# Sustaining Vermont's Forests into the Future


THE UNIVERSITY OF VERMONT FORESTRY

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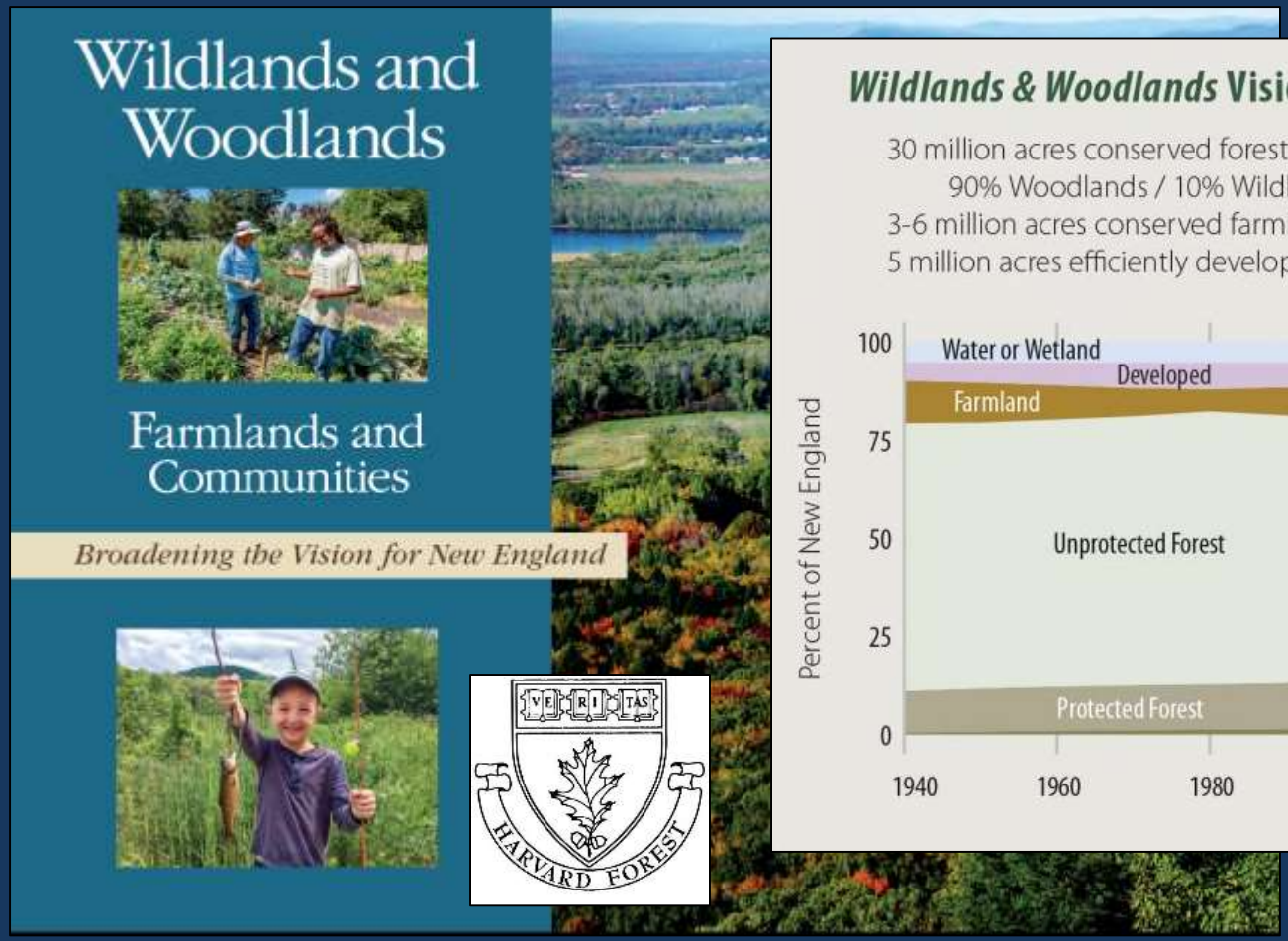
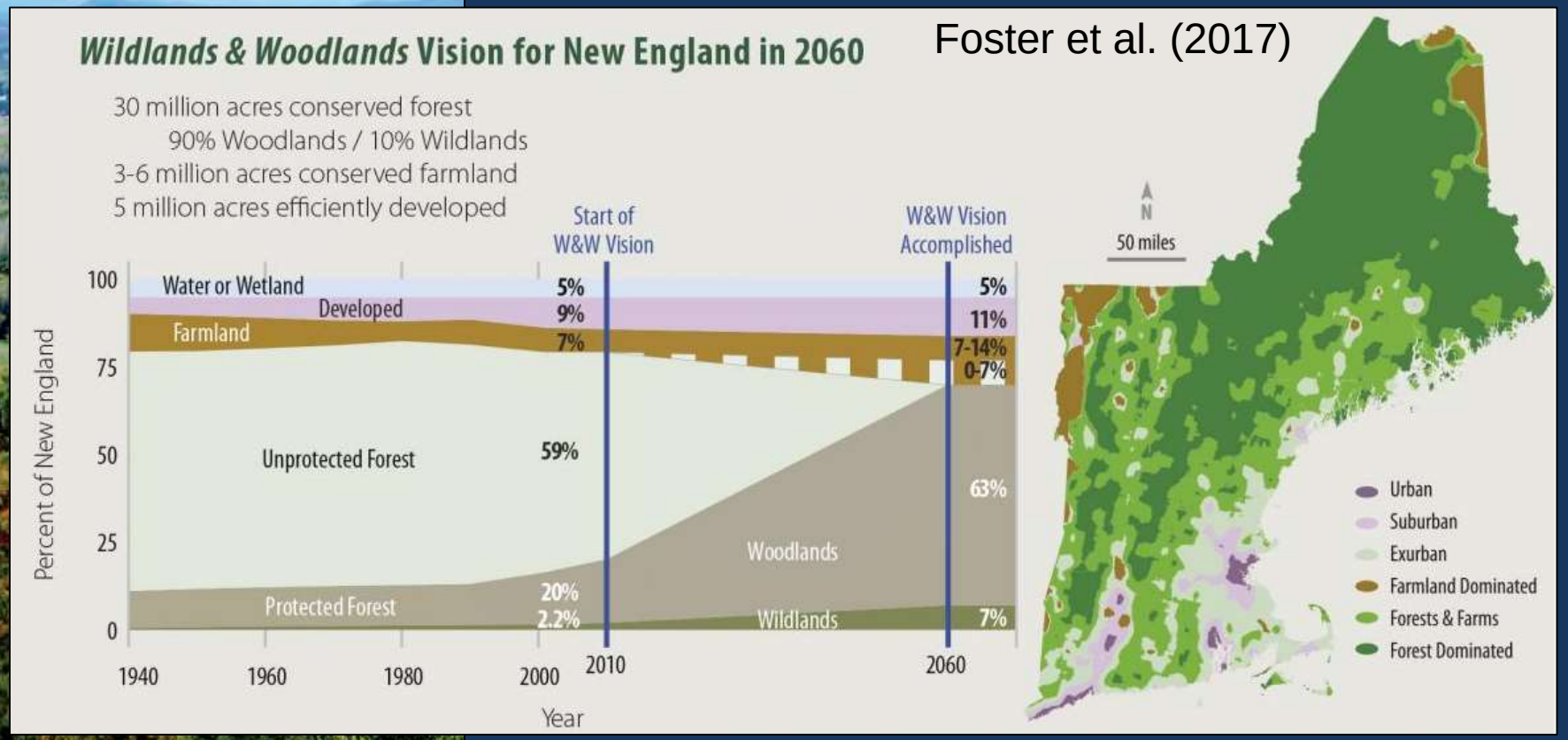
# Recent roadmap for sustaining forests

- Wildlands and Woodlands vision developed in 2010 (updated in 2017) to maintain natural forest infrastructure providing so many benefits to Vermont and broader region




Foster et al. (2017)

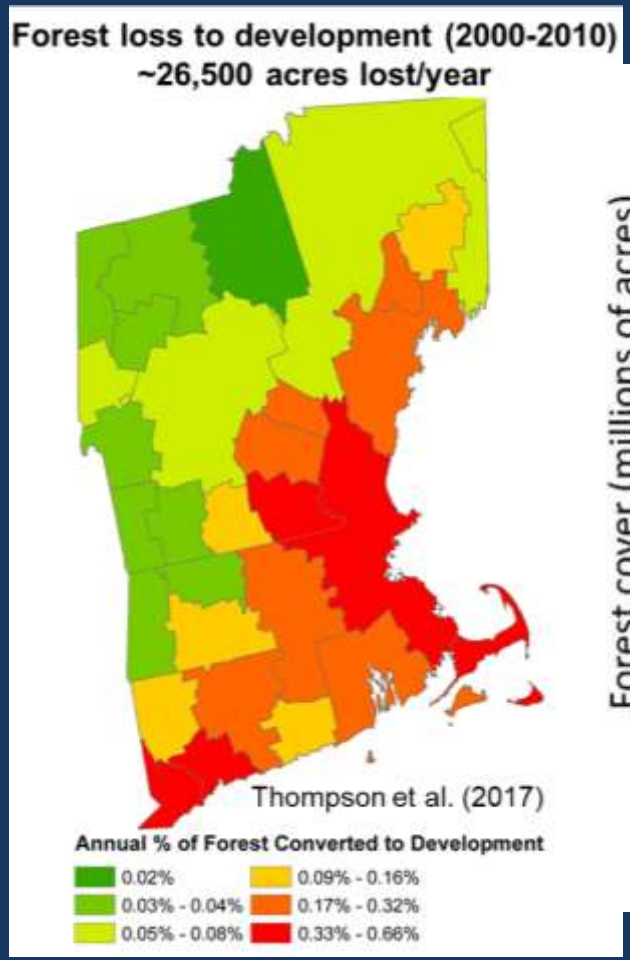
# Recent roadmap for sustaining forests

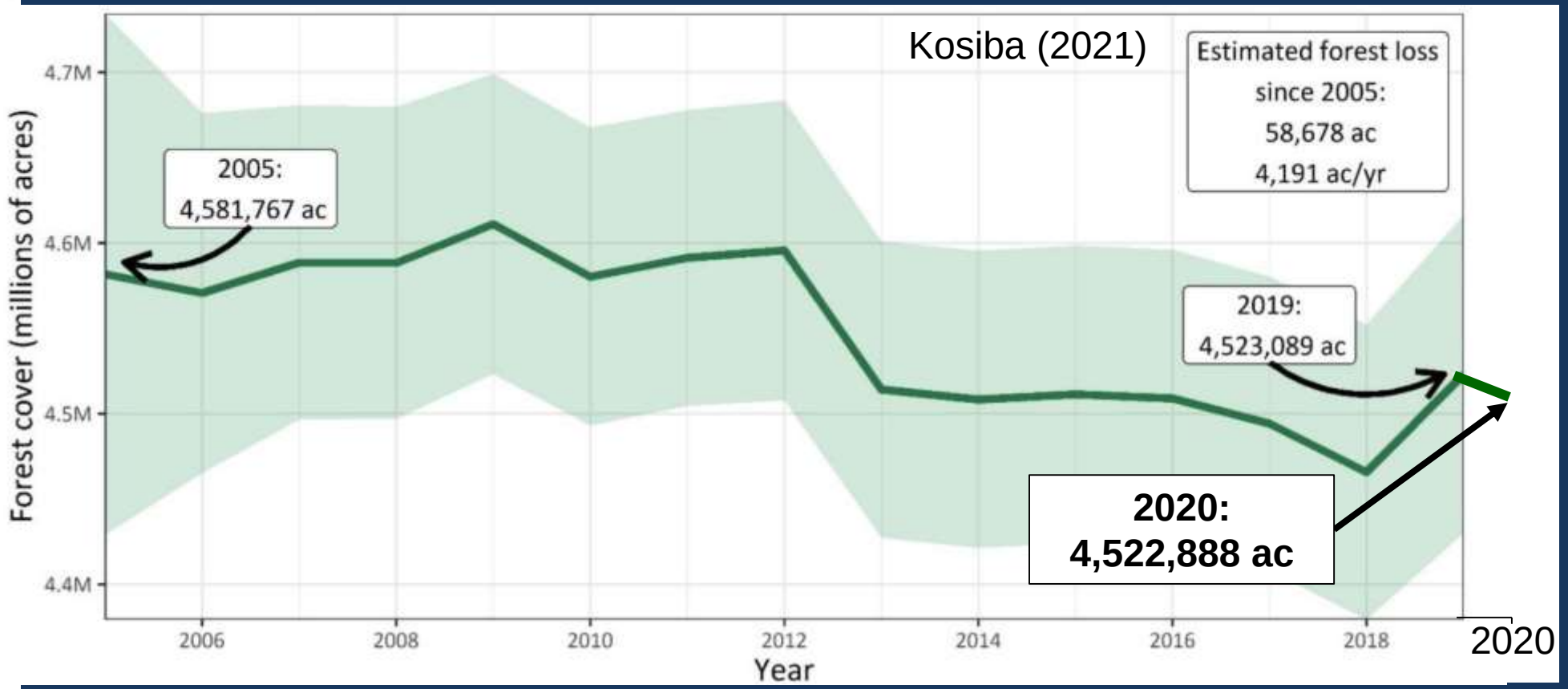
- Two key elements for addressing global crises of climate, biodiversity, and inequity
  1. **<u>Unmanaged "Wildlands"</u>:** allow old forest conditions to develop passively for carbon storage and diversity benefits; retain areas of natural, cultural, and spiritual significance; provide benchmark to evaluate and improve management practices
  2. **<u>Managed "Woodlands"</u>:** enhance local economies by establishing dependable resource base; restore and maintain range of forest conditions to support regional wildlife populations; increase resilience to stressors associated with global change




# Recent roadmap for sustaining forests

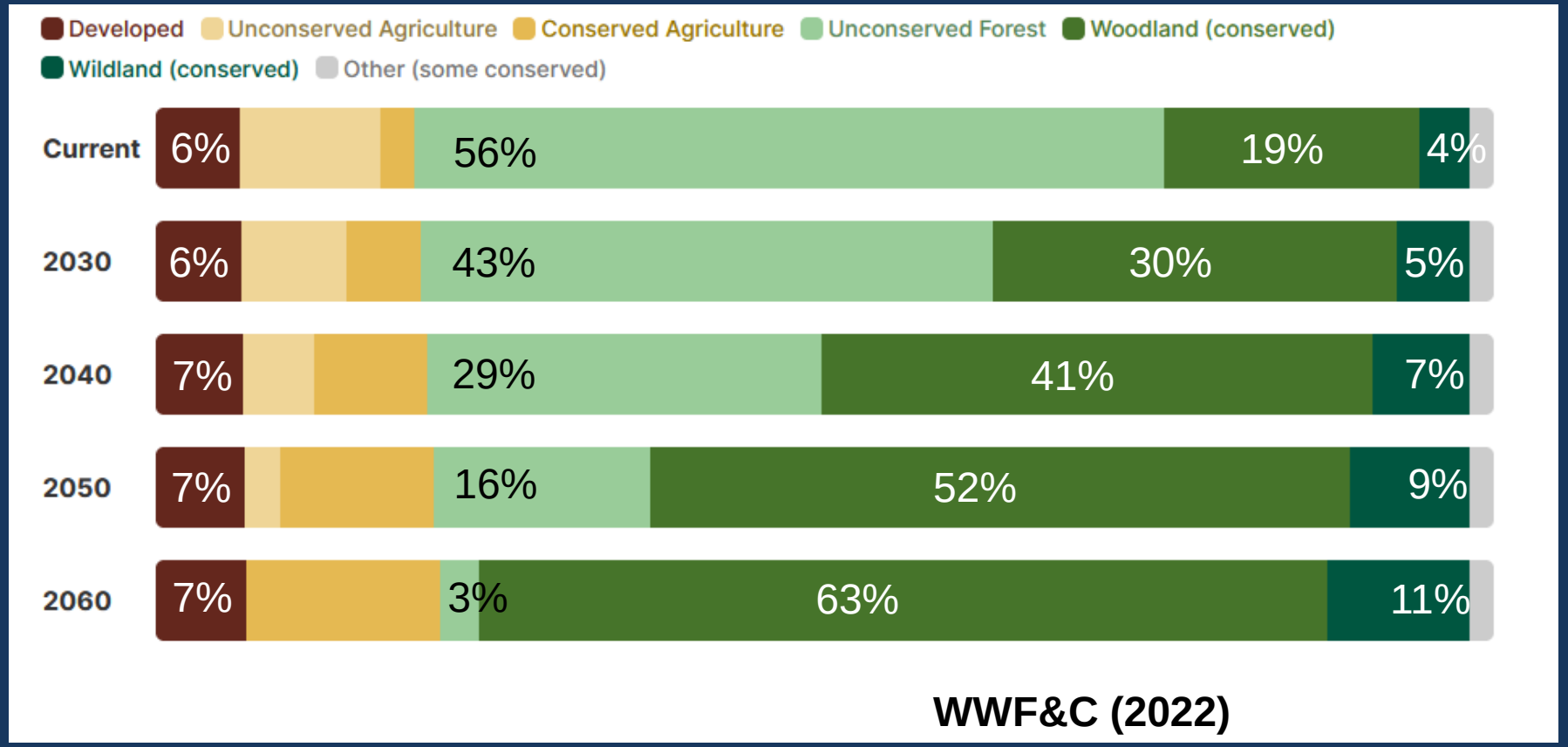
- Key issues motivating Wildlands and Woodlands
  - Continued (and accelerating) erosion of natural infrastructure through forest conversion and loss



# Recent roadmap for sustaining forests

## Vermont progress towards forest conservation goals

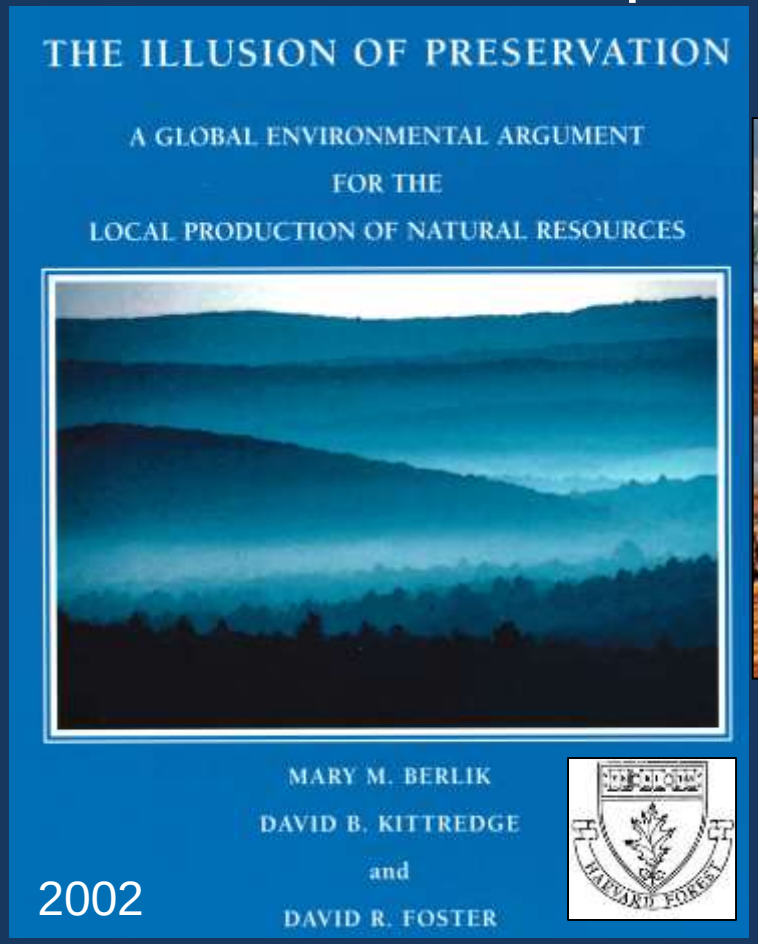



**WWF&C (2022)**


- Percentages don't factor in that denominator is decreasing over time
- Recent emphasis on stewardship of public forest lands (formally conserved lands) distracts from forest conservation deficit in Vermont

# Recent roadmap for sustaining forests

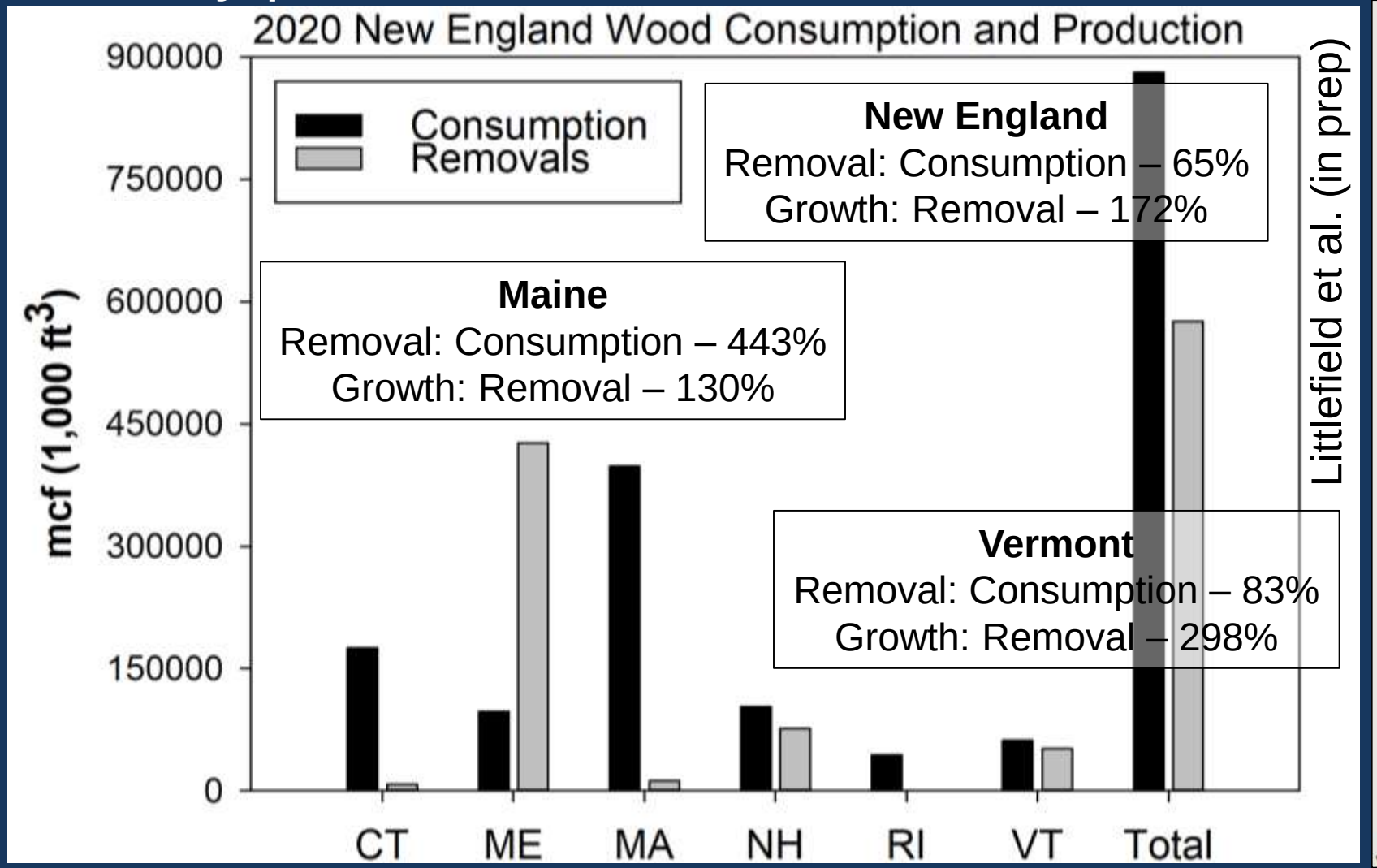
- Key issues motivating Wildlands and Woodlands
  - Consideration of the local benefits and the global implications of our conservation, production, and consumption decisions

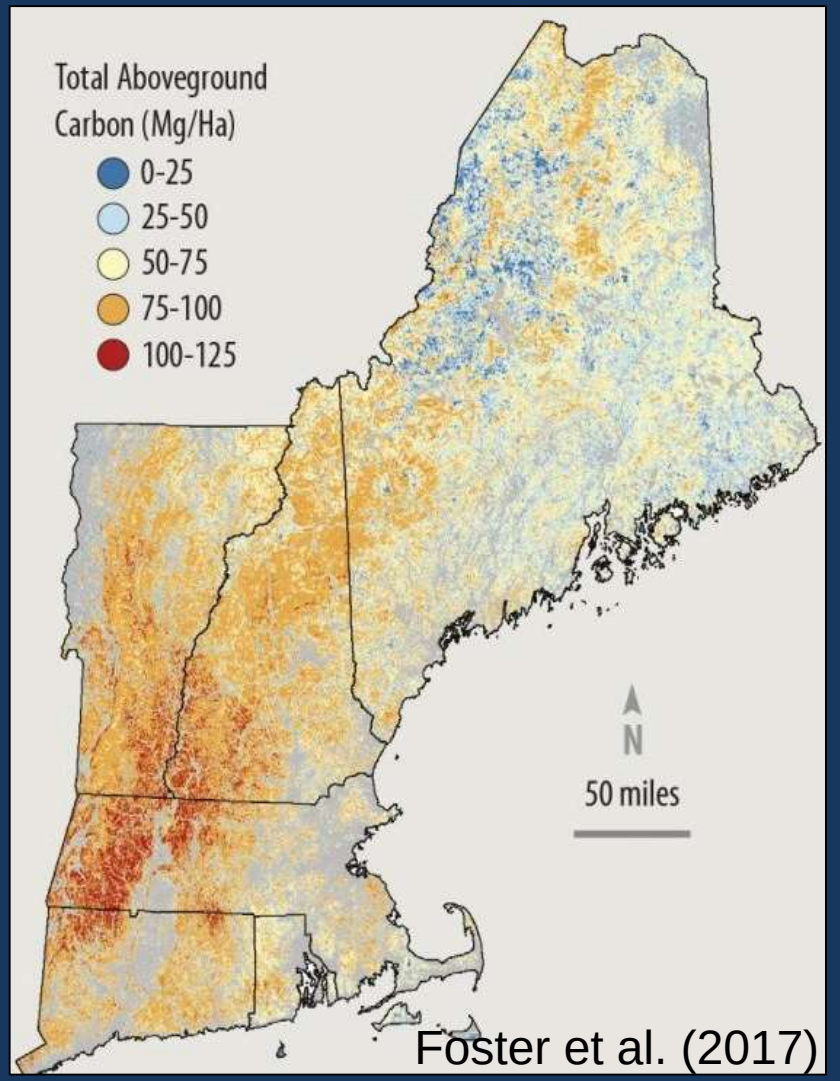




# Recent roadmap for sustaining forests

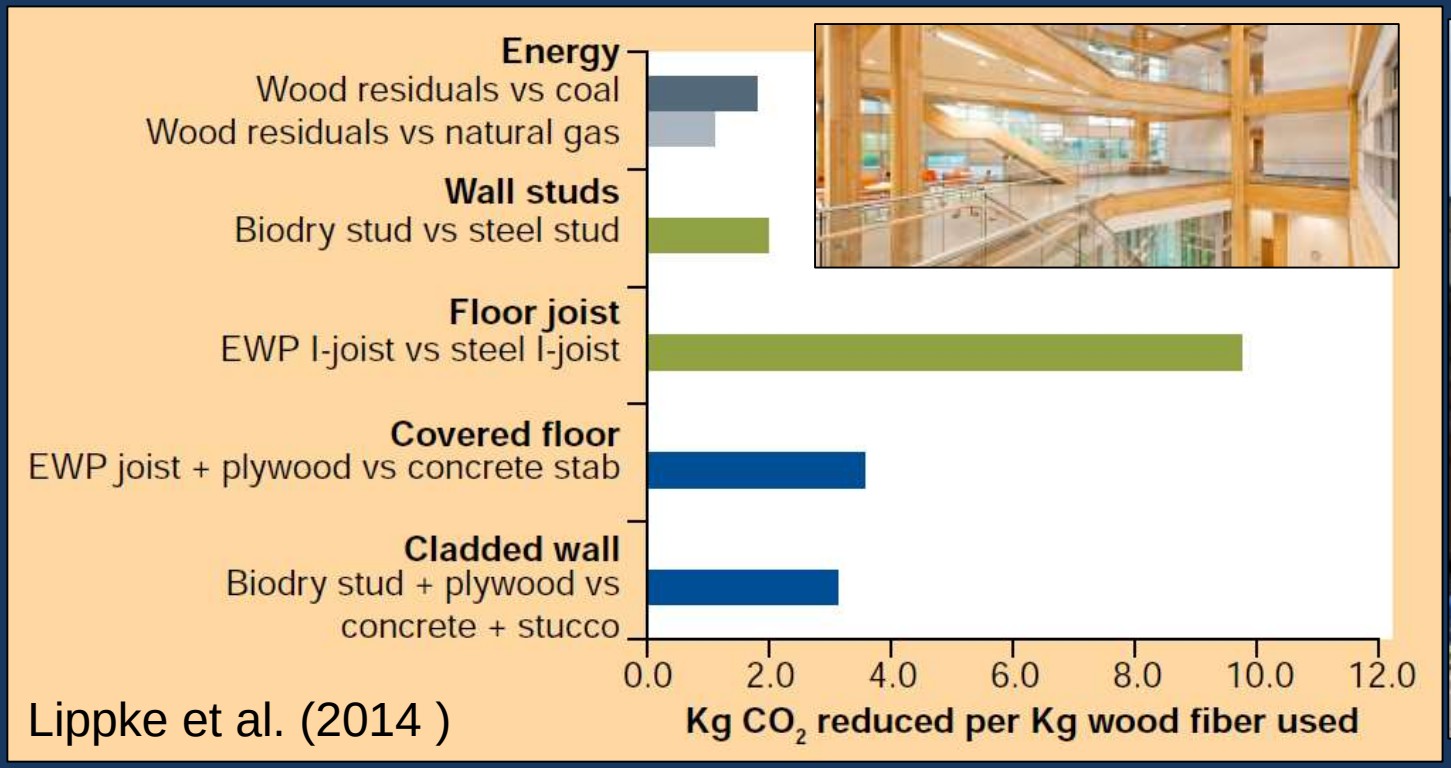
- Illusion remains with all states, but Maine consuming more than they locally produce



# Addressing regional and global forest inequities

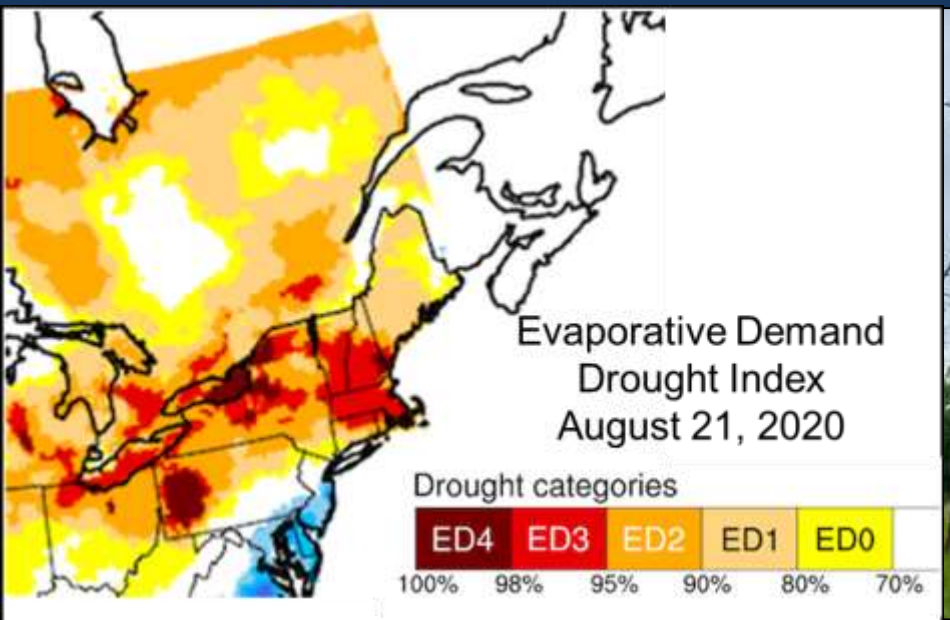
- Reduce consumption
- Recognize and incentivize substitution benefits from local wood
- Retain local markets to sustain workforce and communities needed to meet long-term economic and ecological goals



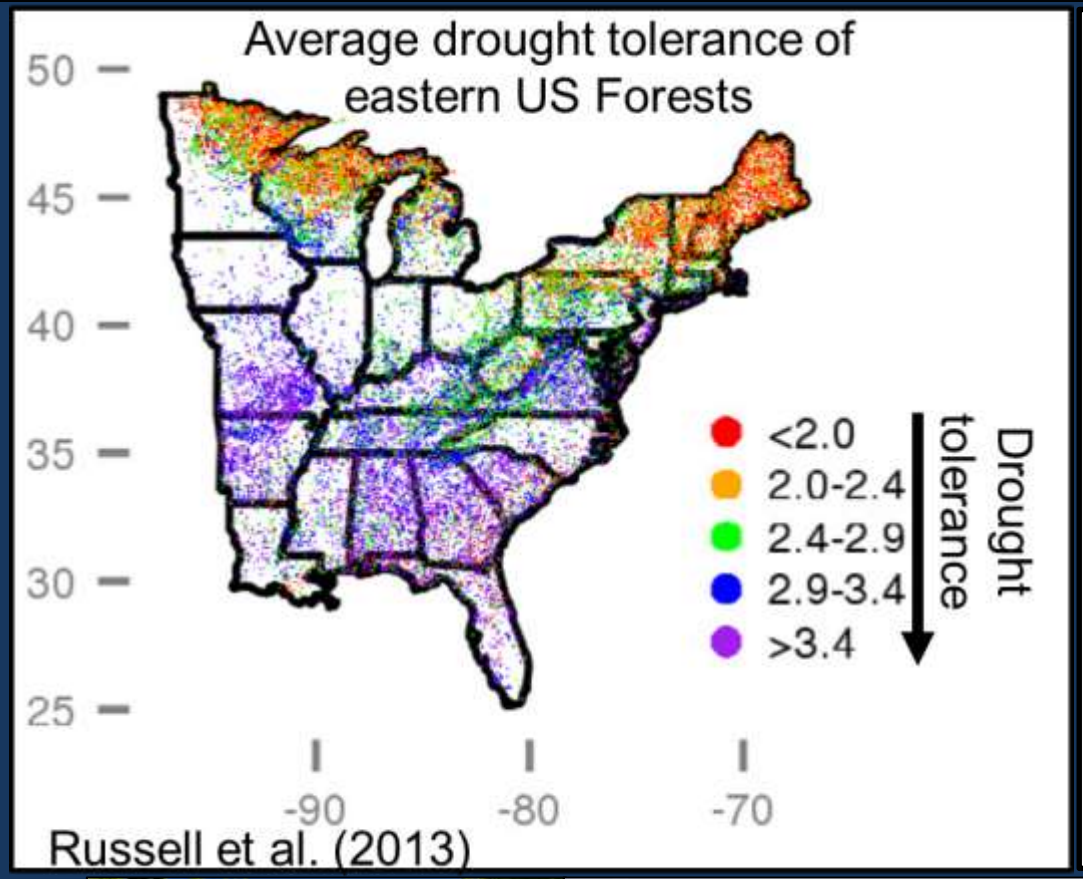

Lippke et al. (2014 )

# Sustaining Vermont's forests into the future

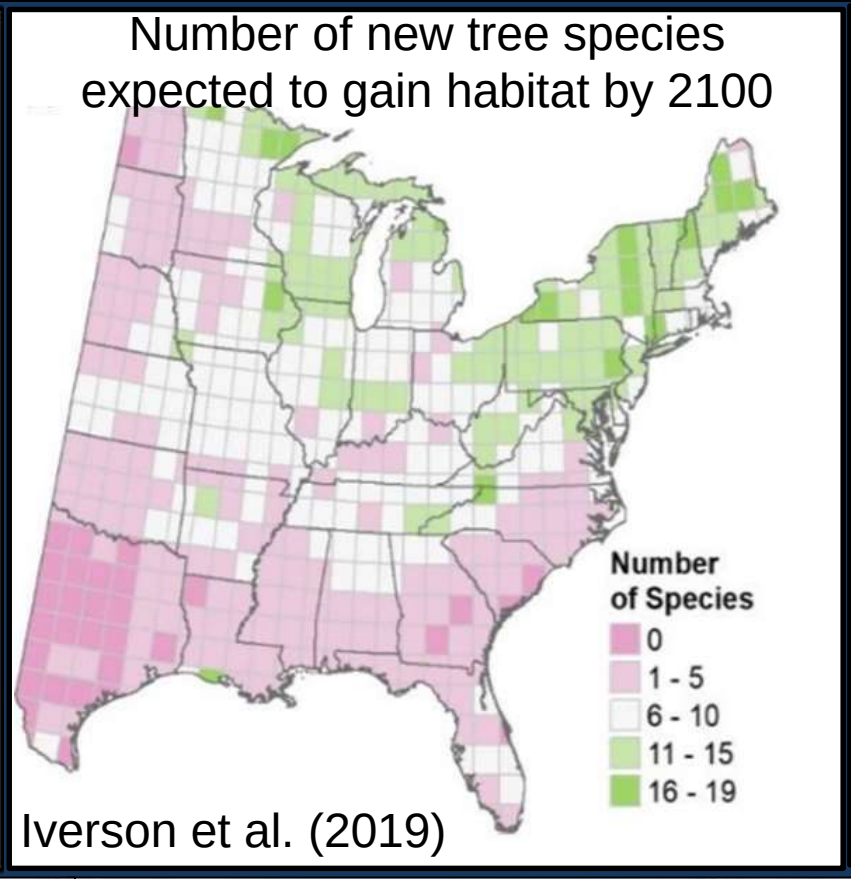
- Beyond conservation and economic benefits, local markets provide options for adaptation to an increasingly novel environment



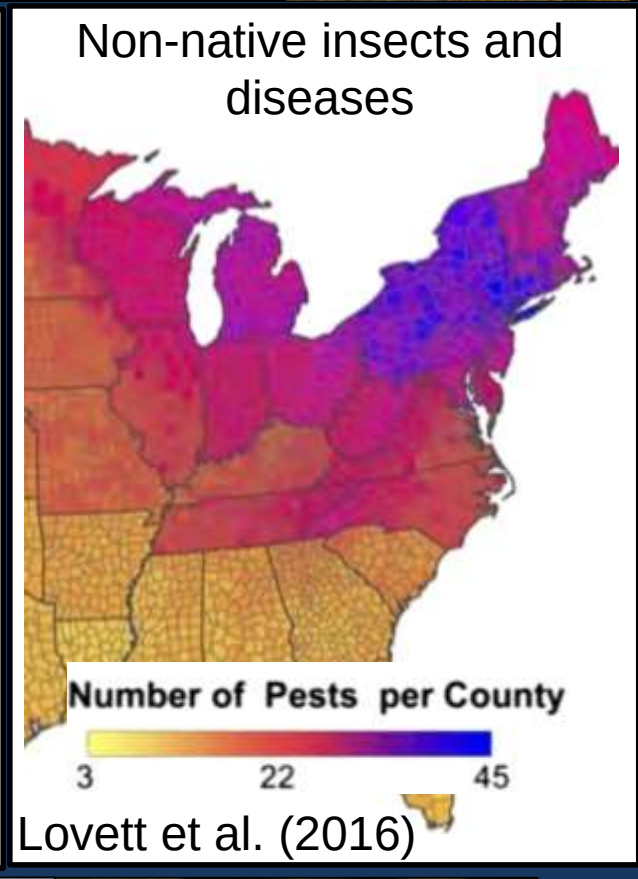

# Sustaining Vermont's forests into the future




Russell et al. (2013)




Iverson et al. (2019)



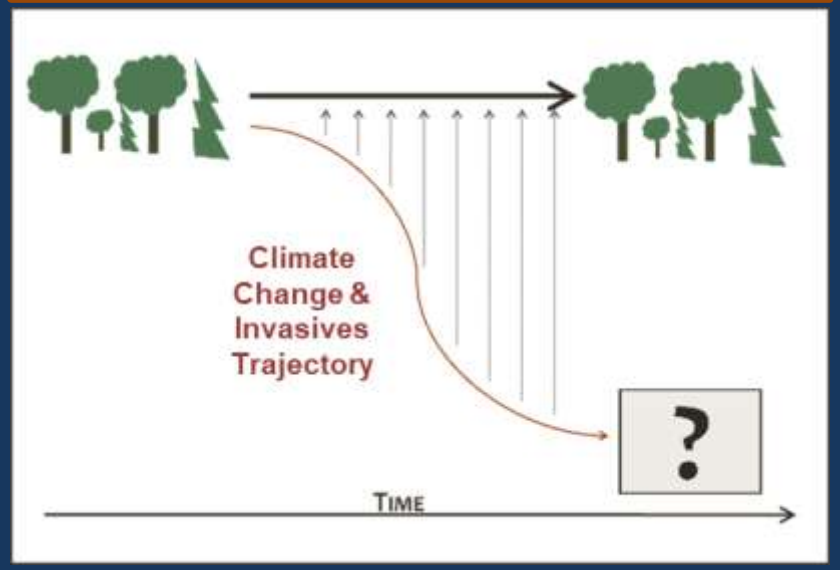

Lovett et al. (2016)

# Sustaining Vermont's forests into the future

## General adaptation options proposed for climate change and invasives

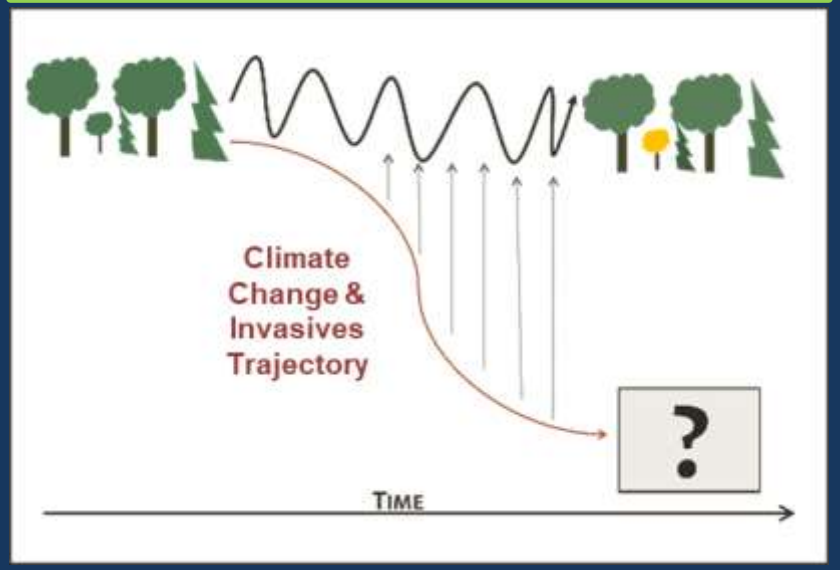
Nagel et al. (2017); Adapted from Millar et al. (2008)

### RESISTANCE



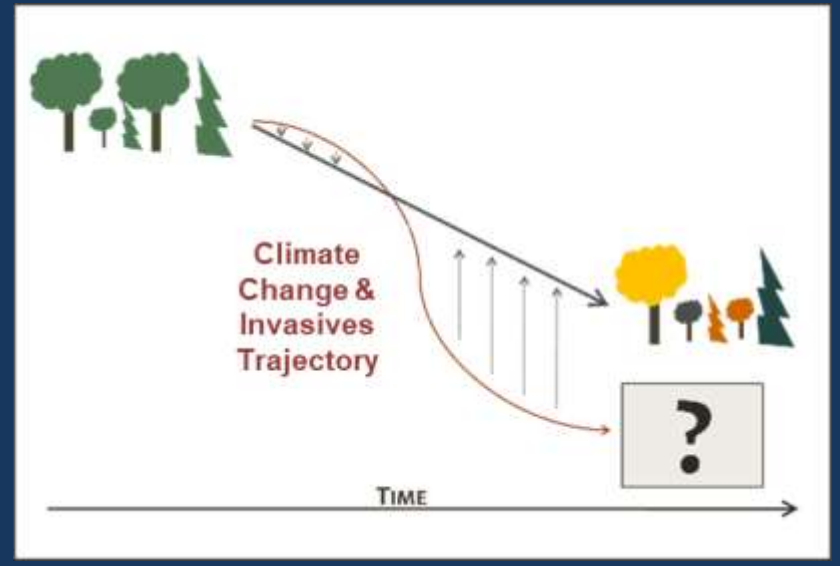

**Improve forests defenses against predicted changes or disturbance to maintain relatively unchanged conditions**

### RESILIENCE




**Accommodate some change, but encourage a return to prior or desired reference condition following disturbance**

### TRANSITION




**Facilitate change and encourage ecosystems to adaptively respond to new or changing conditions**

All of these adaptation options rely on ability to conduct forest management

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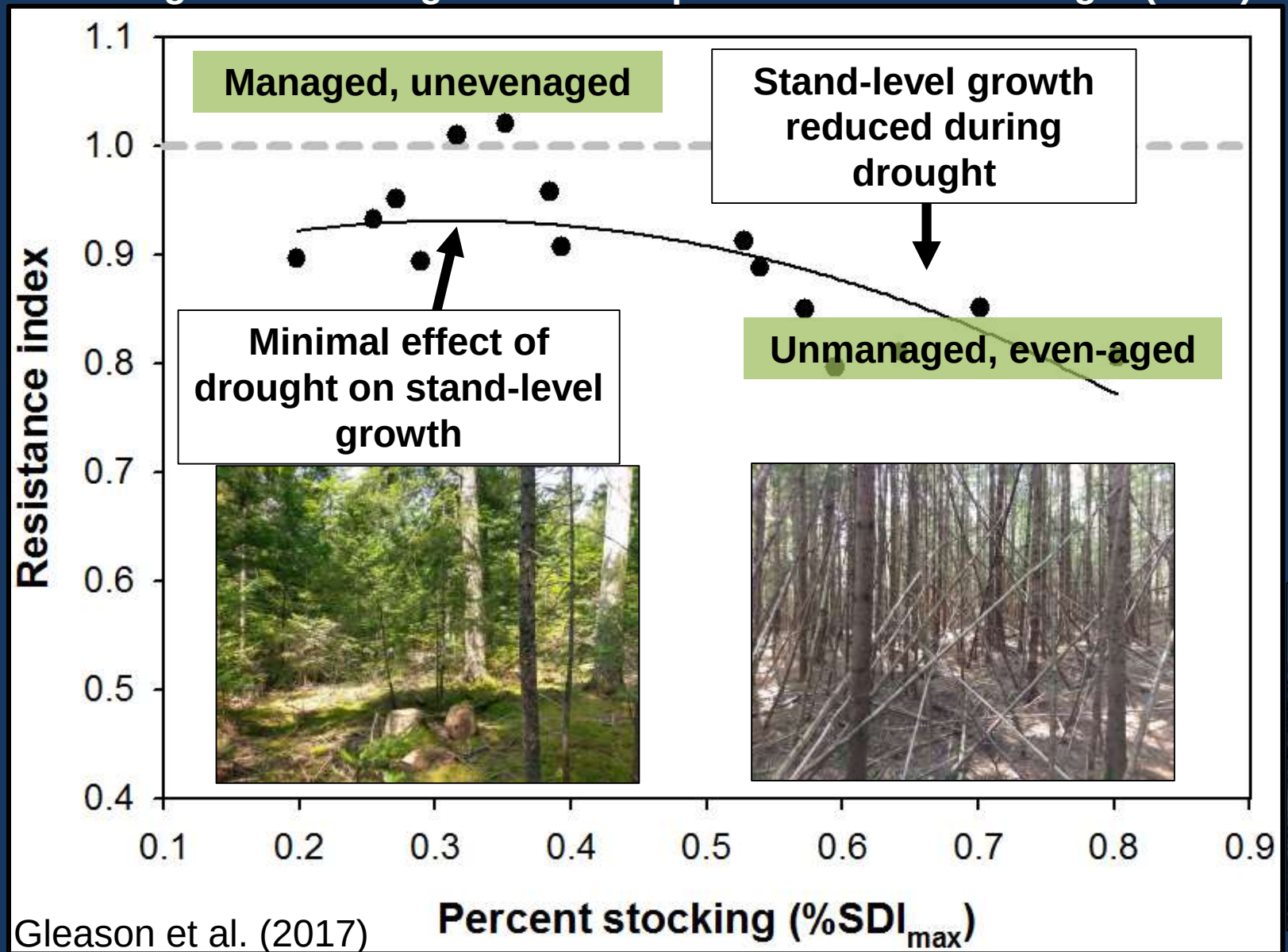
**Unmanaged and managed forest response to historic drought (2001)**




Gleason et al. (2017)

- Adaptation strategies recognize importance of complex forest conditions in providing pathways for resilience and adaptation
- Rely on ecological silviculture strategies that restore and enhance complexity of VT forests

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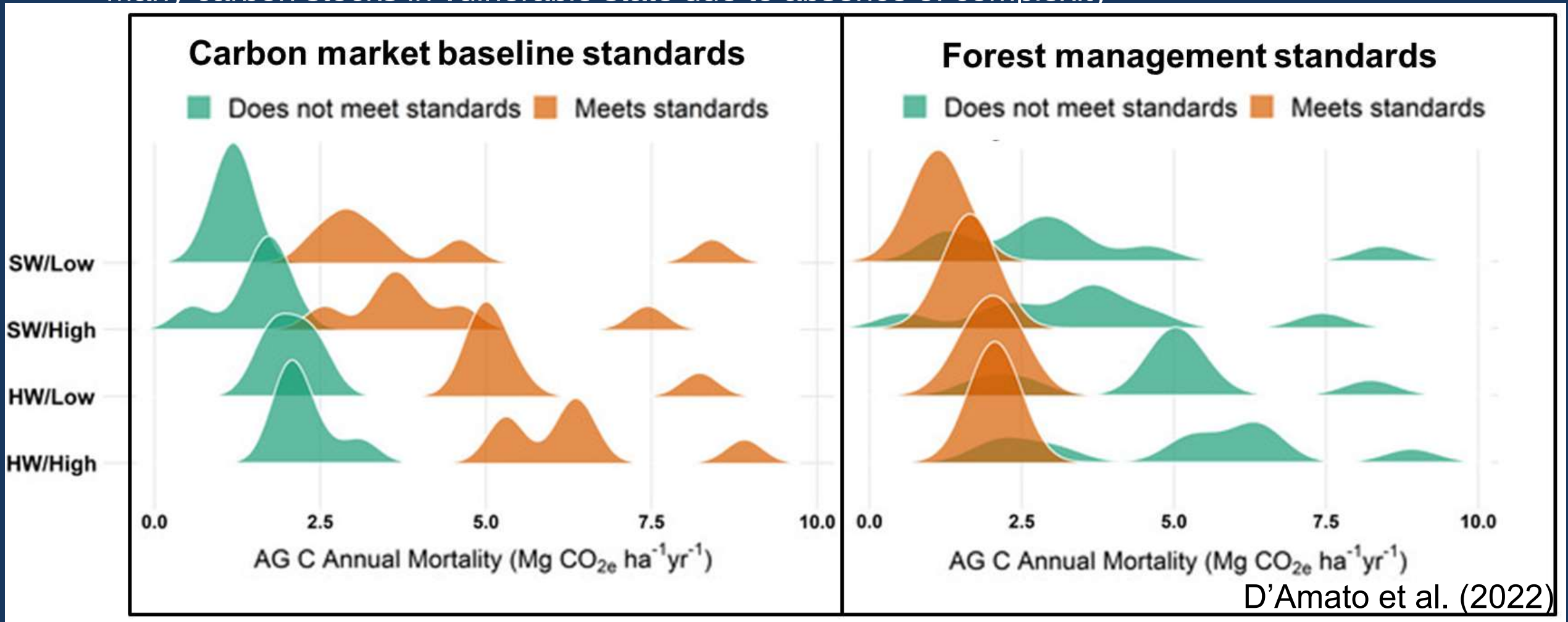
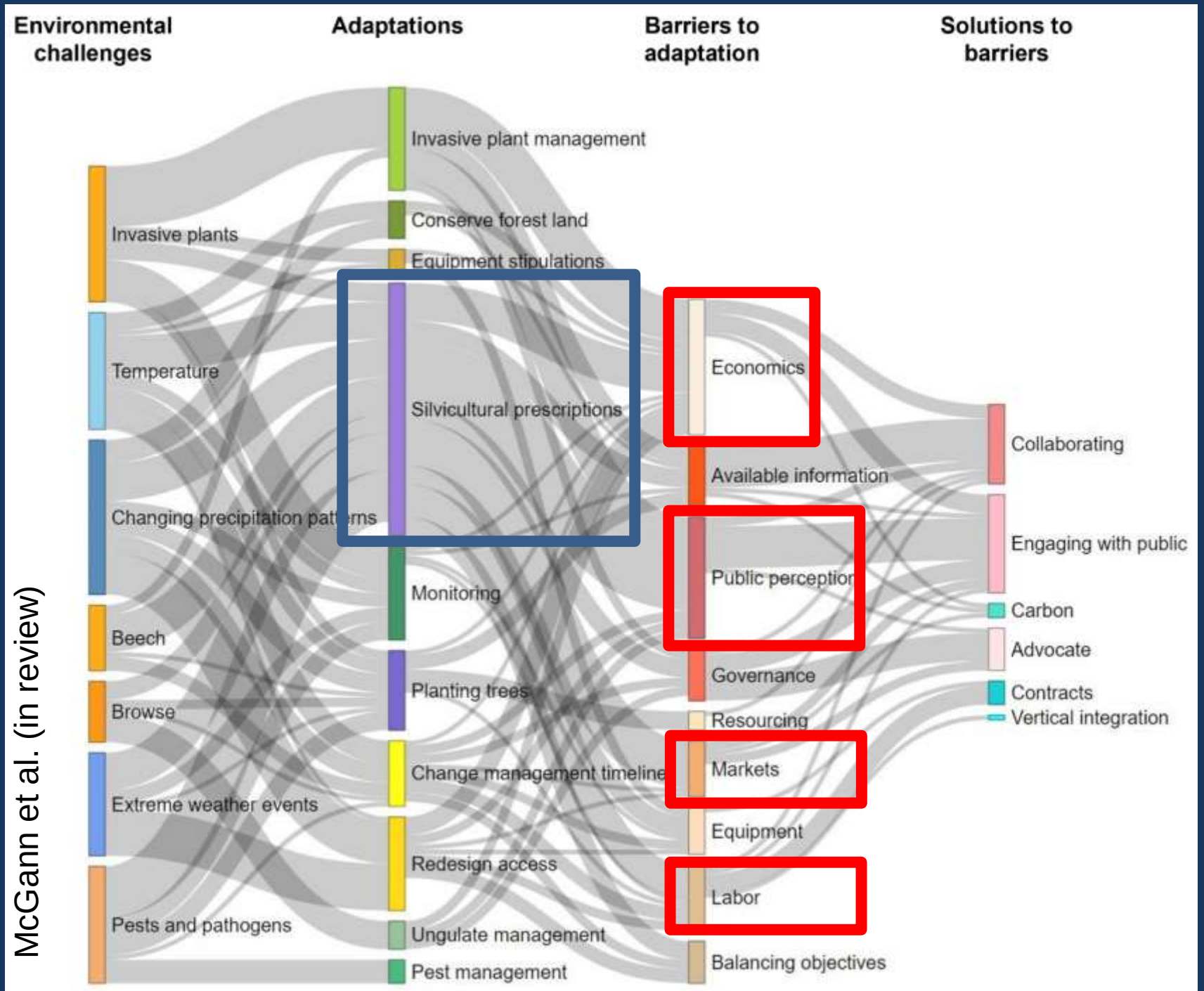
- Long-term stability of forest carbon benefits requires consideration of factors conferring resilience in dynamic systems
  - Many carbon stocks in vulnerable state due to absence of complexity




D'Amato et al. (2022)




McGann et al. (in review)

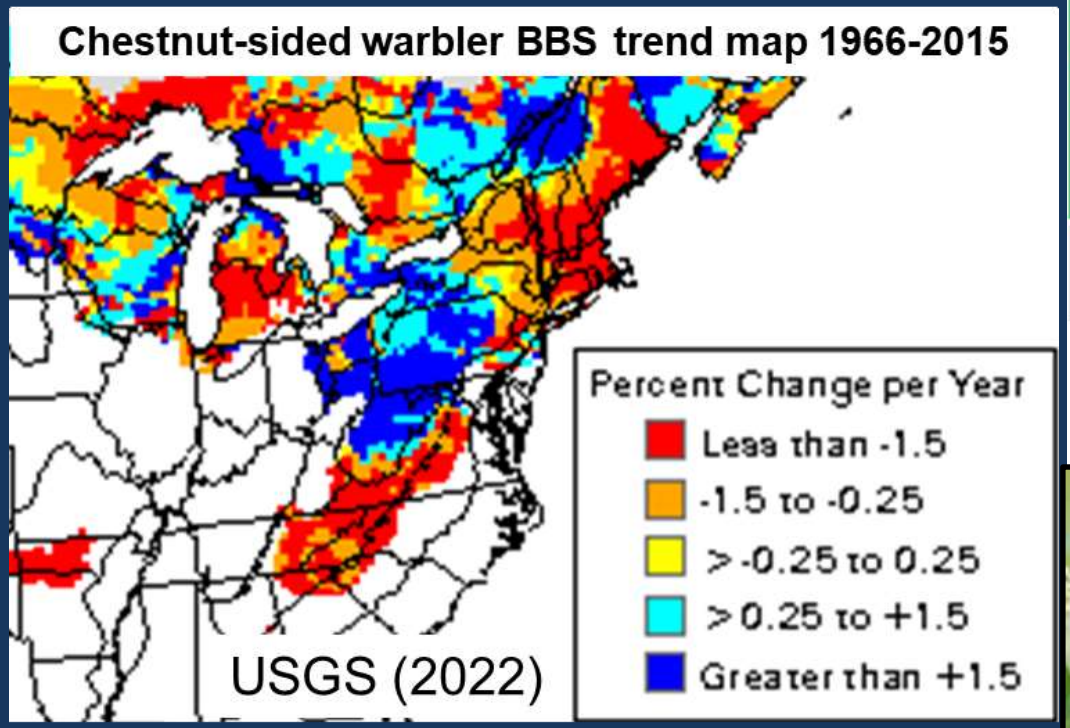
# What is currently limiting forest adaptation in VT?

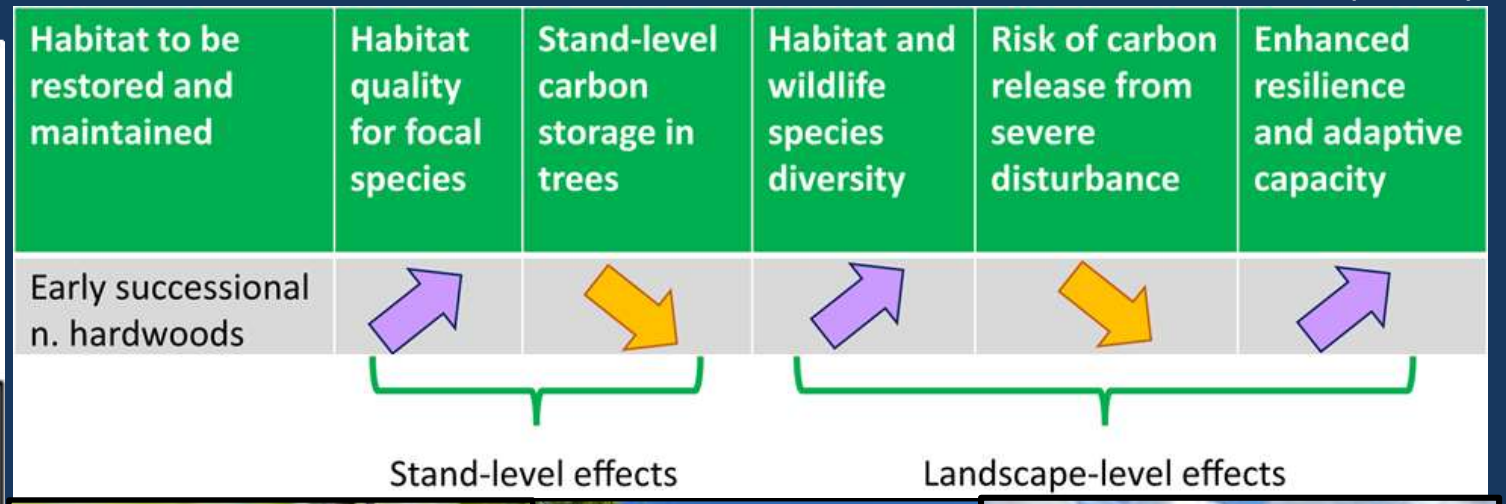
- Lack of knowledge on best adaptation practices secondary to constraints posed by limited markets and increasing public opposition to management

# Sustaining Vermont's forests into the future

- Dynamic and multidimensional nature of forests and associated values and benefits should prevent singular focus on any one objective (with recognition of tradeoffs where present)

Littlefield and D'Amato (2022)




# Tradeoffs and compatibility between objectives across adaptive, ecological silvicultural systems

**Unharvested and single-tree selection**

- Highest levels of carbon storage
- Greatest abundance of interior species
- Lowest levels of adaptation potential

**Group selection/irregular shelterwood**

- Lower levels of carbon storage
- Greatest abundance of young forest species
- Greater levels of adaptation potential

Wikle et al. (unpublished)

# Conclusions

- Forests have outsized importance to Vermont's climate future, but these benefits are threated by permanent conversion to non-forest and global change impacts
- Resilience to changing climate not only requires diversity of forest and landscape conditions, but also diversity of markets to sustain forest-dependent communities and options for adaptation
- Connections between local markets, our consumptive demands, and the role of ecological and adaptive forest management for addressing diverse goals and challenges are key to ensuring Vermont's future forests are resilient, healthy, and just