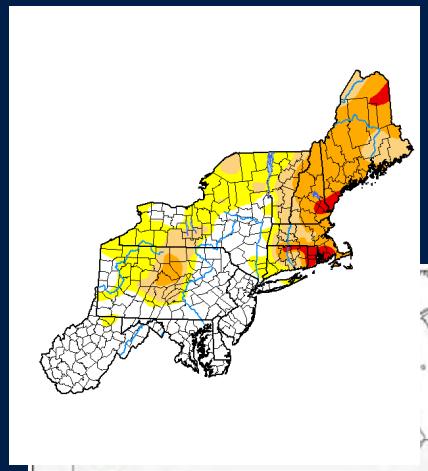
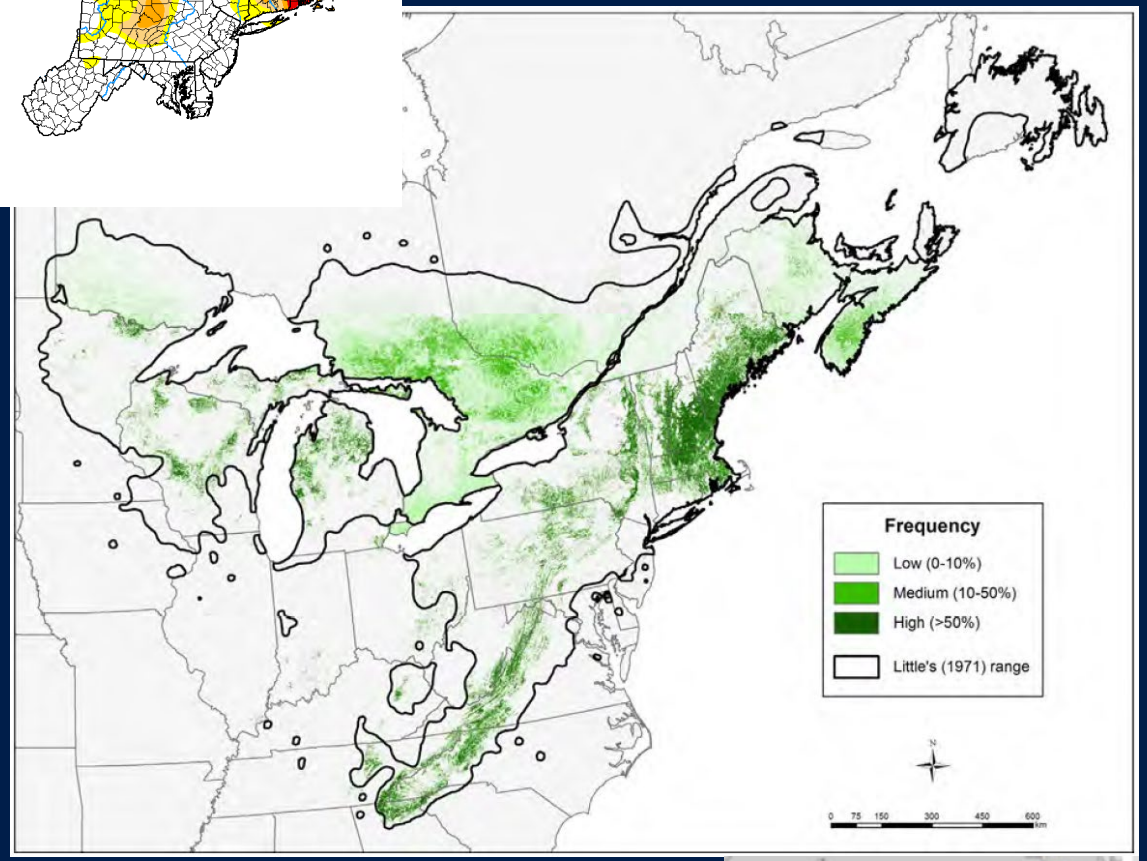
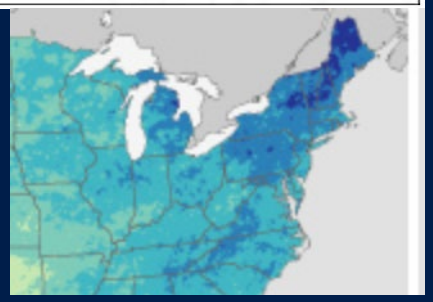






Eastern White Pine Management Institute

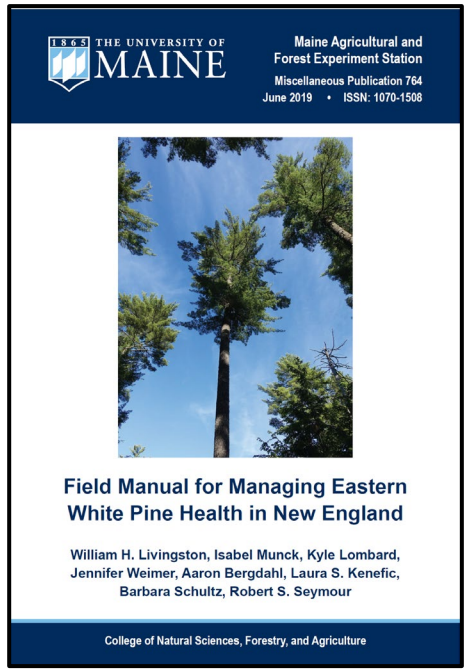
Eastern White Pine Symposium: Review of Part 1

Dr. William H. Livingston
School of Forest Resources
University of Maine

1865 THE UNIVERSITY OF MAINE

Eastern White Pine Management Institute

- https://extension.unh.edu/natural-resources/forests-trees/woodlot-management/eastern-white-pine-management-institute
- Expand existing knowledge on eastern white pine management
- Make available trainings and resources to natural resource professionals
- Next Symposium and Field Workshop, June 23-24, Concord, NH
  - Speakers on managing EWP in Virginia and North Carolina



Symposium/Workshop on the Management & Health of Eastern White Pine
March 23-24, NESAF Winter Meeting
June 23-24, 2022, Concord, NH

Isabella Munck	USFS, Durahm, NH	Field parameters associated with severity of Caliciopsis symptoms and white pine needle damage (WPND).
William Livingston	University of Maine,	Updates on insect pests of eatern white pine, including southern pine beetle outbreak in NC in 2000
Cameron McIntire	USFS, Durahm, NH	Drought and Eastern White Pine Health
Gregory Edge	Wisconsin Dept of Natural Resources	Eastern White Pine Management in Wisconsin: Use of patch cuts for regeneration (remote presentation)
Robert Cole & Jessica Cancelliere	NY Department of Env. Conserv.	Eastern White Pine Management in New York: Forest Conditions and Management Activities
Nicholas Brazee	University of Massachusetts	Eastern White Pine Management in Massachusetts: The Urban/Rural Interface
Robert Seymour	University of Maine	Eastern White Pine Management in Maine
Steven roberge & Karen Bennett	University of New Hampshire	Eastern White Pine Management in New Hampshire
William Livingston	University of Maine	Eastern White Pine: Past, Present, and Future

Symposium/Workshop on the Management & Health of Eastern White Pine

March 23-24, NESAF Winter Meeting

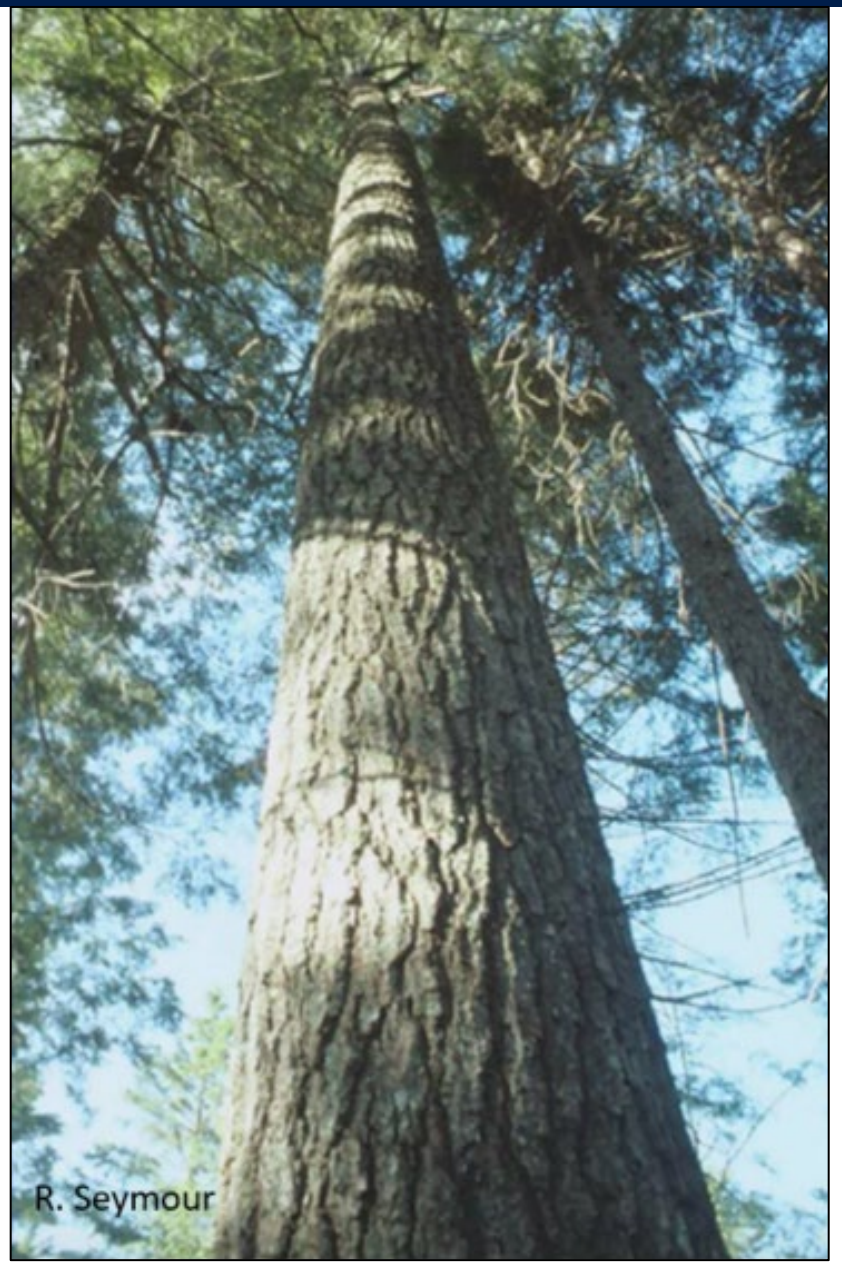
June 23-24, 2022, Concord, NH

Zach Olinger	VA Dept. of Forestry	Eastern White Pine Management in Virginia.
Jim Phillips	Avery Timber Resources	White Pine Markets and Management of Natural Regeneration in North Carolina
		Reports of EWP management from other locations
George Weir	Consulting Forester	Managing Eastern White Pine on Woodlots in Southern Vermont
	Durgin & Crowell Lumber Co	Tour of White Pine Mill
	Mast Yard State Forest	Workshop on recognizing and quantifying white pine needle damage and Caliciopsis symptoms
	Bear Brook State Park	Workshop on low density management of white pine

Symposium Proceedings to be published by the Center for Research on Sustainable Forests, University of Maine

Eastern White Pine

- One of most ecologically, culturally, and economically important conifer species in eastern North America
- “Super” dominant in the forest stands
- Impacted by human use for centuries
- A model species to demonstrate benefits of a managed forest



Key Sources For Talk

Forest Ecology and Management 423 (2018) 3–17

Contents lists available at ScienceDirect

Forest Ecology and Management

journal homepage: www.elsevier.com/locate/foreco

A synthesis of emerging health issues of eastern white pine (*Pinus strobus*) in eastern North America☆

Kara K.L. Costanza[a,*], Thomas D. Whitney[b], Cameron D. McIntire[c], William H. Livingston[a], Kamal J.K. Gandhi[b]

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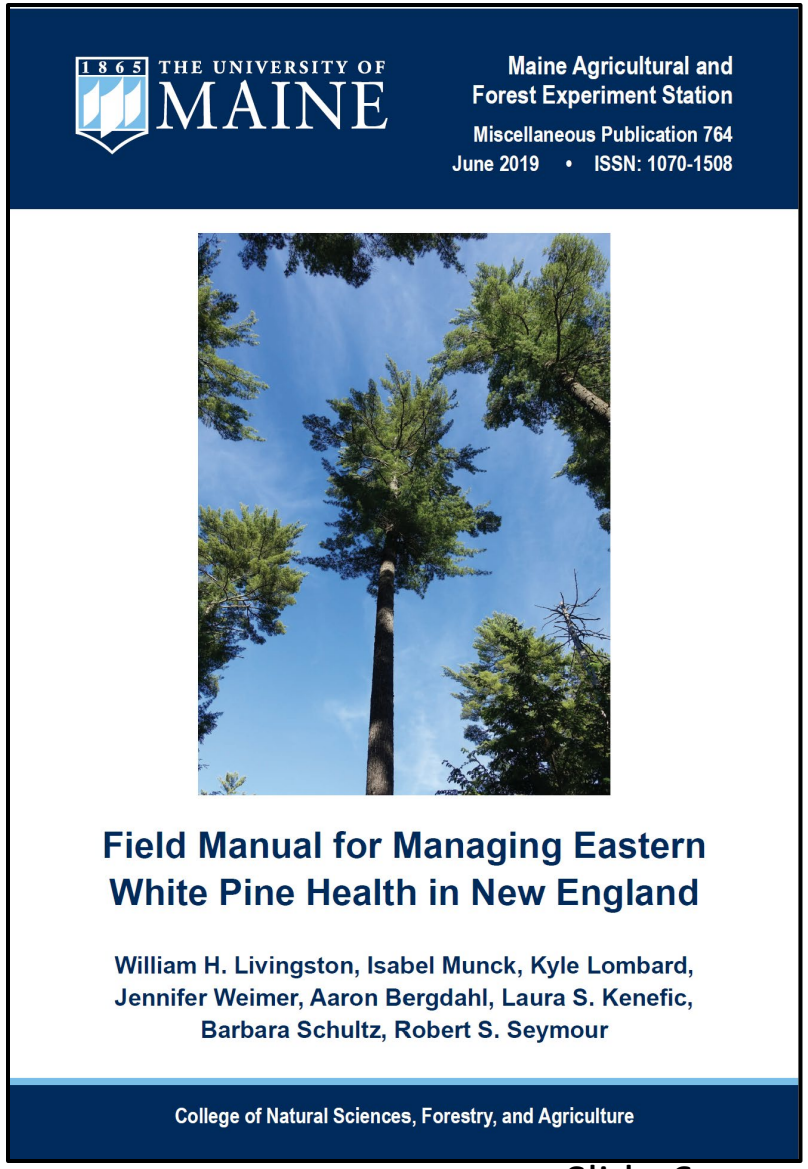
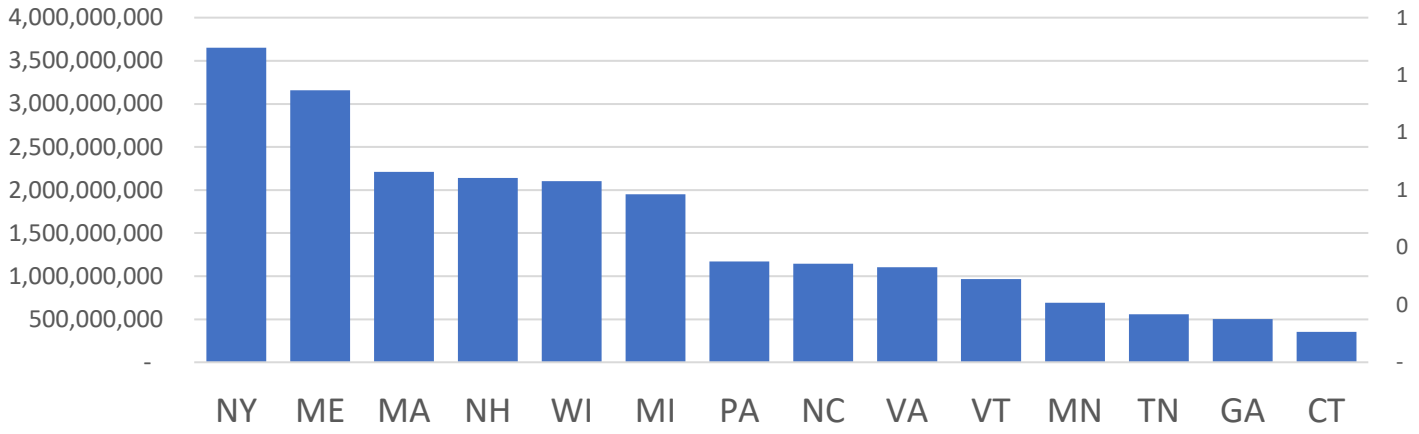
[b] D.B. Warnell School of Forestry and Natural Resources, University of Georgia, 180 E. Green Street, Athens, GA 30602, United States
[c] University of New Hampshire, Natural Resources and the Environment, 56 College Road, Durham, NH 03824, United States

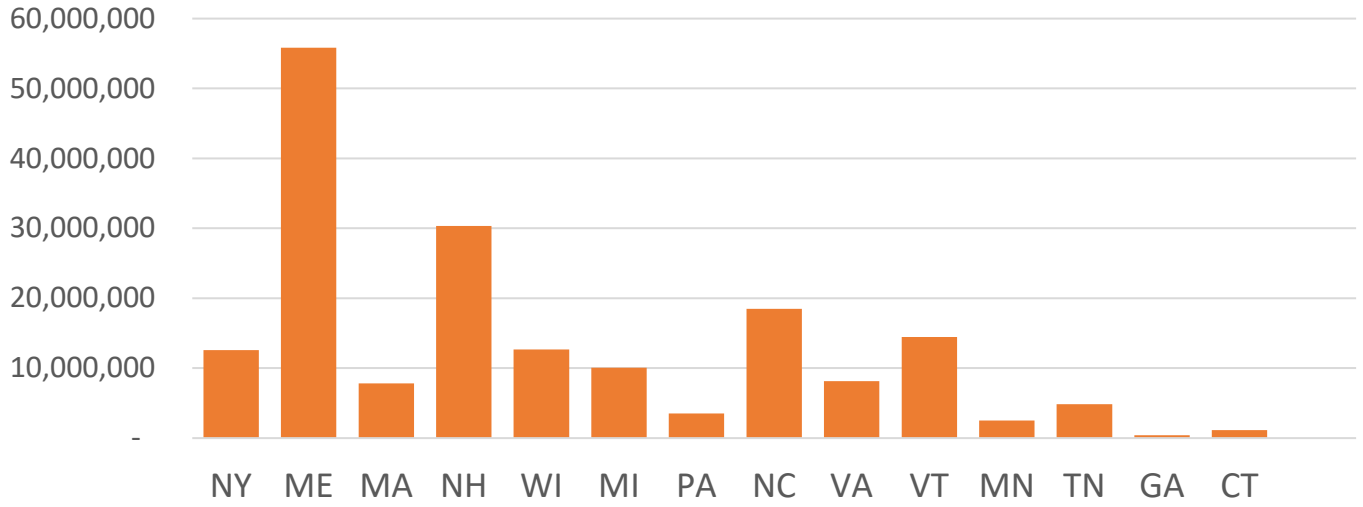


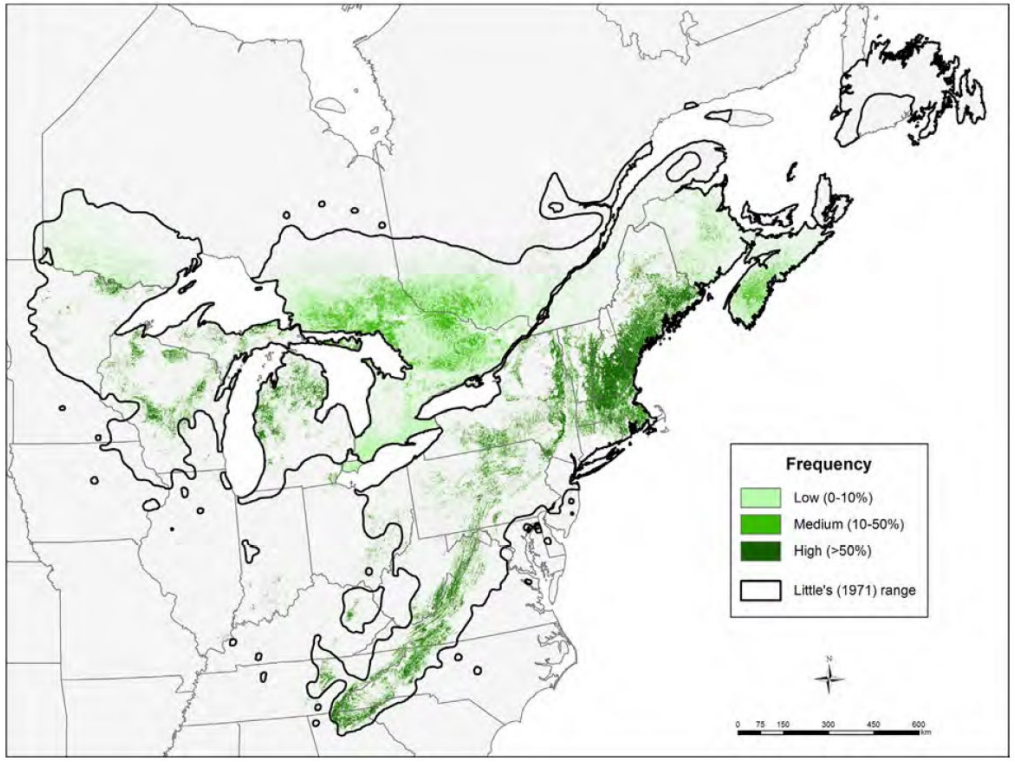
Current Status of Eastern White Pine

Net **merchantable bole volume** of live trees (at least 5 inches d.b.h./d.r.c.), in cubic feet, on forest land



Average annual **harvest removals** of sound bole volume of trees (at least 5 inches d.b.h./d.r.c.), in cubic feet, on forest land





0.65% annual mortality

Eastern White Pine Management Institute

Growth Rates

- Northeast:
  - Site indexes of 50-90 at 50 yr
  - 6,600 cu ft after 40 yr in the northeast
- Southeast
  - Site indexes of 60-130 at 50 yr,
  - Volume of 11,000 cu ft after 35 yr

Spruce Pine, NC

White pine provenance trial in Manistique, Michigan. Photo by Ron Zalesny, US Forest Service

Why the Difference?

- Soils? – Sandy loams in both locations
- Summer temperatures the same
- Precipitation similar in VA, more in NC
- Likely longer growing season in fall
- Warmer winters and less snowfall – soil temperatures

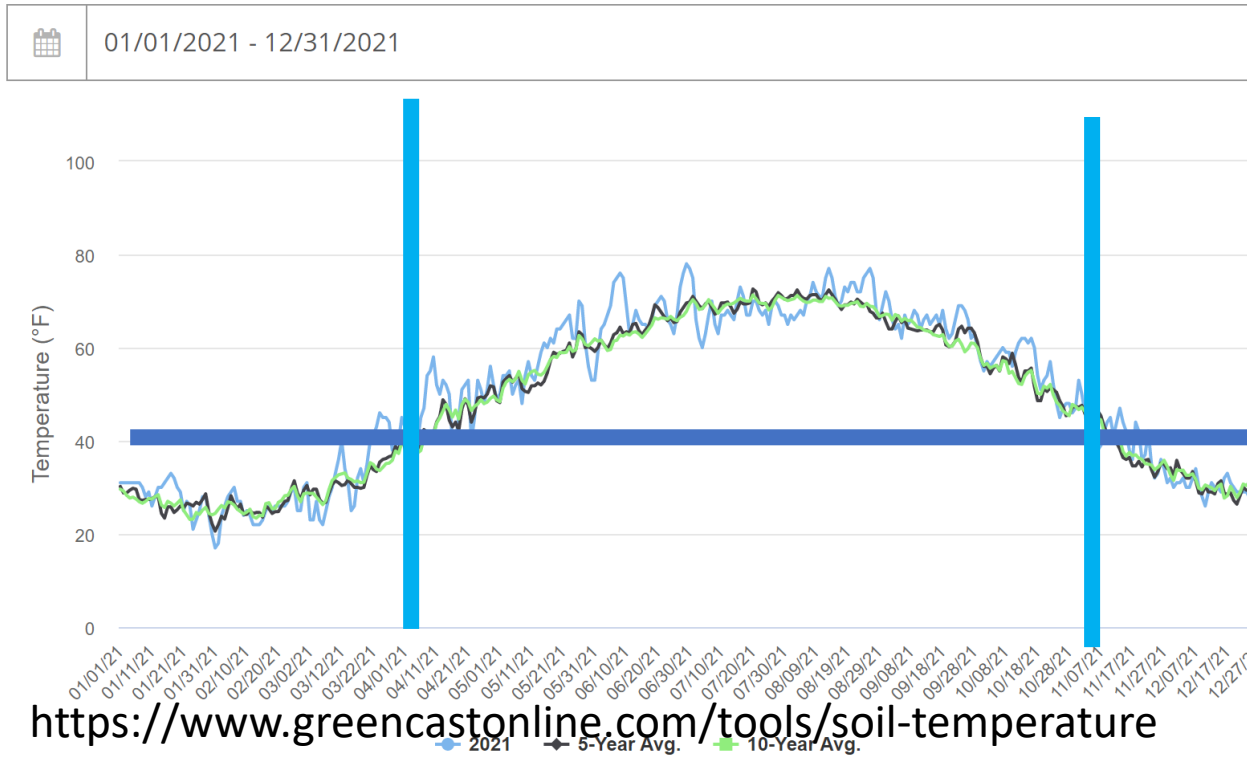
Location	July high avg	January low avg	Annual precip. avg	Total Snow Accum. Avg.	Last spring frost	First fall frost
Augusta, ME	79	8	44	67	May 1	Oct 1
Galax, VA	82	21	43	16	Apr 29	Oct 11
Spruce Pine, NC	81	22	53	13	Apr 29	Oct 11

https://www.greencastonline.com/tools/soil-temperature

Why the Difference in Growth Rates?

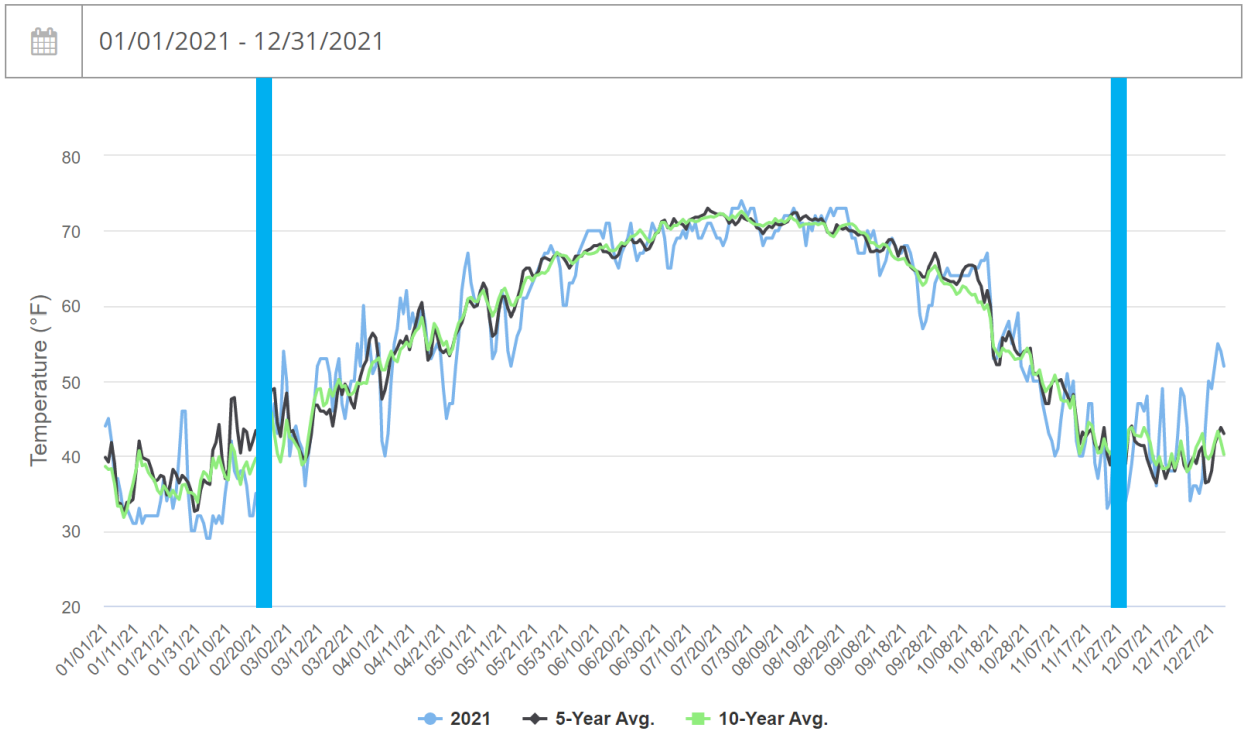
- **Soil temperatures >40F needed for significant root activity**
  - Augusta >40F April 1 to November 1: 7 months
  - Spruce Pine >40F March 1 to December 1 – 9 months, two more months of root activity
  - Both locations reach 70 F in summer

Average Soil Temperature in Augusta, ME



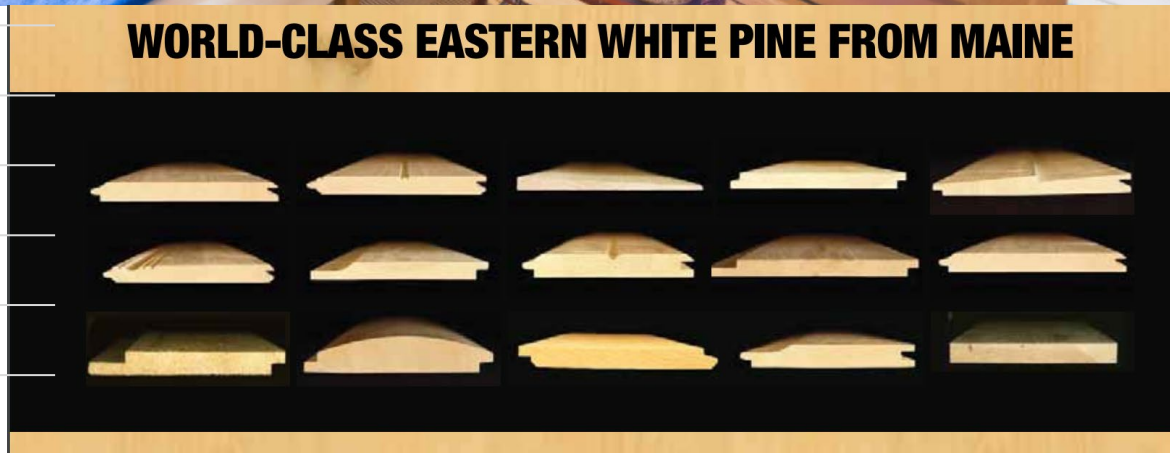
https://www.greencastonline.com/tools/soil-temperature

Average Soil Temperature in Spruce Pine, NC

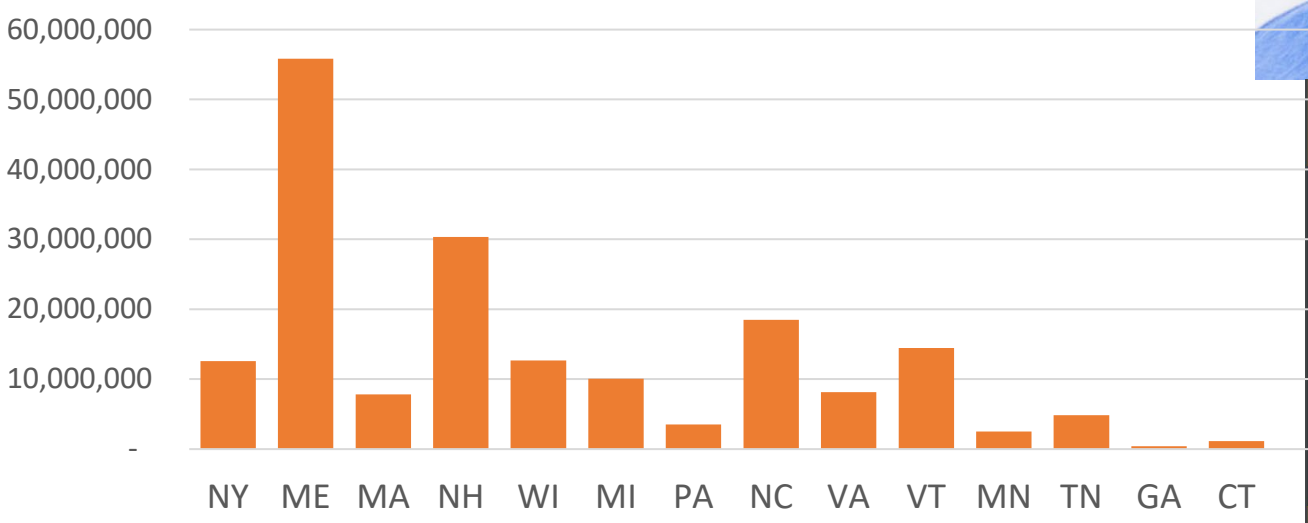


Markets in New England

- Sawtimber stumpage: $50-$550
  - NELMA grades give a premium
- Smaller: $0 or biomass



Average annual **harvest removals** of sound bole volume of trees (at least 5 inches d.b.h./d.r.c.), in cubic feet, on forest land



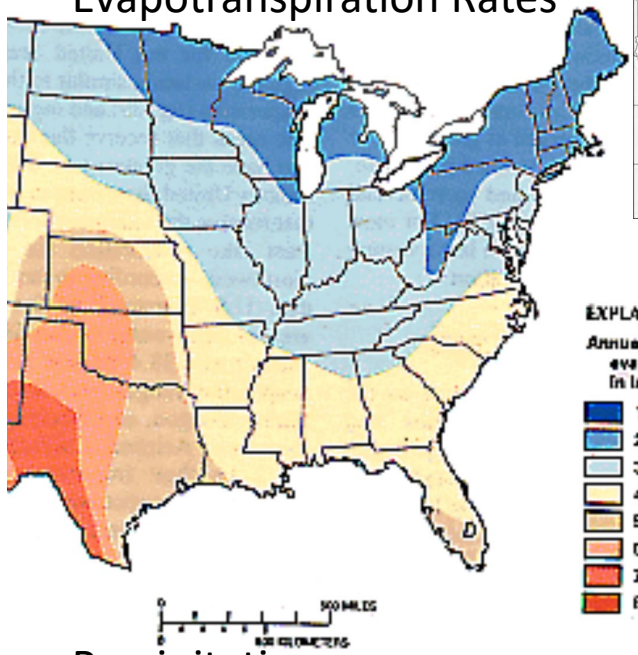
Stresses, Risk Factors, and Management

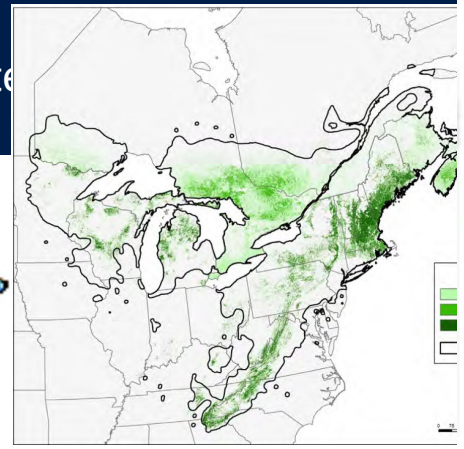
Stresses	Risk Factors	Management
White pine weevil	Full sunlight favors thick leaders on regeneration	Regeneration under partial shade • Less sun, small diameter leaders • Less dew High sapling density – straighter trees, less Ribes
White pine blister rust	Ribes, moist conditions	
Decline: Competition, drought Pine bast scale Caliciopsis cankers Bark beetles	Soil restrictions < 30 cm Abandoned fields Dense pole-size stands	Site selection – sandy loam: Minimize hardwoods Avoid shallow roots
White pine needle damage	Wet springs	Low-density management Less competition stress Crowns dry-out faster

Future Climate & EWP

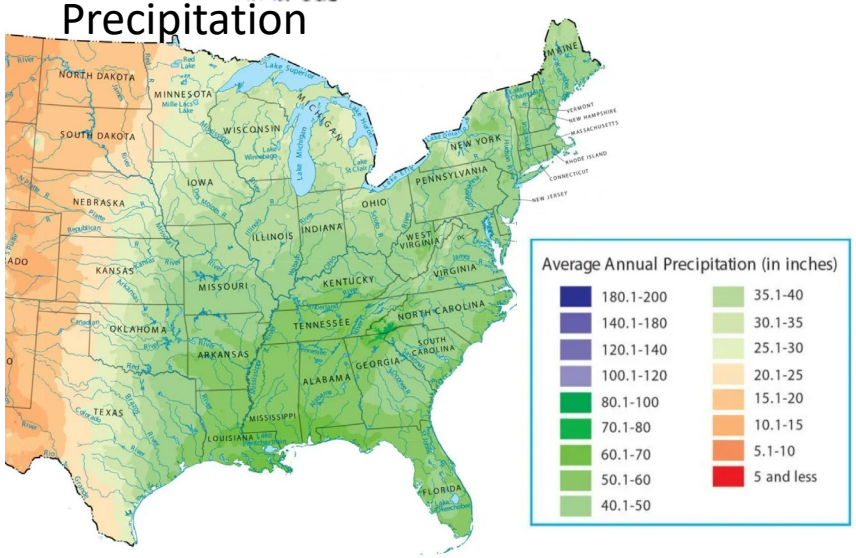
- EWP most common where evapotranspiration rate (ER) is 20-30 inches/year
- EWP needs precipitation > ER
- Predicting warmer summers with more precipitation.
  - Because of higher ER, more vulnerable to drought
  - Use low density management to reduce risk of decline

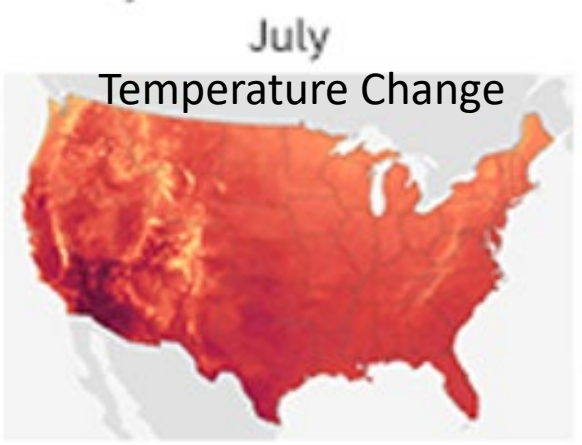
Evapotranspiration Rates



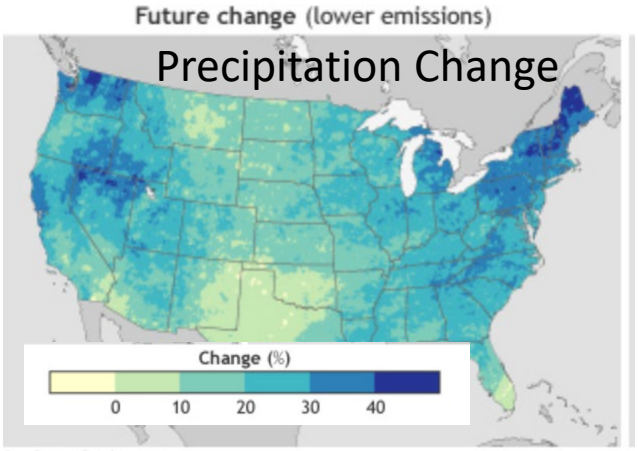


Precipitation





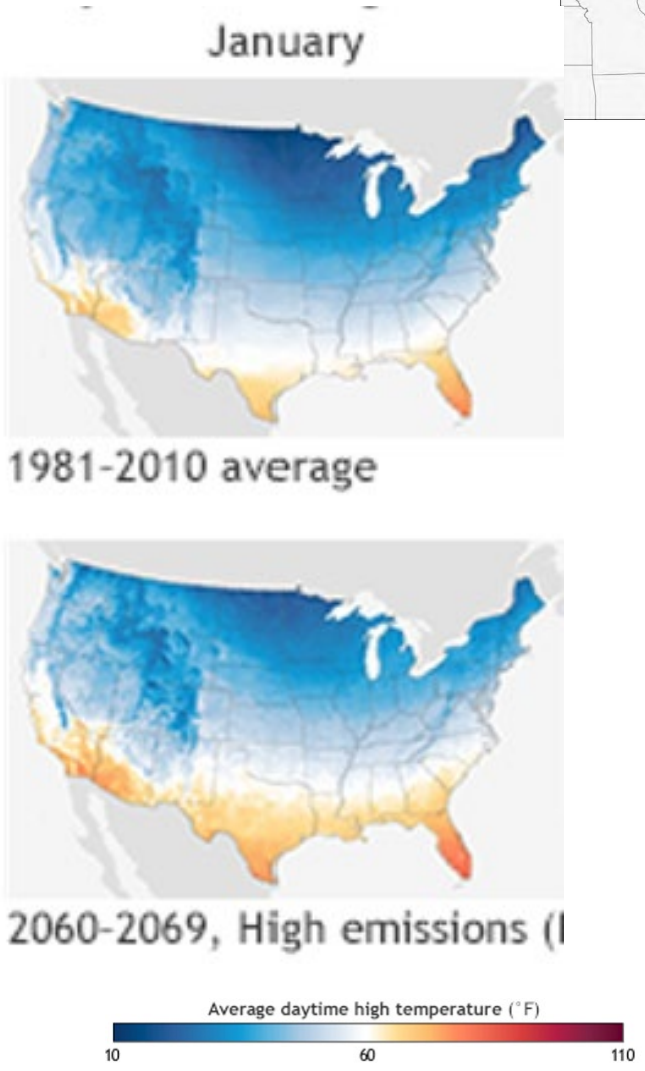
Climate.gov

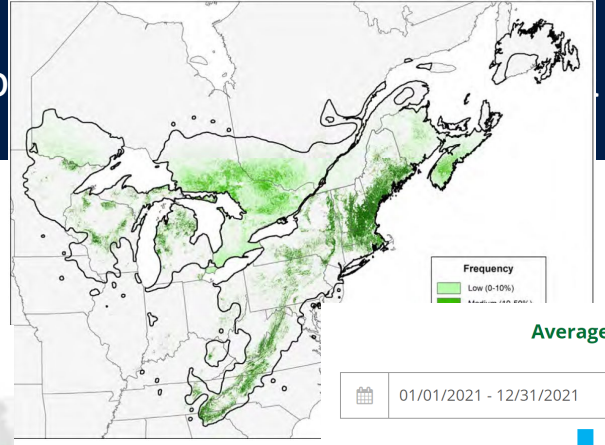


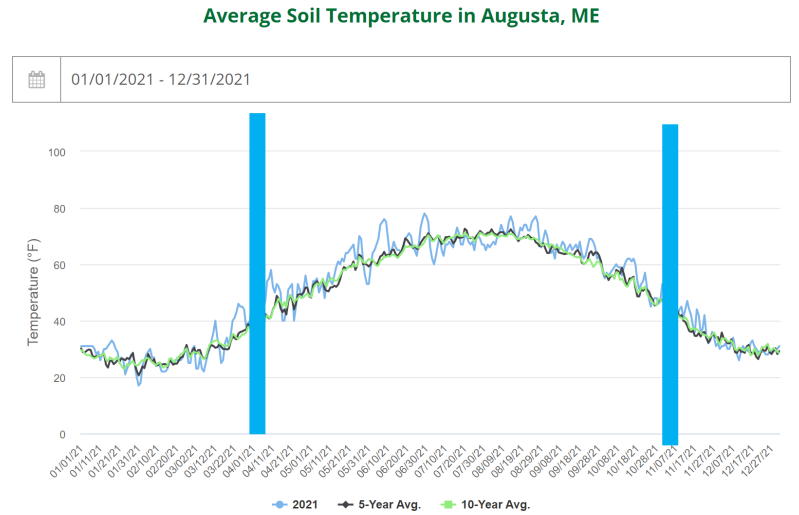
Future Climate & EWP

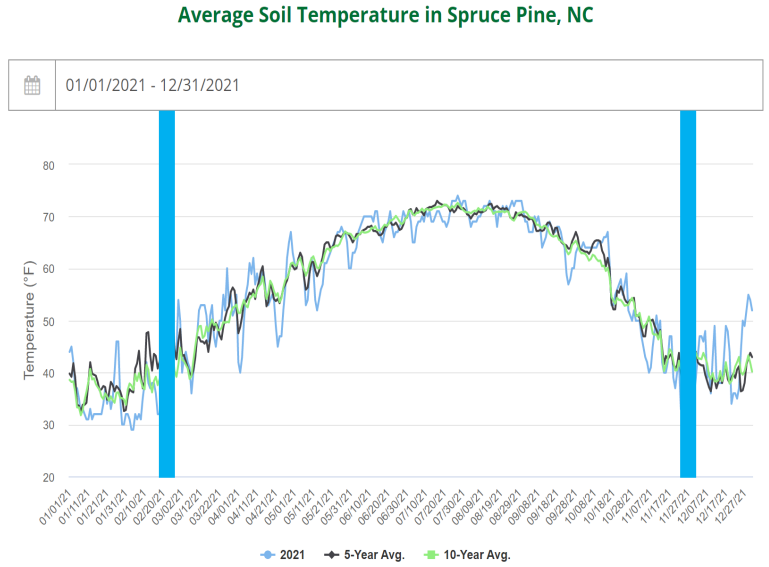
- Warmer winters
  - Less weevil risk
  - Increased wood production
  - More southern pine beetle risk
  - Use low density management to reduce risk of decline

Temperature Change

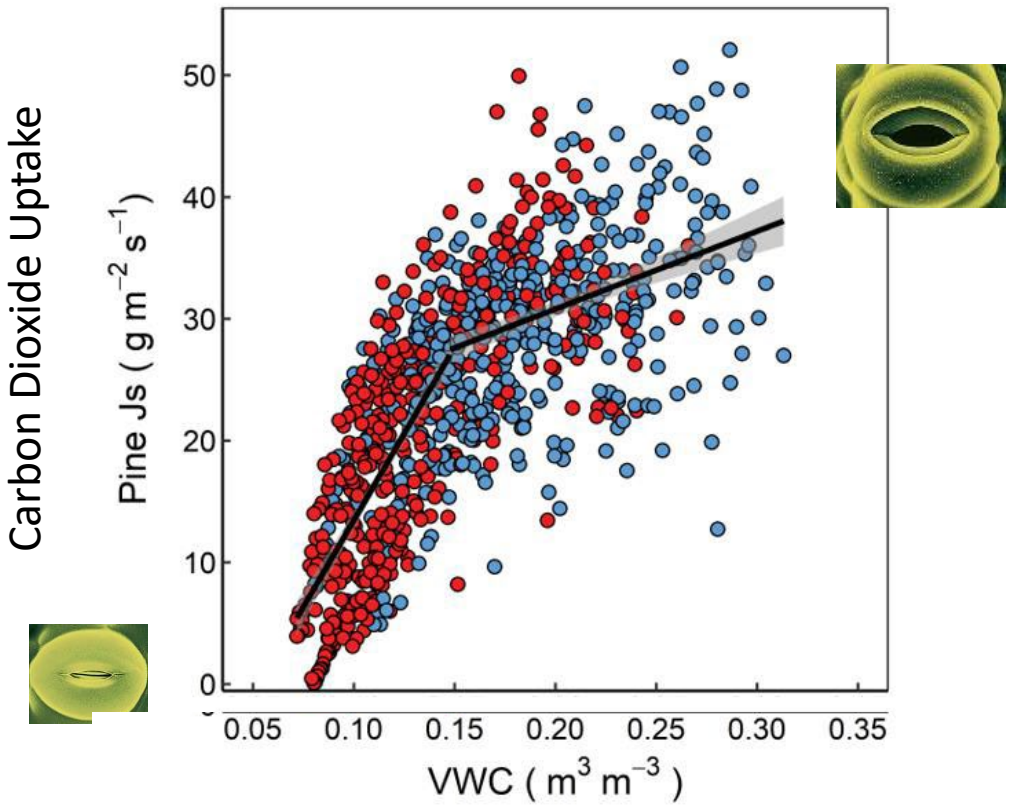




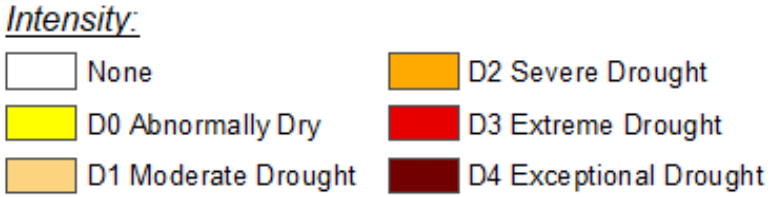


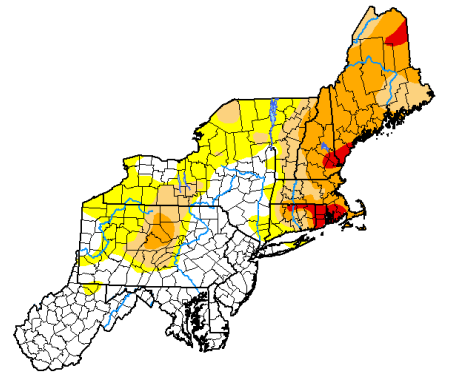


Drought – (from Cameron McIntire)



U.S. Drought Monitor
September 22, 2020



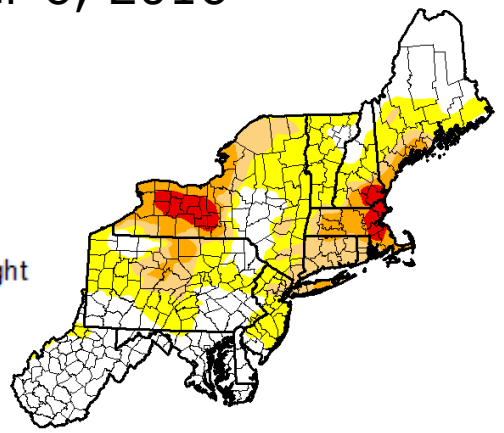


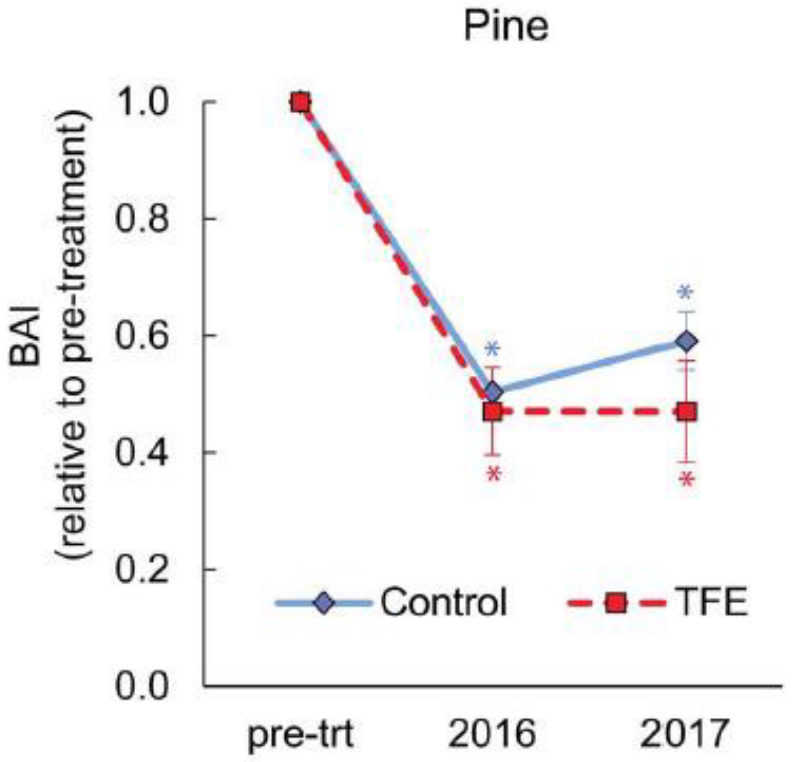
- **White Pine is sensitive to soil water availability**
- •Soil water content threshold of 14.7% -begins to reduce water usage (moderate drought)
- •Stomata close to reduce water loss at the expense of C uptake
- •Otherwise, water use is largely regulated by atmospheric demand

Impacts

- Pine BAI declined ~50% during the 2016 drought
- Increased risk to other health factors

U.S. Drought Monitor
September 6, 2016

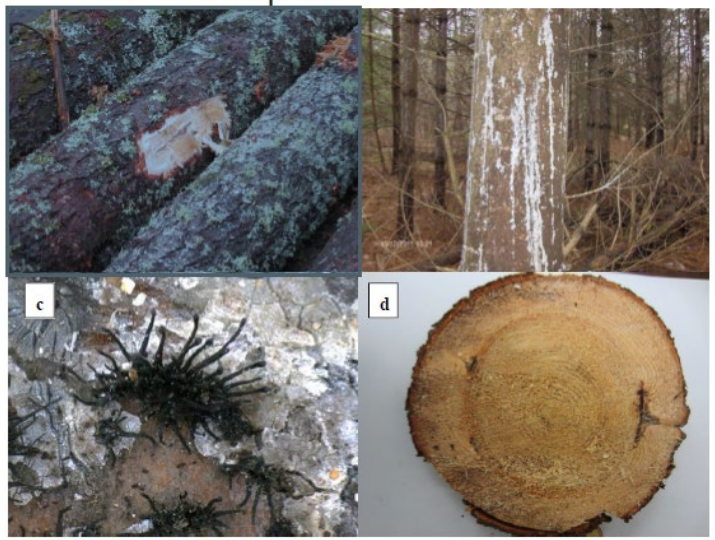




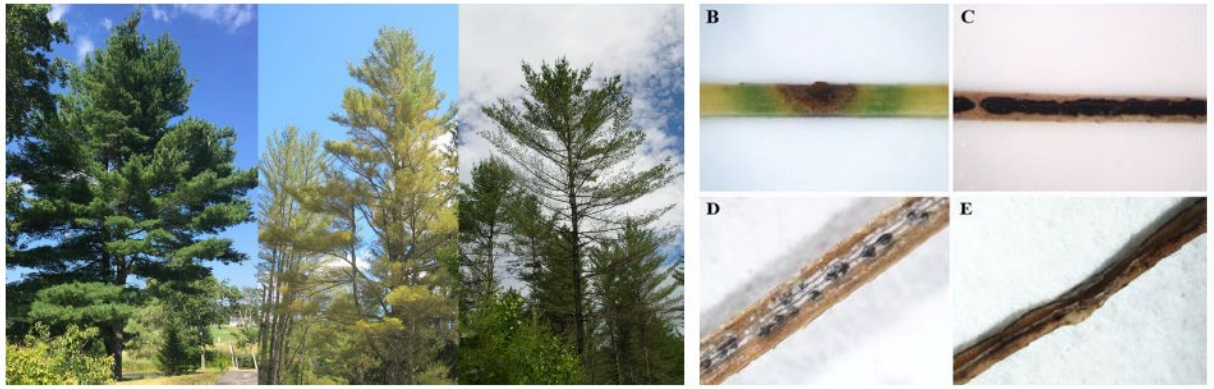
Caliciopsis Canker & WP Needle Damage

- Caliciopsis Canker
  - Loss of wood quality (up to 1/3 value)
  - Component in 50% mortality in high-risk EWP stands after drought
- WP Needle Damage
  - Loss of needles in June/July
  - Complex of 4 fungal pathogens
  - Favored by wet Junes
  - Growth loss 25-73%

Caliciopsis canker

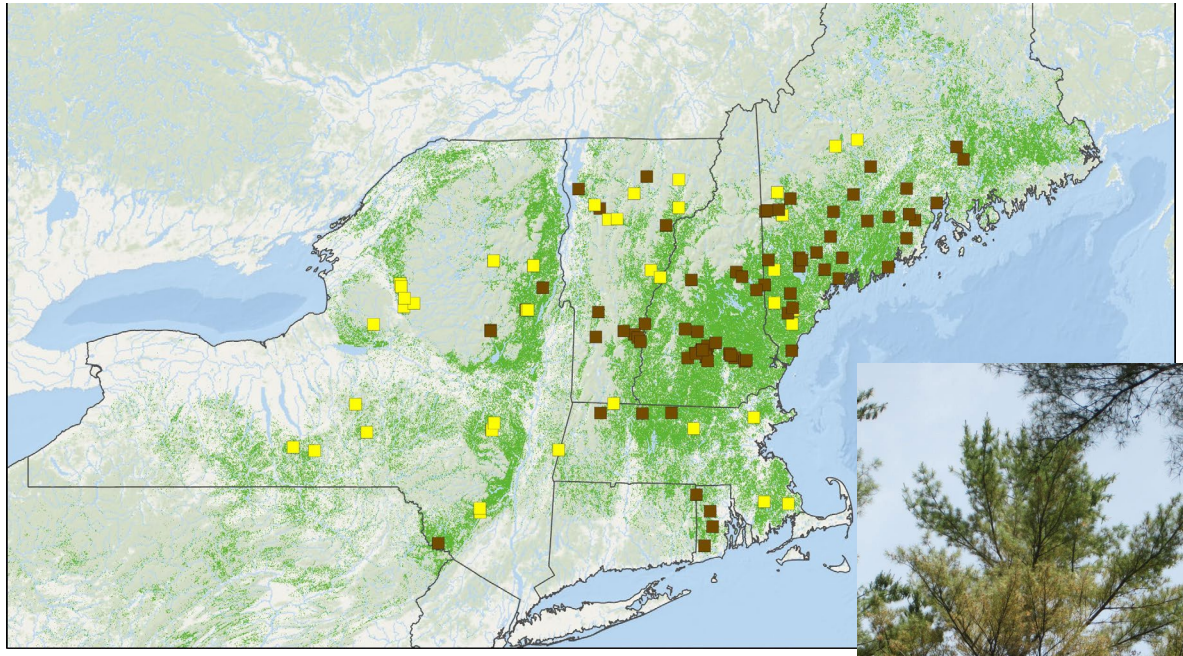


White Pine Needle Damage (WPND)= complex of foliar diseases



Caliciopsis Canker & WP Needle Damage from Isabella Munck

- Surveyed 122 stands and 4,419 trees
- •95% of the stands had WPND symptoms
  -more symptoms, thinner crowns
  •71% of the stands had Caliciopsis canker symptoms
  - Higher WP basal area, more symptoms



WP Weevil and Southern Pine Beetle

- Weevil attacks cause the greatest damage in more northern locations - 42-100% of trees, starting a 3 ft high
- Weevils are **almost non-existent in the southern part** of the range of white pine
- Why?

Climate Differences between Maine and VA/NC White Pine Regions

Location	July high avg	January low avg	Annual precip. avg	Total Snow Accum. Avg.	Last spring frost	First fall frost
Augusta, ME	79	8	44	67	May 1	Oct 1
Galax, VA	82	21	43	16	Apr 29	Oct 11
Spruce Pine, NC	81	22	53	13	Apr 29	Oct 11

- Warmer winters (not summers) and less snow in south
- 1-2 weeks longer growing season in south
- Increased winter mortality of white pine weevil?
  - More predation
  - More likely to starve with warmer temperatures

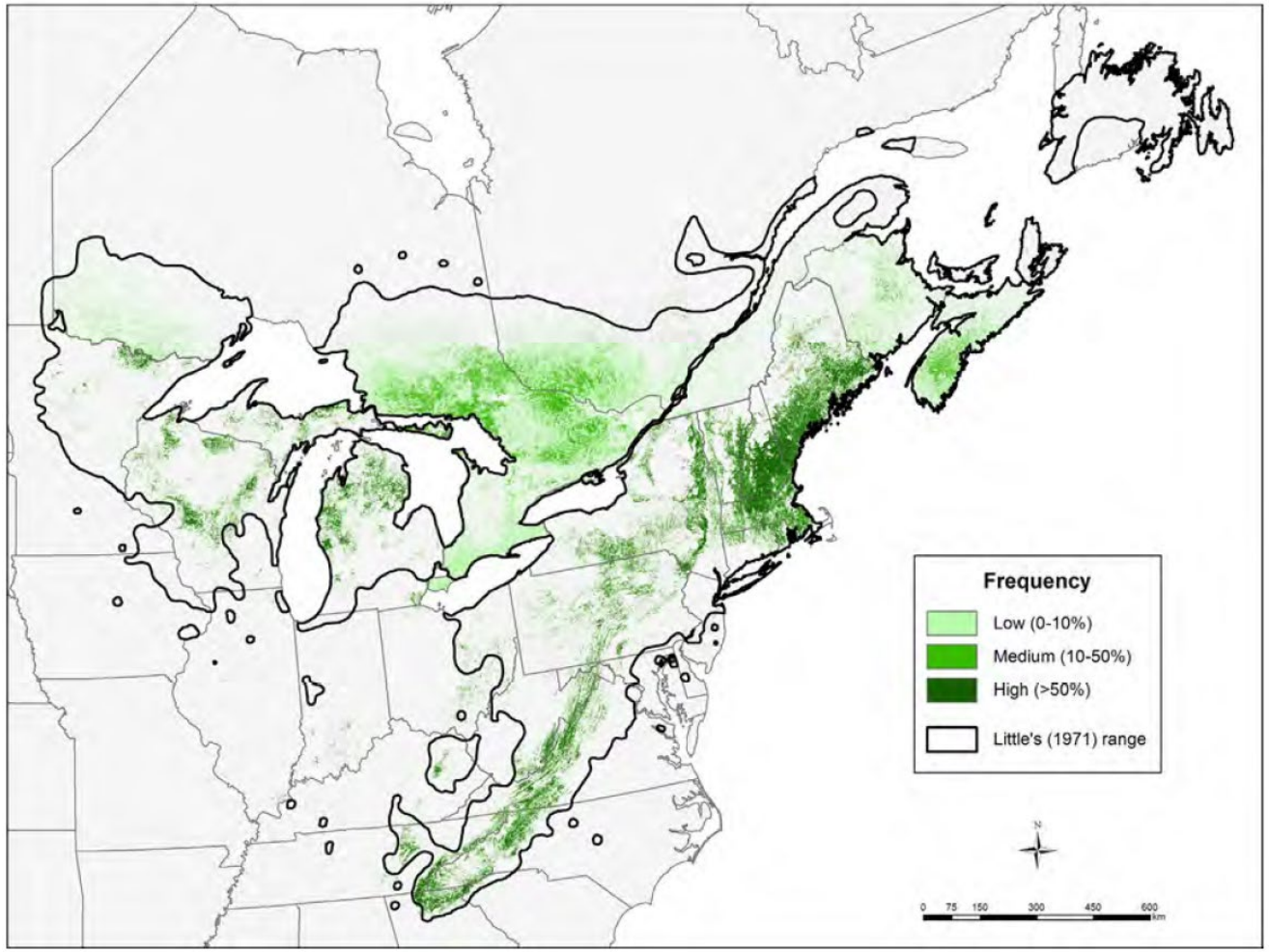
Southern Pine Beetle Outbreak in Eastern White Pine 1998-2002 Key Factors

from Paul Merten, forest entomologist, USFS Forest Health Protection section, Asheville, NC

- Population built up in neighboring yellow pine stands
- White pine stands were stressed
  - Many plantations established 1960's to 2000's due to field abandonment– stands were 25-45 yr old
  - Planted on non-white pine sites
  - Not managed, BA exceeded 200 ft^2/ac
  - Prolonged drought period
- Outbreaks collapsed more rapidly than seen in yellow pine stands
- Warmer winters allowing SPB to spread into southern New England

Eastern White Pine Status & Health

- Abundant tree in eastern US
- WP Weevil problem with regeneration in northern part
- Drought stress major factor in growth loss and risk to other factors
  - Stress from dry soils
  - Stress from high densities
- Wet springs will increase WPND
- Warmer winters may reduce WP weevil damage but increase SPB threat



Managing Stand Densities Key to Reducing Risks

- High stand density at young ages (<20 ft tall)
  - Reduce weevil damage
  - Straiten trees
  - Natural pruning
- Low stand densities as mature
  - Reduce competition for water
  - More sun light for growth
  - More tolerance for risks from drought, Caliciopsis, WPND, and SPB