Climate Change in Rhode Island's Forests

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Illustration: Adelaide Tyrol for the VT *Citizen*

Silvics, Ecology, and Forest Development

- **Silvics:** ecological characteristics of each tree species (how a species grows and what it requires to thrive)
  - Soil: **moisture**, nutrients, depth, structure
  - Sunlight: tolerance of shade/competition (just like garden plants!)
  - Growth: rate, form, habit, height, etc.
  - Regeneration: seed distribution, **requirements for germination**, etc.
  - **Fire:** tolerance, sprouting response

Illustration: Adelaide Tyrol for the VT *Citizen*

Silvics, Ecology, and Forest Development

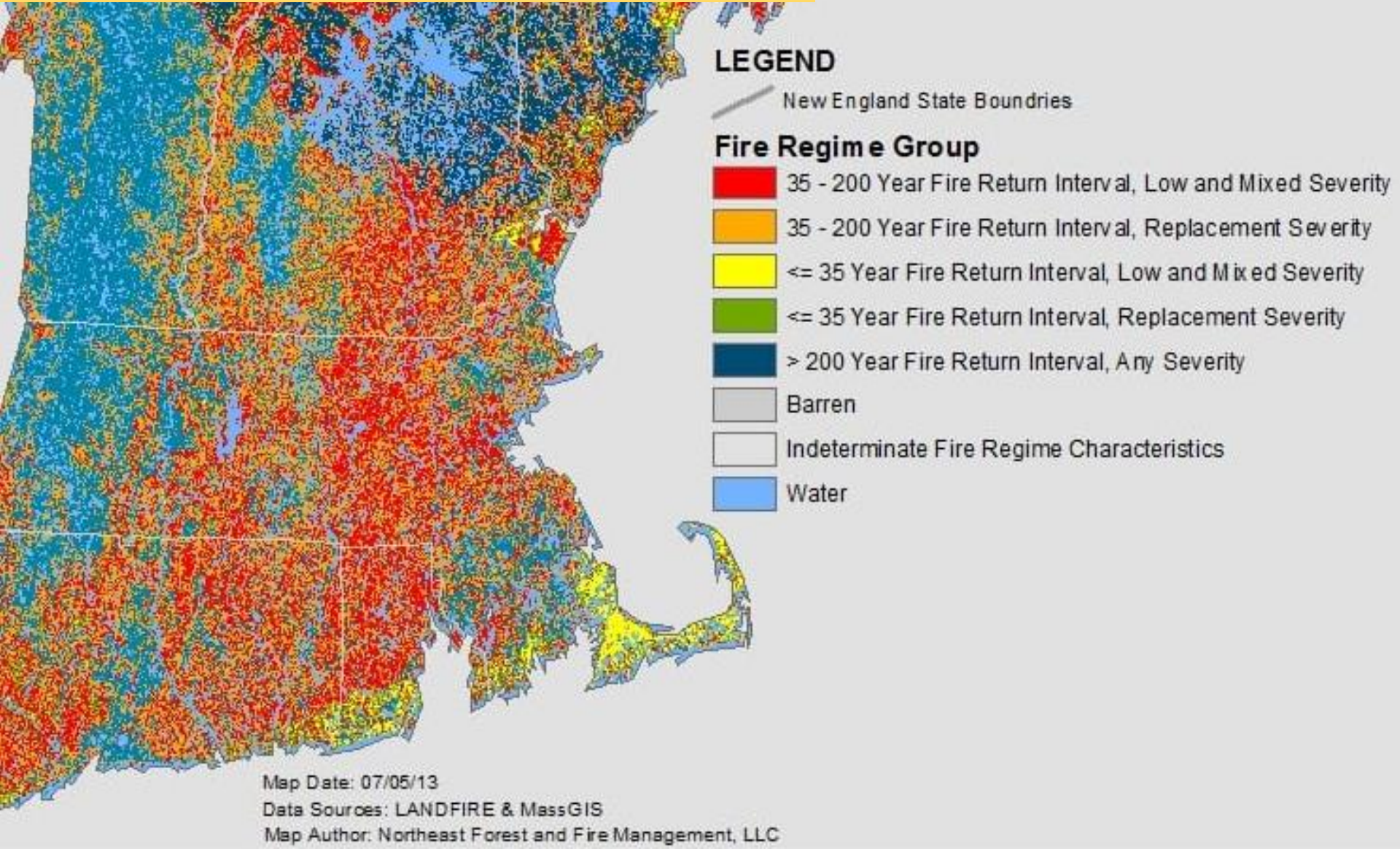
- Forest Development is driven by two phenomena:
  - Succession
  - Disturbance

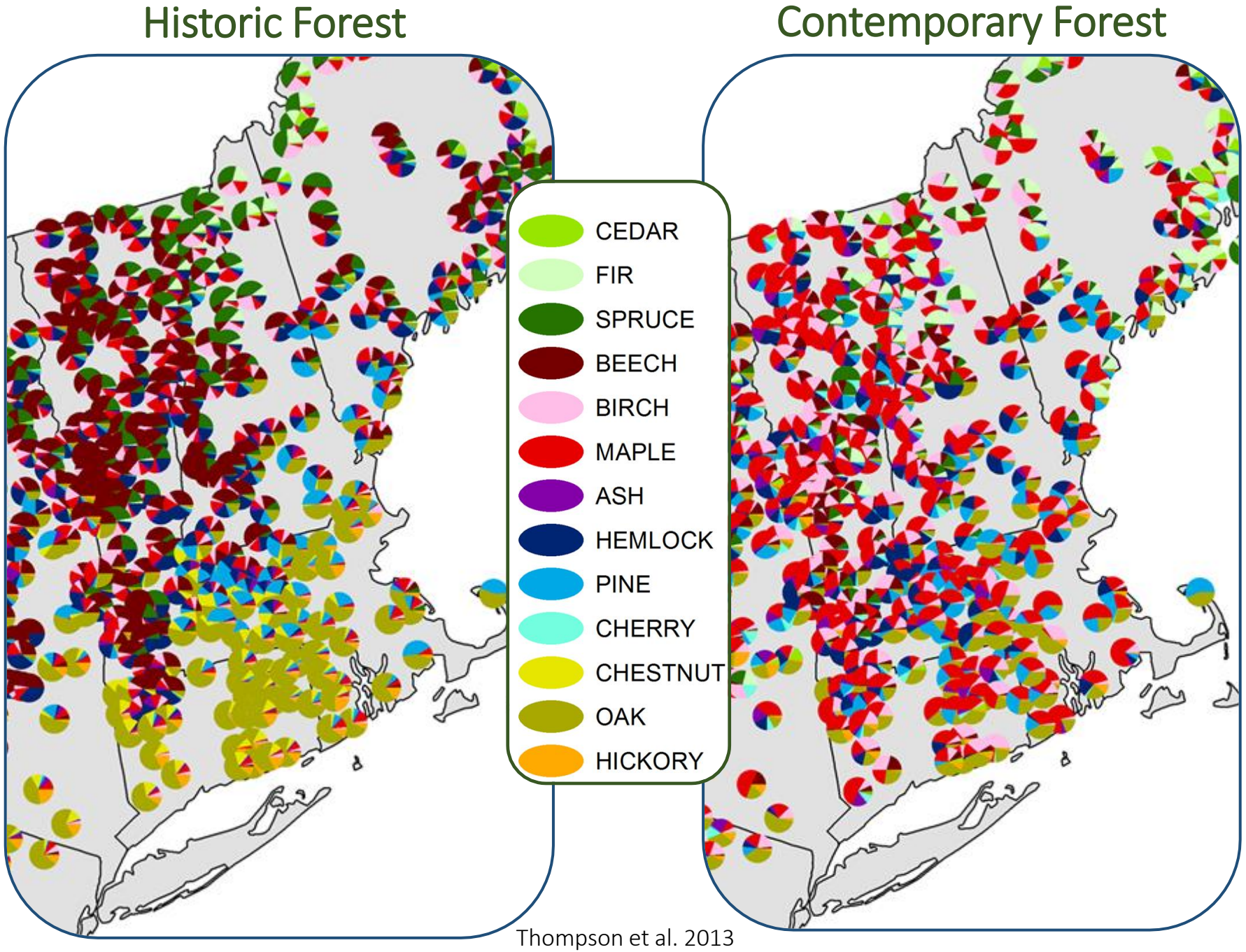
Illustration: Adelaide Tyrol for the VT *Citizen*

Disturbance, Succession and Forest Development

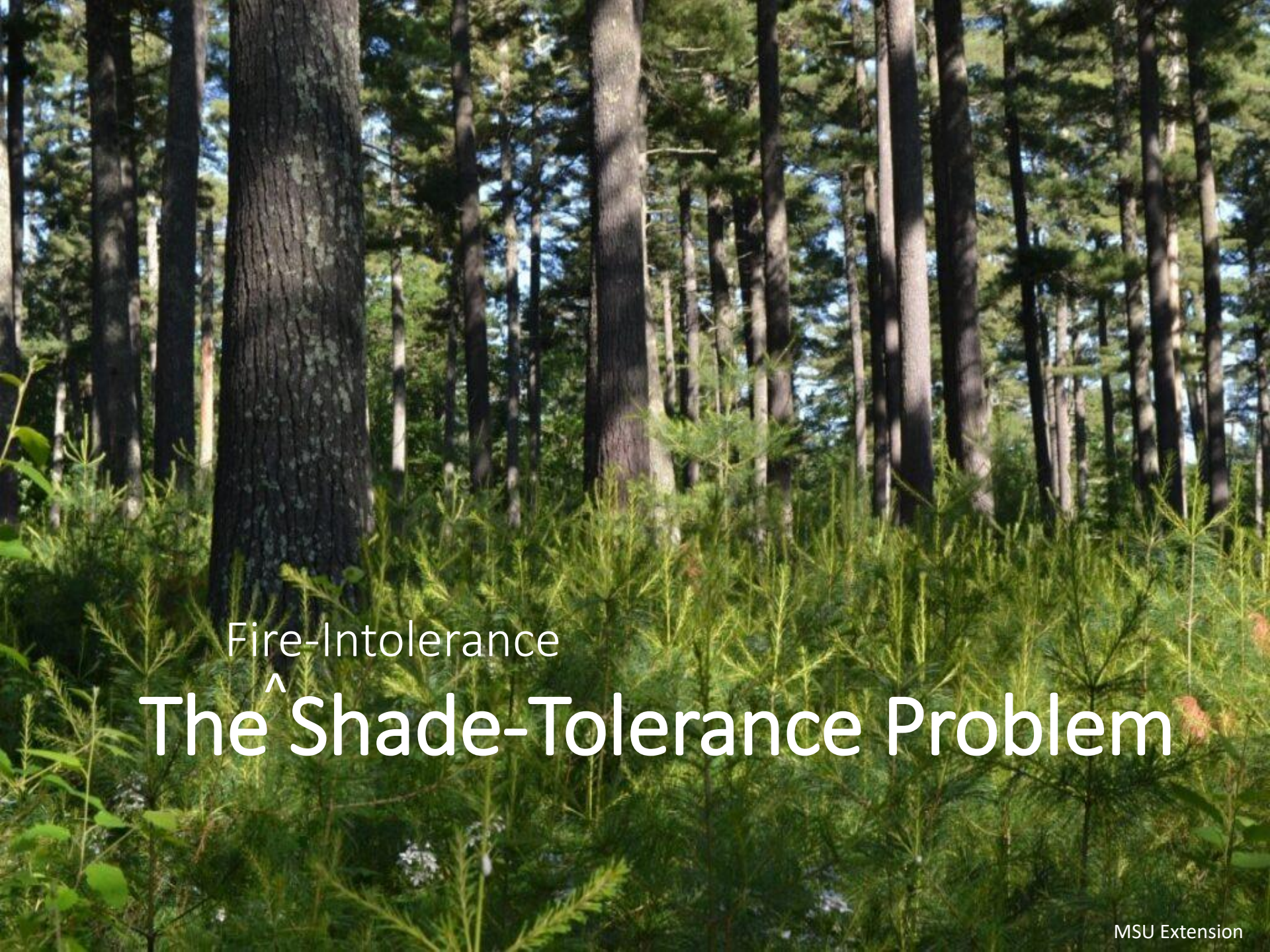
- Severe disturbance (stand replacement) →
- Early succession → scrub/shrub → **young forest** →
- Intermediate succession/**intermediate forest** →
- Canopy closure & **mature forest** →
- **Old forest** (not necessarily ***old growth*** forest)

RI's Fire History





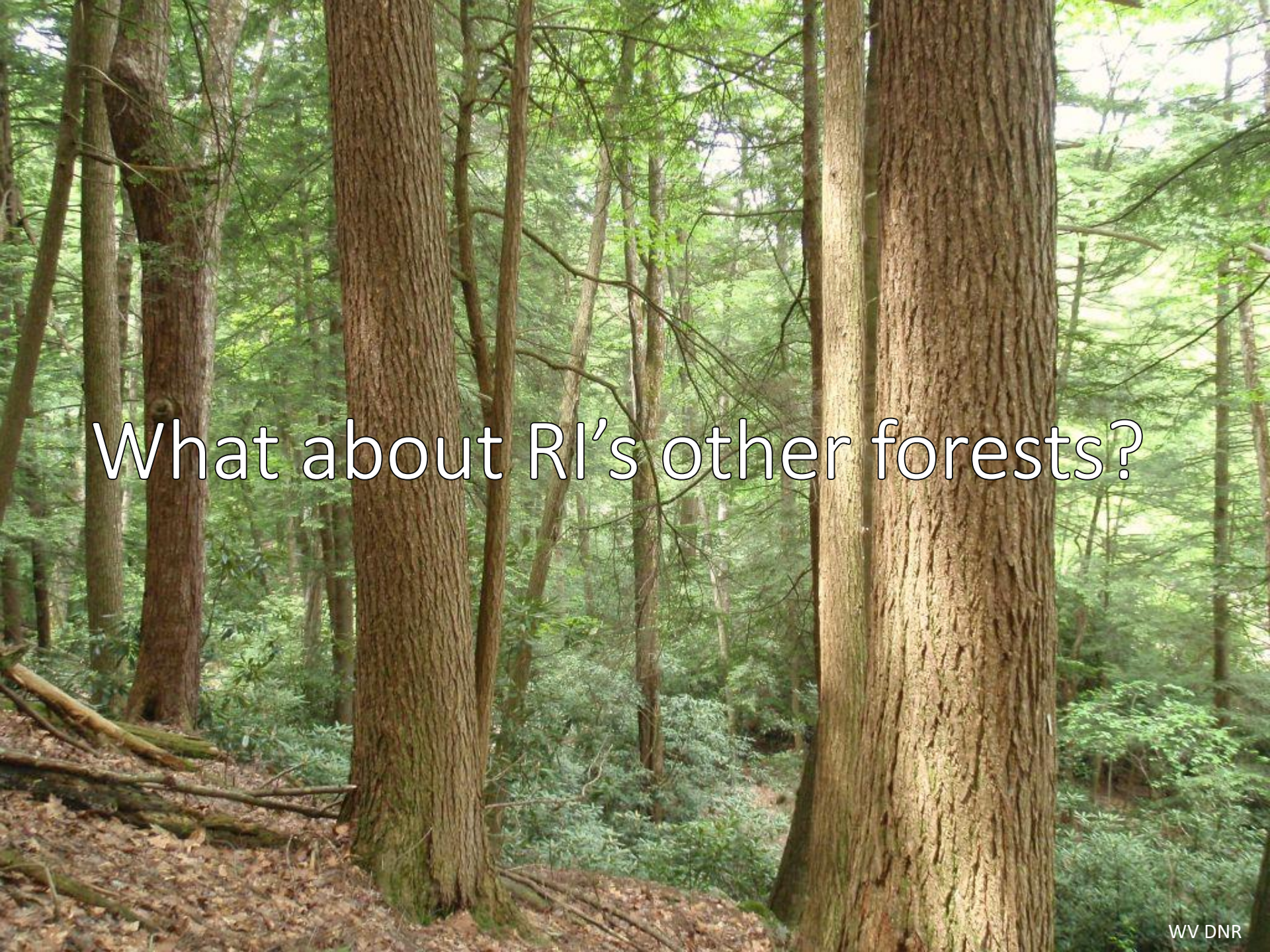
Thompson et al. 2013



Fire-Intolerance

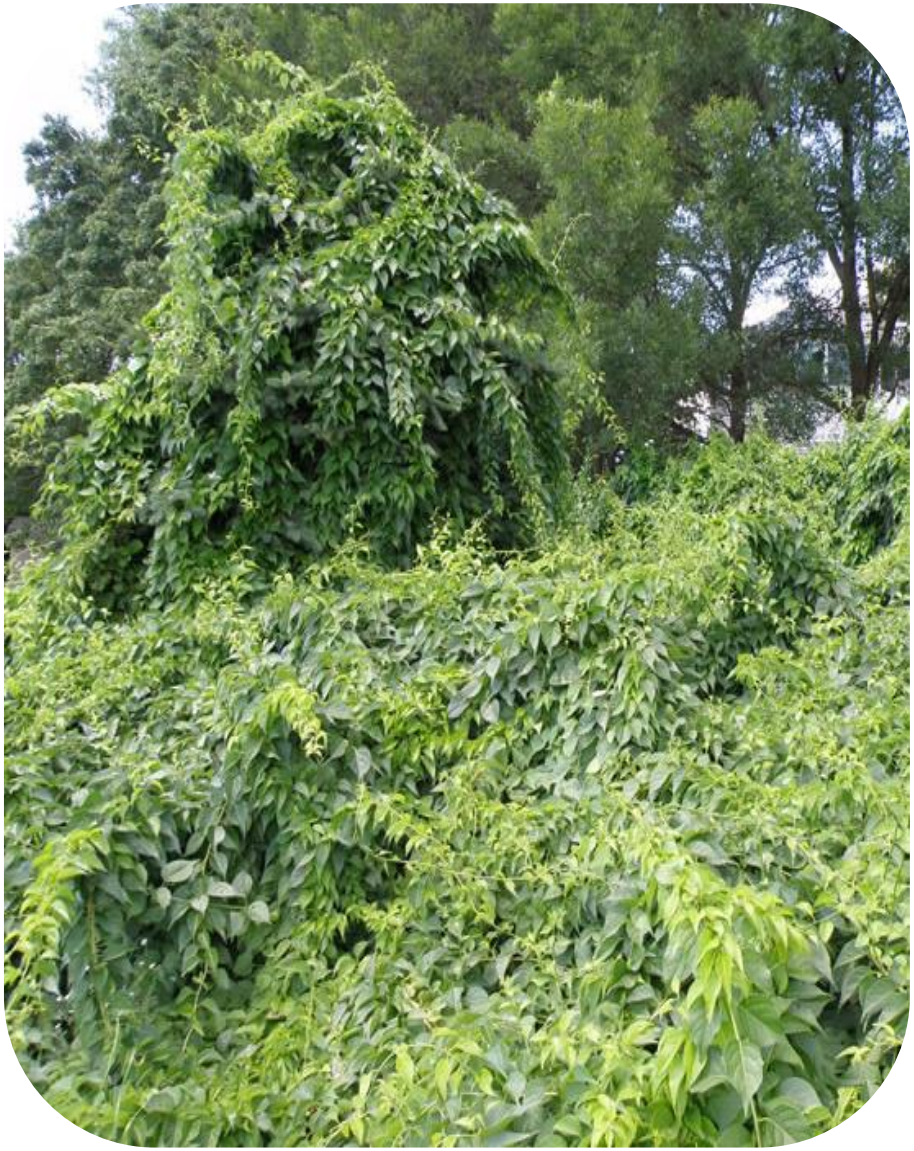
The Shade-Tolerance Problem

MSU Extension


What about RI's other forests?
WV DNR

Invasive Plant Species

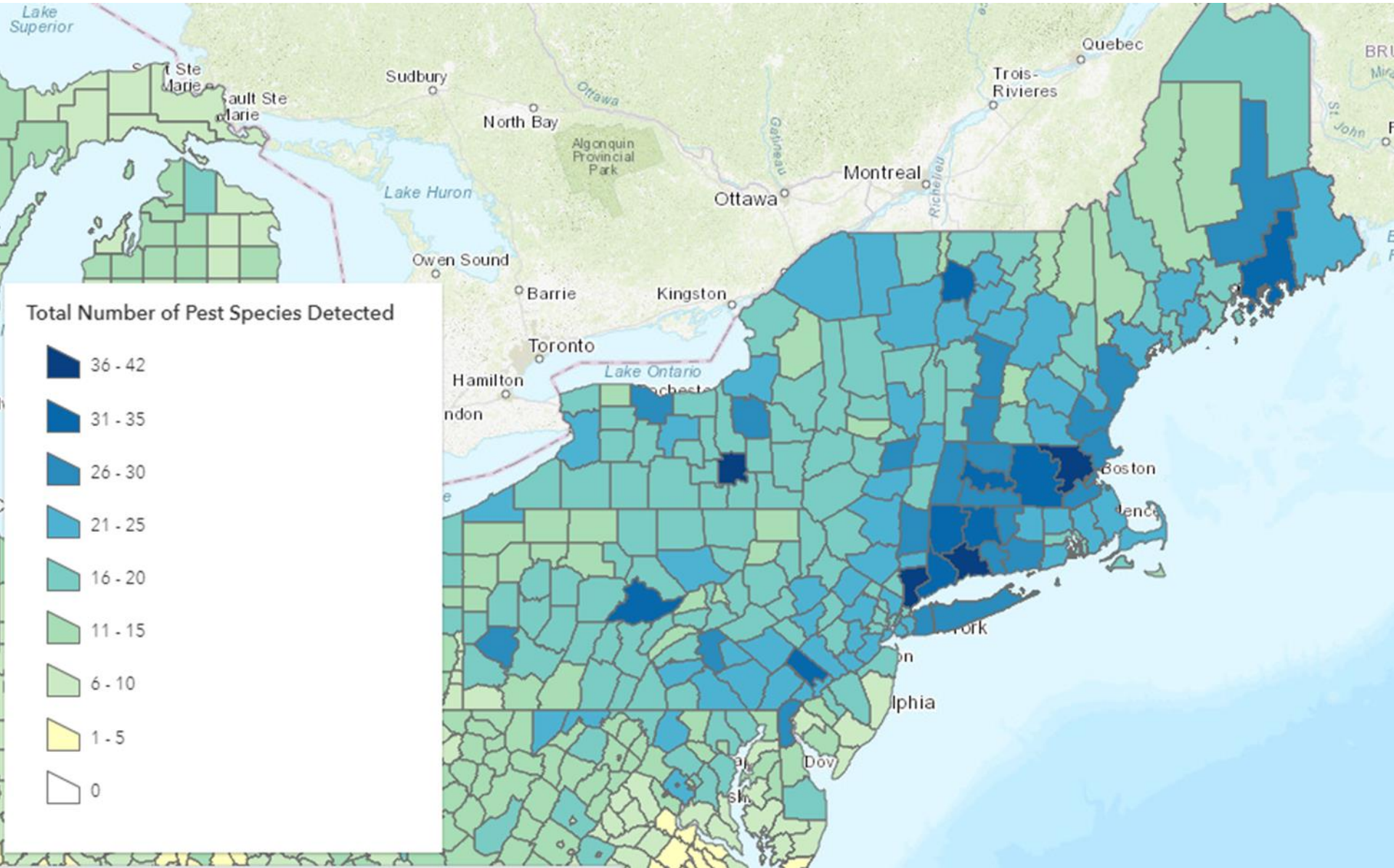
- Early colonizers (favored by disturbance)
  - Grow in monoculture
- Early leaf-out & late senescence
- Abundant, persistent fruits
- Nutritionally poor
- Difficult to eradicate




Boston Globe
CT Post
Science 360 News

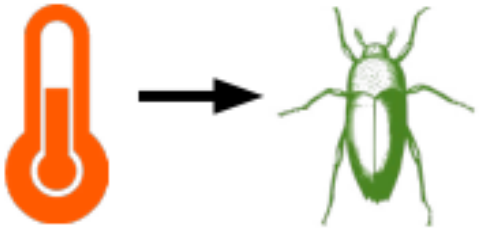
Total number of invasive forest pests

Alien Forest Pest Explorer (AFPE)- Purdue University and USFS

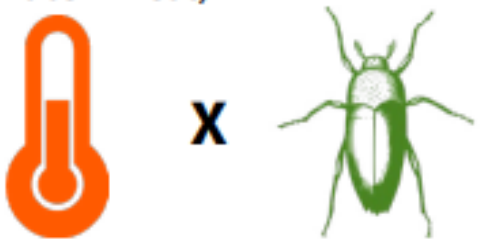


How does climate change influence forest pests?

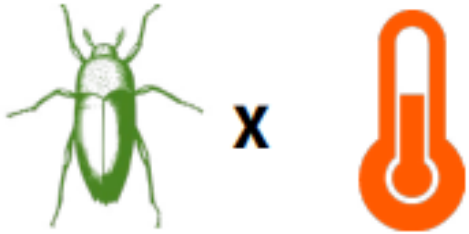
Climate brings a pest to a new area
(1: Climate brings Pest)



Climate stress makes trees more vulnerable to pest outbreaks
(3: Climate X Pest)

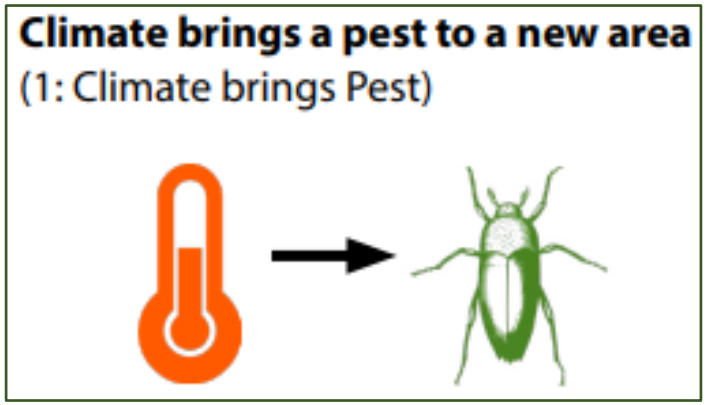


A minor pest becomes virulent with climate change
(2: Pest X Climate)



Climate change alters the trajectory of recovery after tree mortality
(4: Pest then Climate)

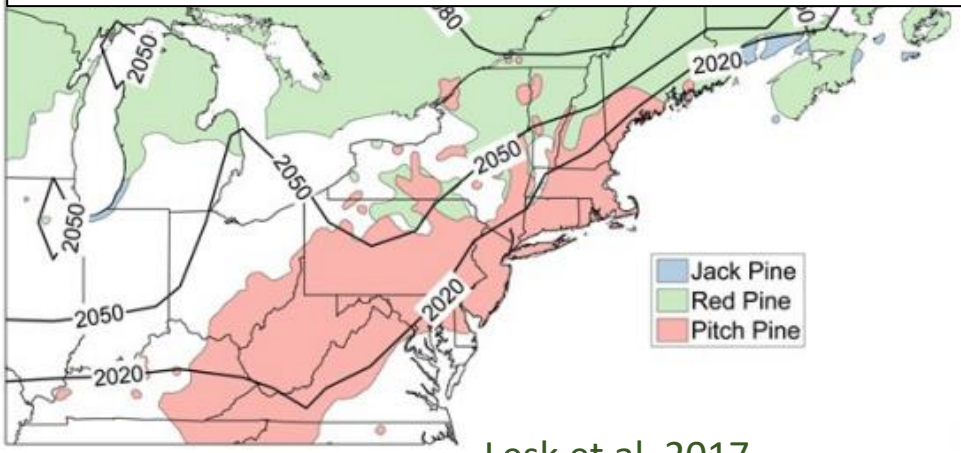
Barker Plotkin et al. 2021



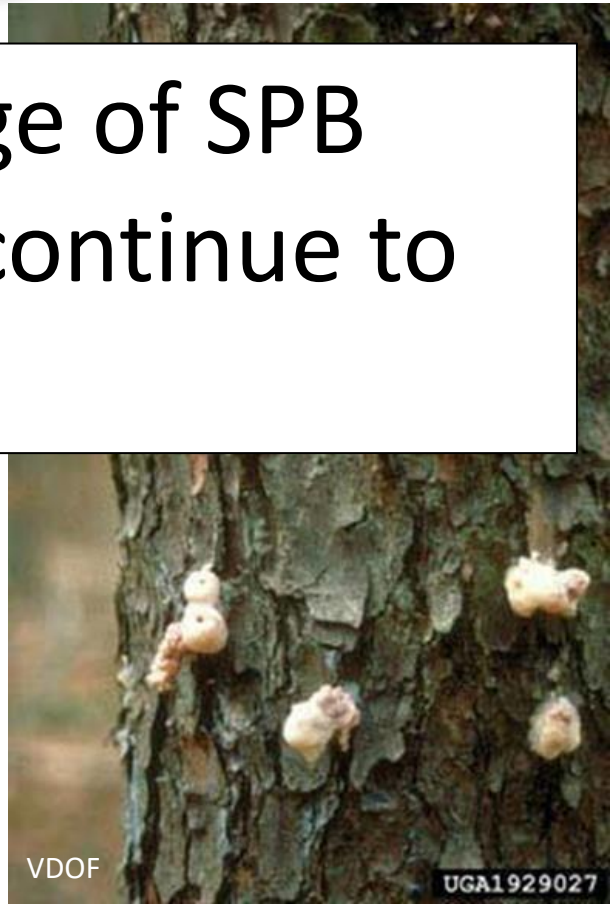
Southern pine beetle

- Warming winter

RI could be on the verge of SPB outbreak if populations continue to grow



Lesk et al. 2017



Climate stress makes trees more vulnerable to pest outbreaks
(3: Climate X Pest)

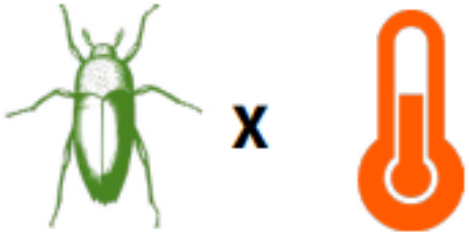
X

Spongy moth
(formerly gypsy moth)

- Drought conditions stress trees and reduce natural fungal controls
- Spongy moth populations explode without natural control

Entomophaga maimaiga

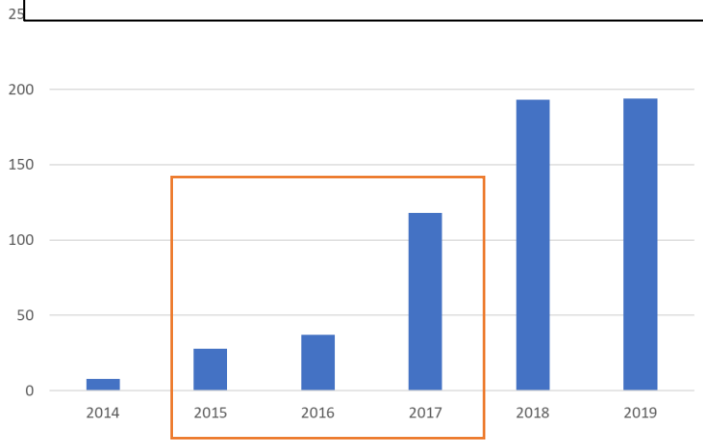
A minor pest becomes virulent with climate change
(2: Pest X Climate)



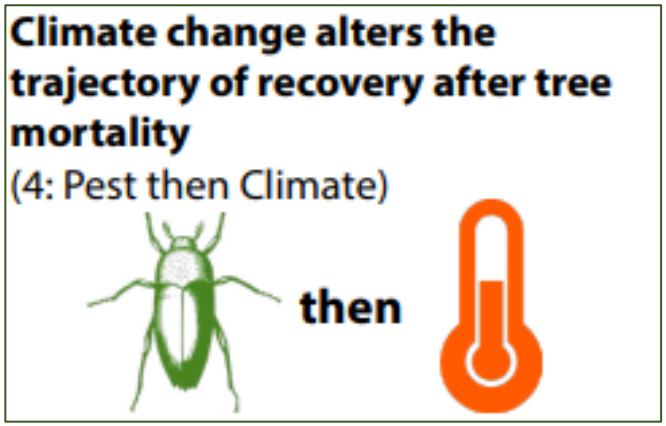
Secondary pest: Two-lined chestnut borer

- TLCB attack drought- and

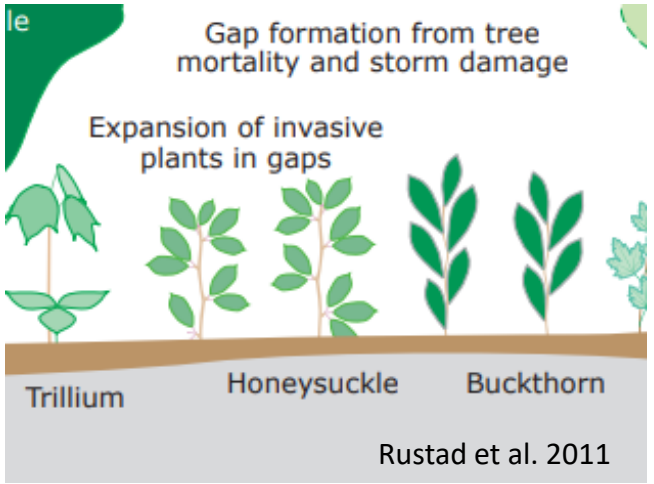
Spongy moth and TLCB impacted 226,880 acres of tree canopy in RI from 2015-2017.



Spongy moth outbreak



Invasive plants and oak mortality



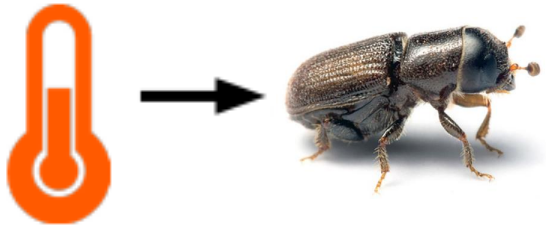
- Open canopies allow understory plants to increase
- Invasive plants have competitive edge, benefitting from longer growing season
- Invasive plants interfere with oak regeneration and understory germination

McEwan et al. 2009; Dey 2014

Climate change influences forest pests in RI in several ways

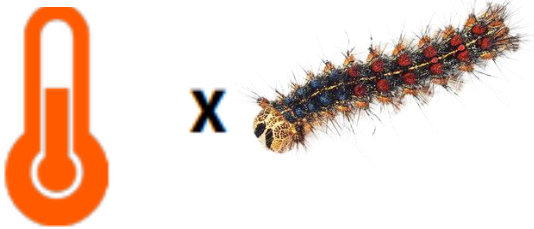
Climate brings a pest to a new area

Warm winters



Climate stress makes trees more vulnerable to pest outbreaks

Drought



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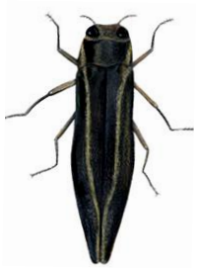


X

Drought and insect stressed trees

Climate change alters the trajectory of recovery after tree mortality

then

Barker Plotkin et al. 2021

Existing Program Funding FFY 2023: **$664,147**

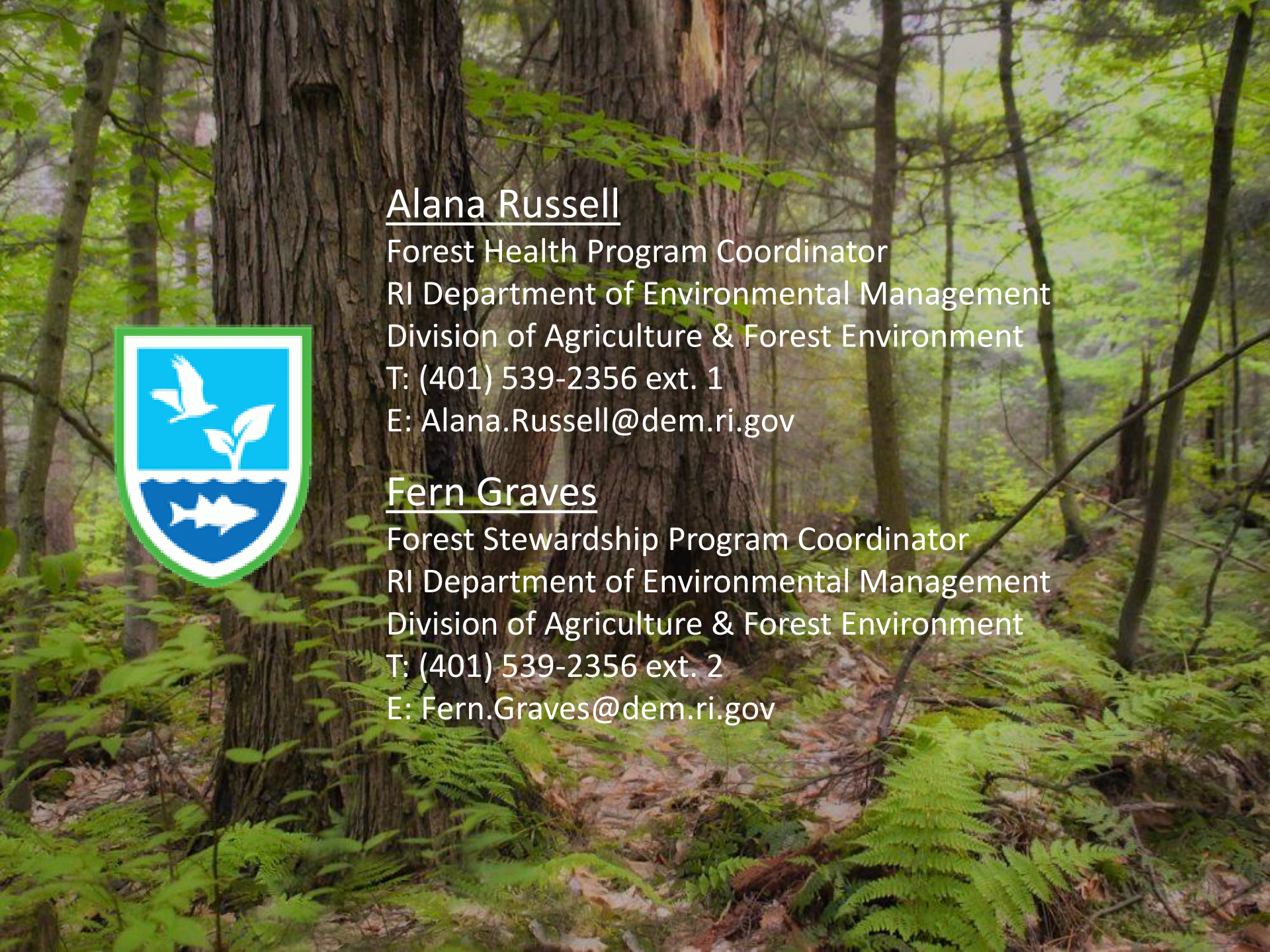
Additional Federal Funding FFY 2023:

Additional PROGRAM Funding

- State Forest Action Plan Implementation Funds (BIL) → **$496,000**
- Forest Health/Invasive Species Capacity Funds (BIL) → **$56,666**
- State Fire Assistance/Preparedness (BIL) → **$105,781**

Special PROJECT Funding

- Urban Forestry Program: Community Capacity Building for Urban Forestry in RI (IRA) → **$1.2M**
- Forest Resource Information Analysis (to assist communities with green infrastructure planning/tree planting/urban forests) → **$300,000**



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