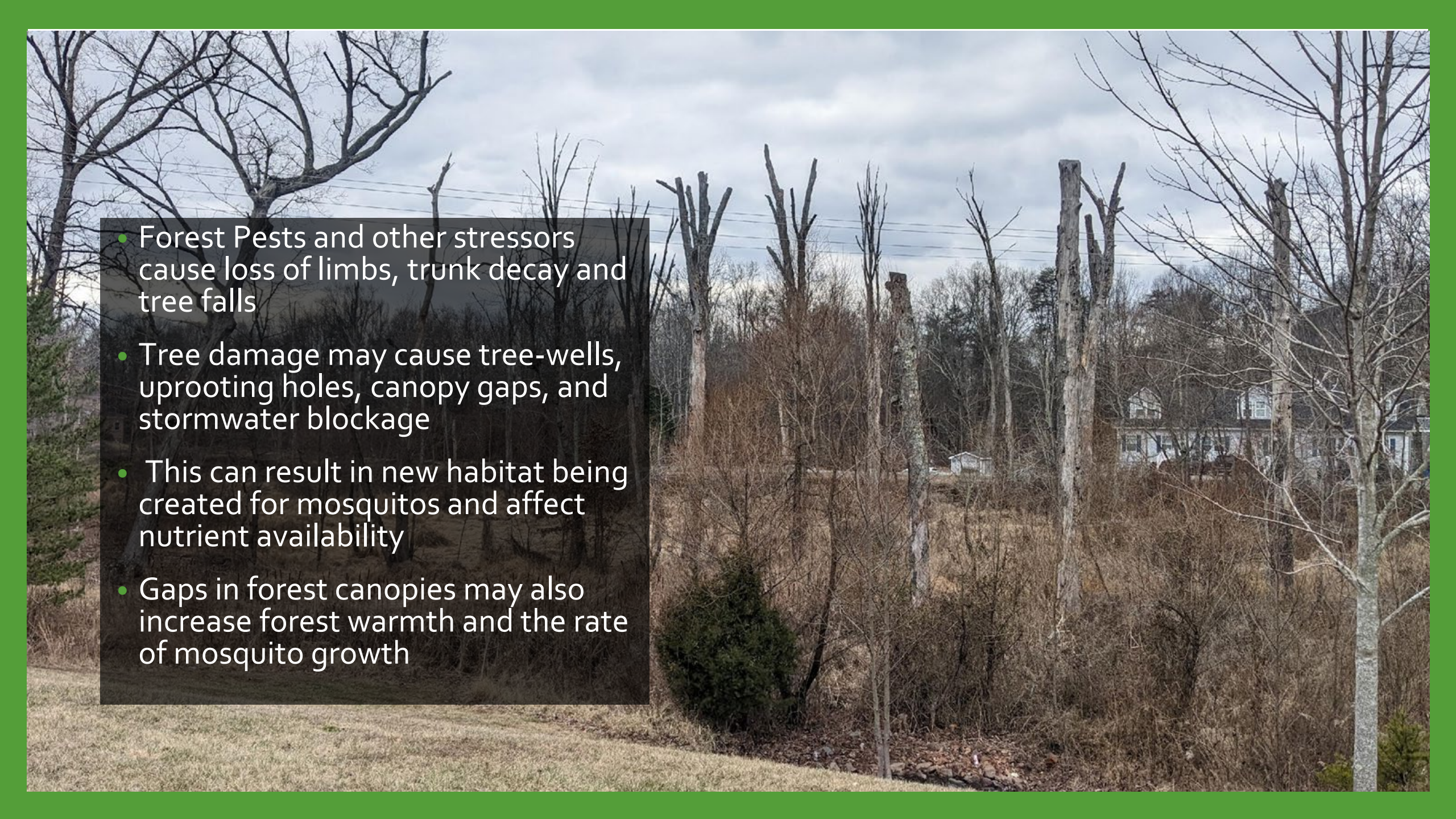
TCD: Ned Tisserat, Colorado State University, Bugwood.org



Oak Decline

- Oak decline is not caused by a single factor but rather a combination of predisposing factors, stressing events and secondary finishers.
- Poor soil, topography, stock density, age, prolonged drought, flooding, hydrology shifts, frost and other stressors compound over years
- The Chesapeake area is currently experiencing an oak decline event
- Oaks are generally decreasing in abundance across Virginia



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- A photograph showing a residential area with several dead, skeletal trees in the foreground and a house in the background under a cloudy sky. The trees are mostly bare and have lost their leaves, with some showing signs of decay and limb loss. The house is a two-story structure with a white exterior and a dark roof. The sky is overcast with grey clouds. The overall scene suggests a winter or late autumn setting with significant tree mortality.
- Forest Pests and other stressors cause loss of limbs, trunk decay and tree falls
 - Tree damage may cause tree-wells, uprooting holes, canopy gaps, and stormwater blockage
 - This can result in new habitat being created for mosquitos and affect nutrient availability
 - Gaps in forest canopies may also increase forest warmth and the rate of mosquito growth

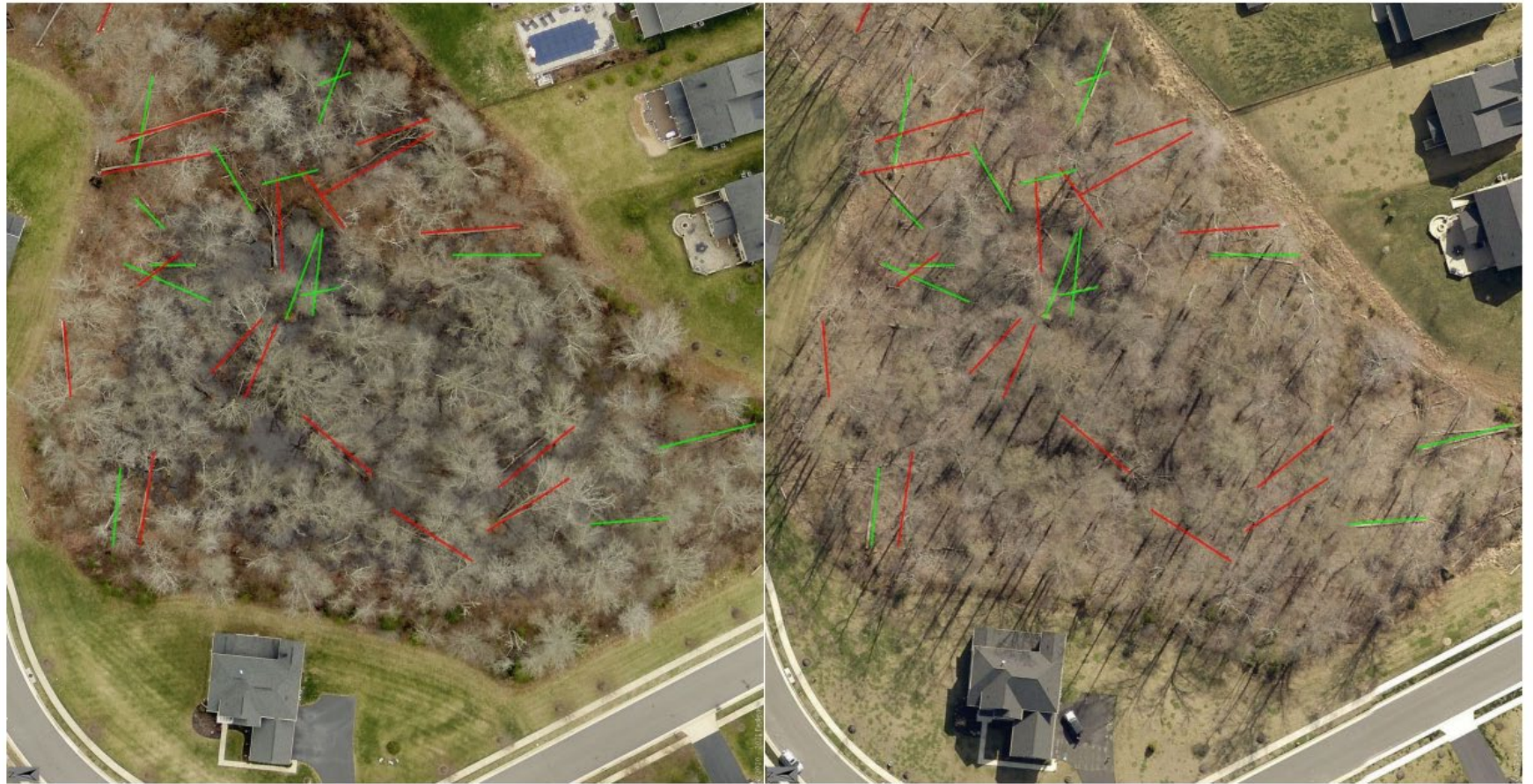
LeopoldSWM

Used EagleView
imagery to count
tree falls at points in
time

Green: falls prior to
2015 (13)

Red: falls since 2015
(17)

Many more are in a
state of decay will
likely fall this year



12/15/2020 - 03/13/2021

03/13/2015 - 04/12/2015

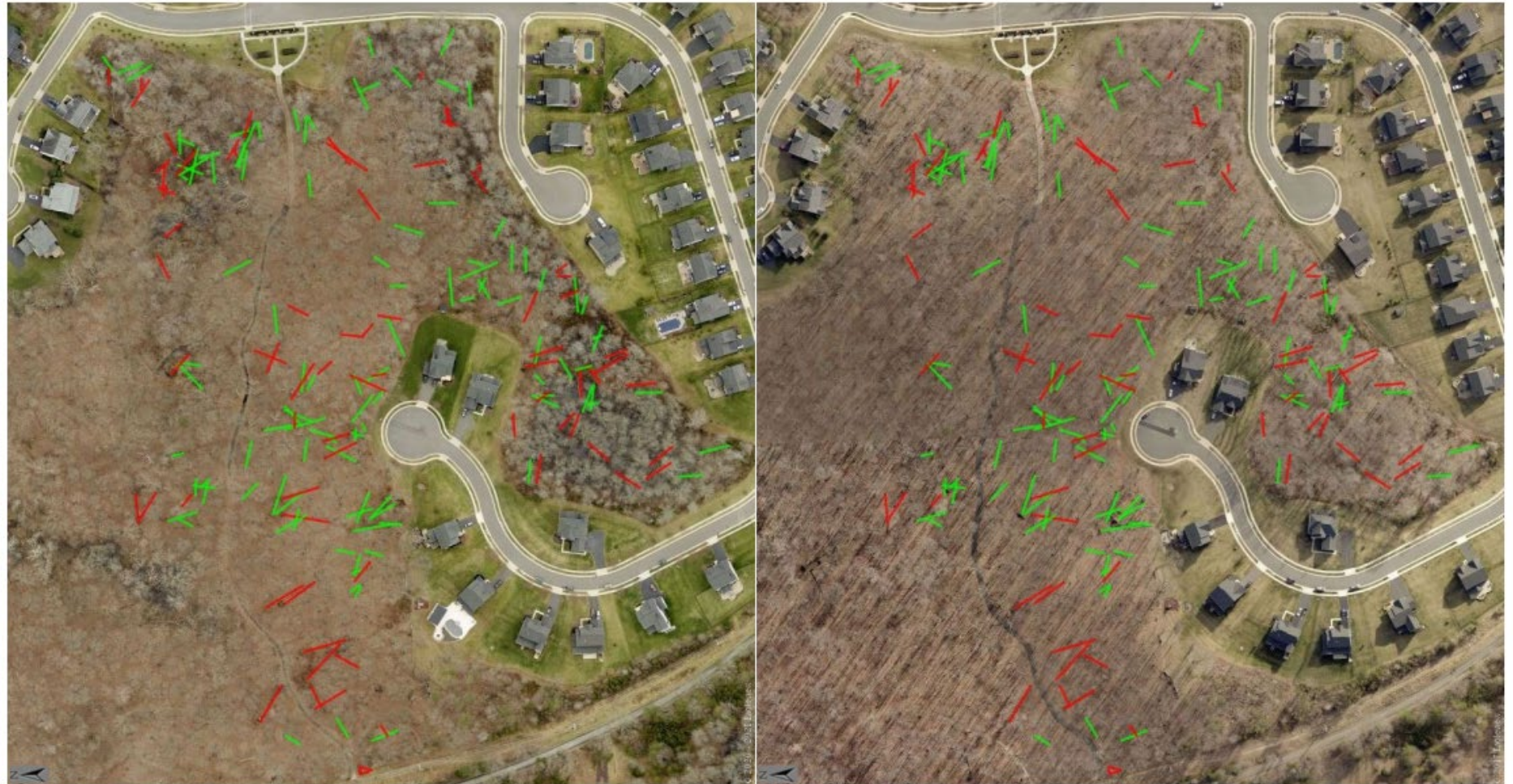
Leopoldpark

Green: Trees have fallen prior to 2015 (93 trees)

Red: Trees have fallen since 2015 (71 trees)

Stormwater areas are under the greatest impact

Beginning to see the impacts of oak decline



12/15/2020 - 03/13/2021

03/05/2017 - 05/16/2017

Leopold Preserve Tree Loss



Leopold Preserve Tree loss 2015-2021

- 158,000 sq. ft
- Green: Prior to 2015 (27)
- Yellow: 2015-2017 (12)
- Orange: 2017-2019 (10)
- Red: 2019-2021 (5)

Leopold Preserve Tree Loss



Hollow Trunk Trap Site

≤2011 (grey)-56
2013 (blue)-41
2015 (turquoise)- 19
2017 (green)- 32
2019 (yellow)- 19
2021 (red)- 14

The rate of tree falls is generally decreasing however the impacts would be compounding over time. Increasing the total trees fallen

Do forest disturbances change mosquito abundances, community, or species richness?

Will this affect disease dynamics in the area?

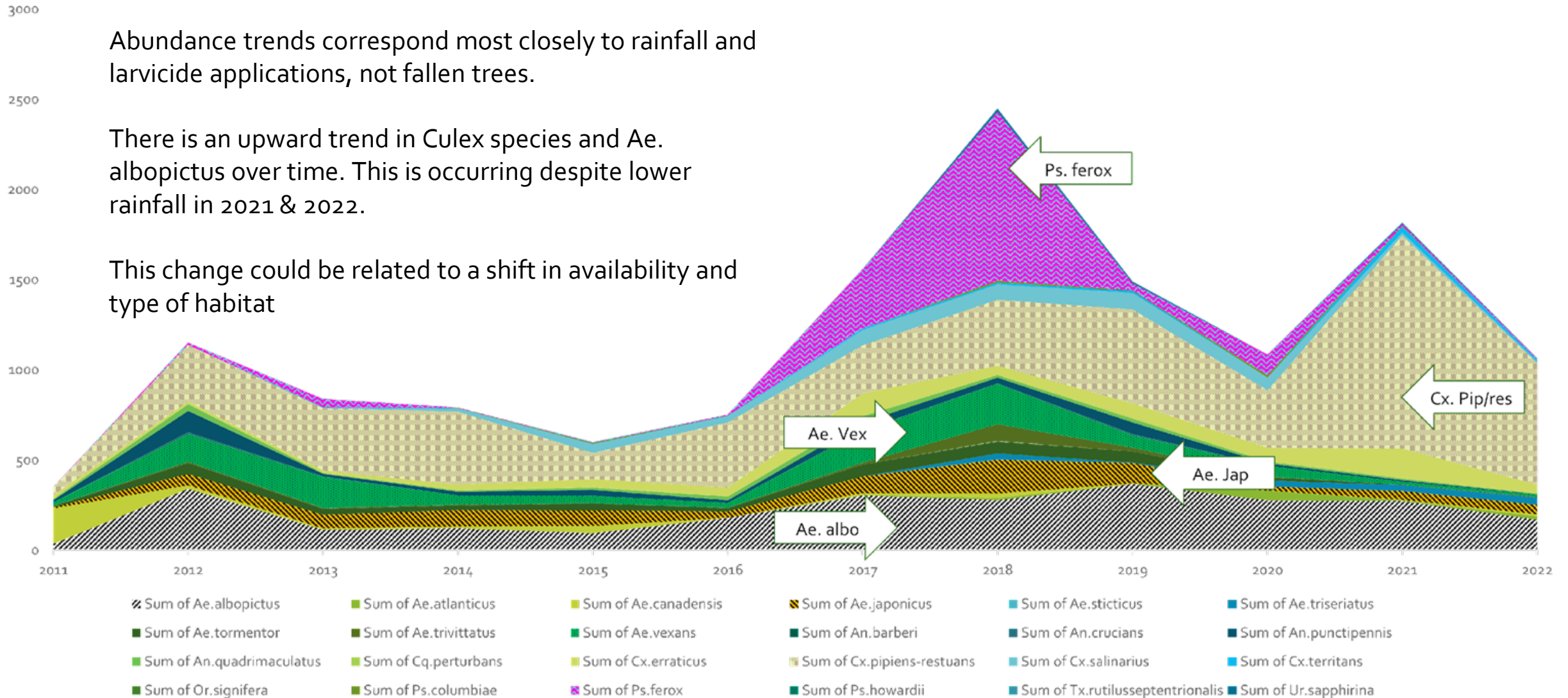
Circle
Area:
785398.2
Square
Feet
Perimeter:
3141.6
Feet
Radius:
500 Feet

Hollow Trunk Mosquito Species Abundance

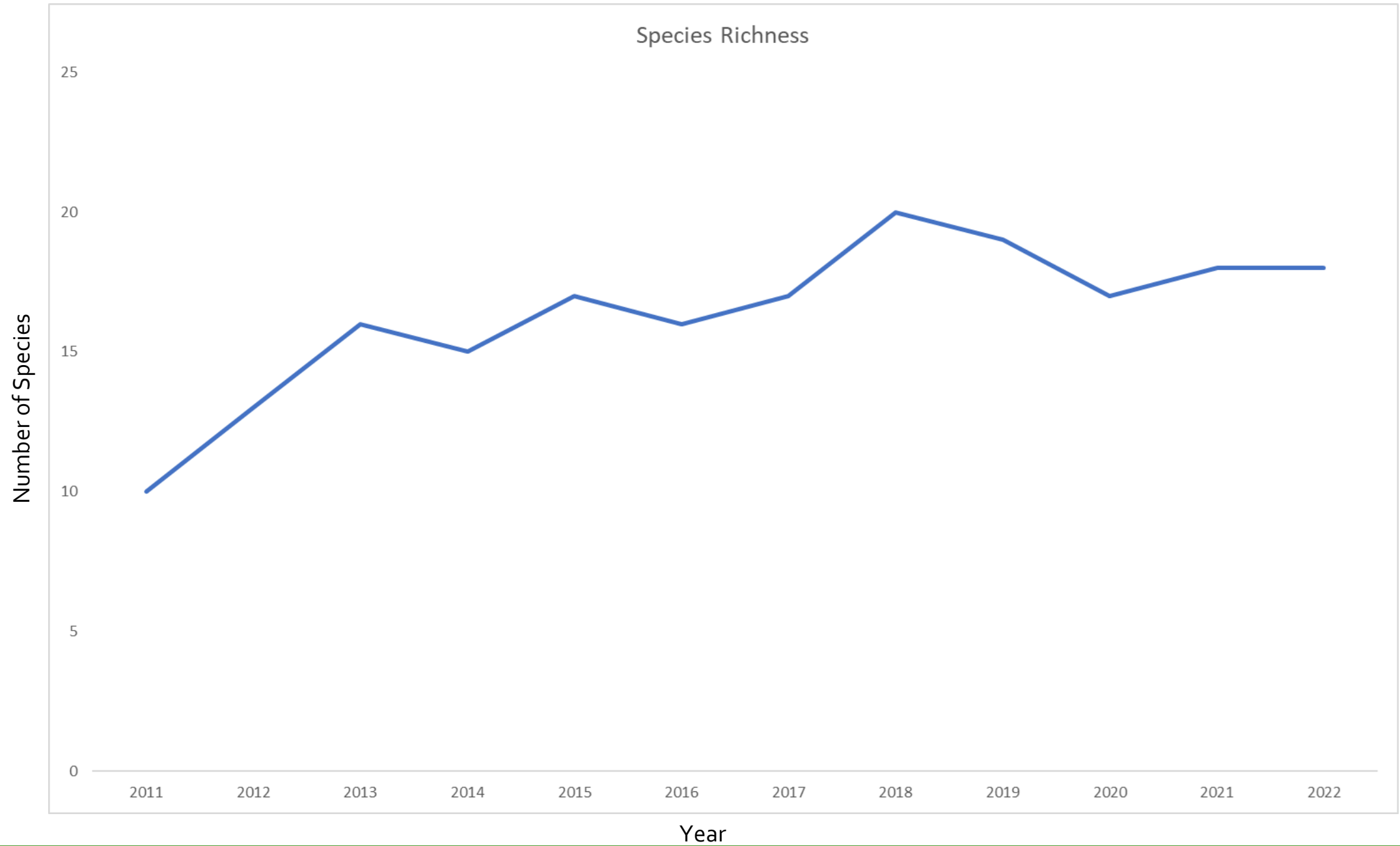
Abundance trends correspond most closely to rainfall and larvicide applications, not fallen trees.

There is an upward trend in Culex species and Ae. albopictus over time. This is occurring despite lower rainfall in 2021 & 2022.

This change could be related to a shift in availability and type of habitat



Species Richness



Final Thoughts

- Tree loss can be caused by forest pests and other factors. **DON'T MOVE FIREWOOD!**
- The recent loss of trees is causing uprooting holes to form in forests that would otherwise absorb water.
- These areas can and do harbor mosquitos and require treatment. How significantly that effects mosquito populations and disease dynamics is hard to determine since there are many other factors.
- Not all tree falls result in mosquito habitat formation. Low lying, clay based, and riparian habitats are most regularly breeding.
- Mosquito trends do not appear to have a relationship to fallen trees. Tree holes are not the limiting factor.



Questions?

