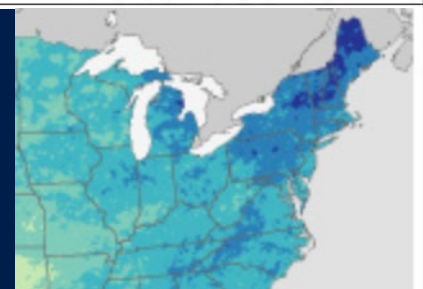
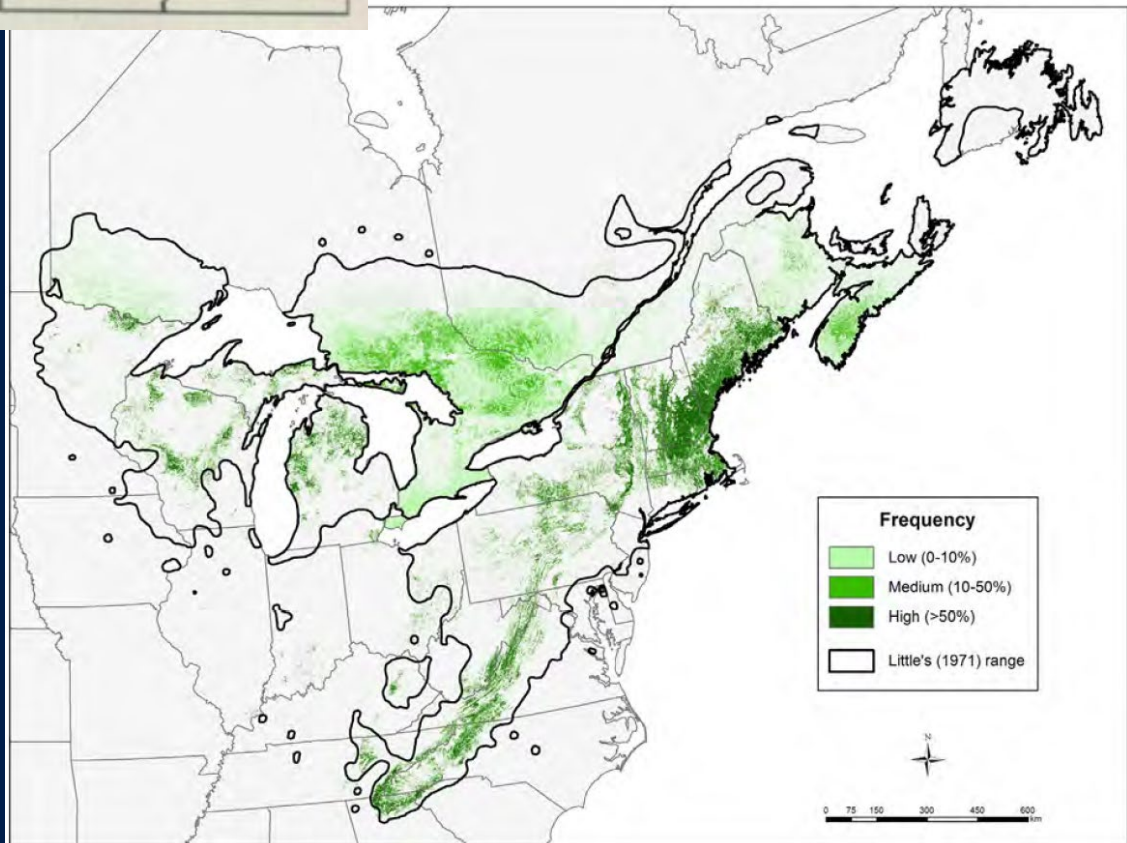
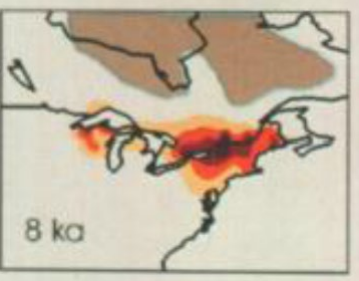


Eastern White Pine: Past, Present, and Future

Dr. William H. Livingston
School of Forest Resources
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



White Pine Silvics

- Intermediate shade tolerance.
- Seeds abundant every 3-5 years.
- Rooting best in deep, sandy soils.
- Strong competitor with grass.
- Once established,
 - Has excellent height and diameter growth.
 - Annual volume growth remains high even in large (>24 in DBH), older trees.



R. Seymour

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

^a School of Forest Resources, University of Maine, 5755 Nutting Hall, Orono, ME 04469, United States

^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



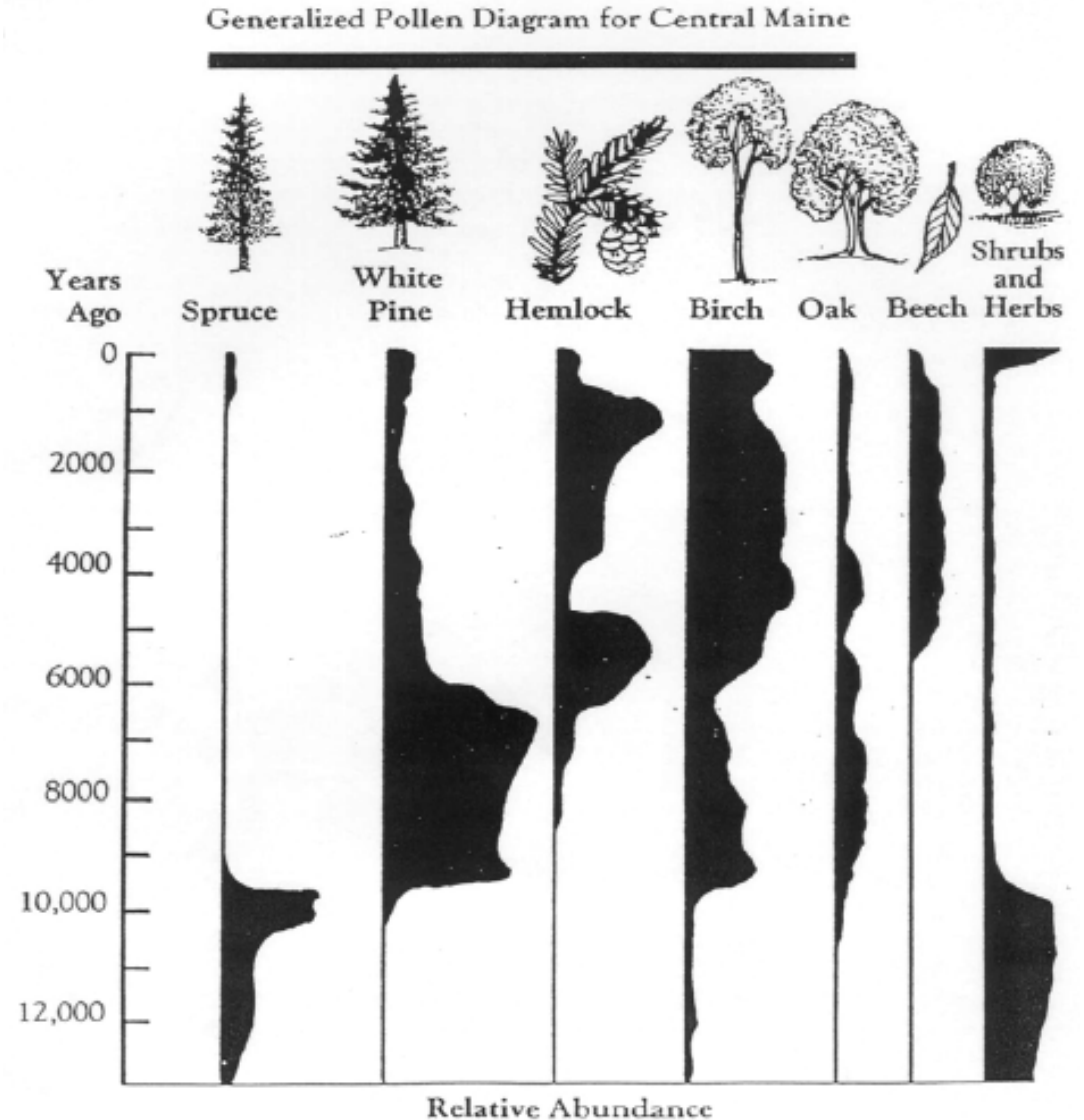
**Field Manual for Managing Eastern
White Pine Health in New England**

William H. Livingston, Isabel Munck, Kyle Lombard,
Jennifer Weimer, Aaron Bergdahl, Laura S. Kenefic,
Barbara Schultz, Robert S. Seymour

13,000 Years of Development

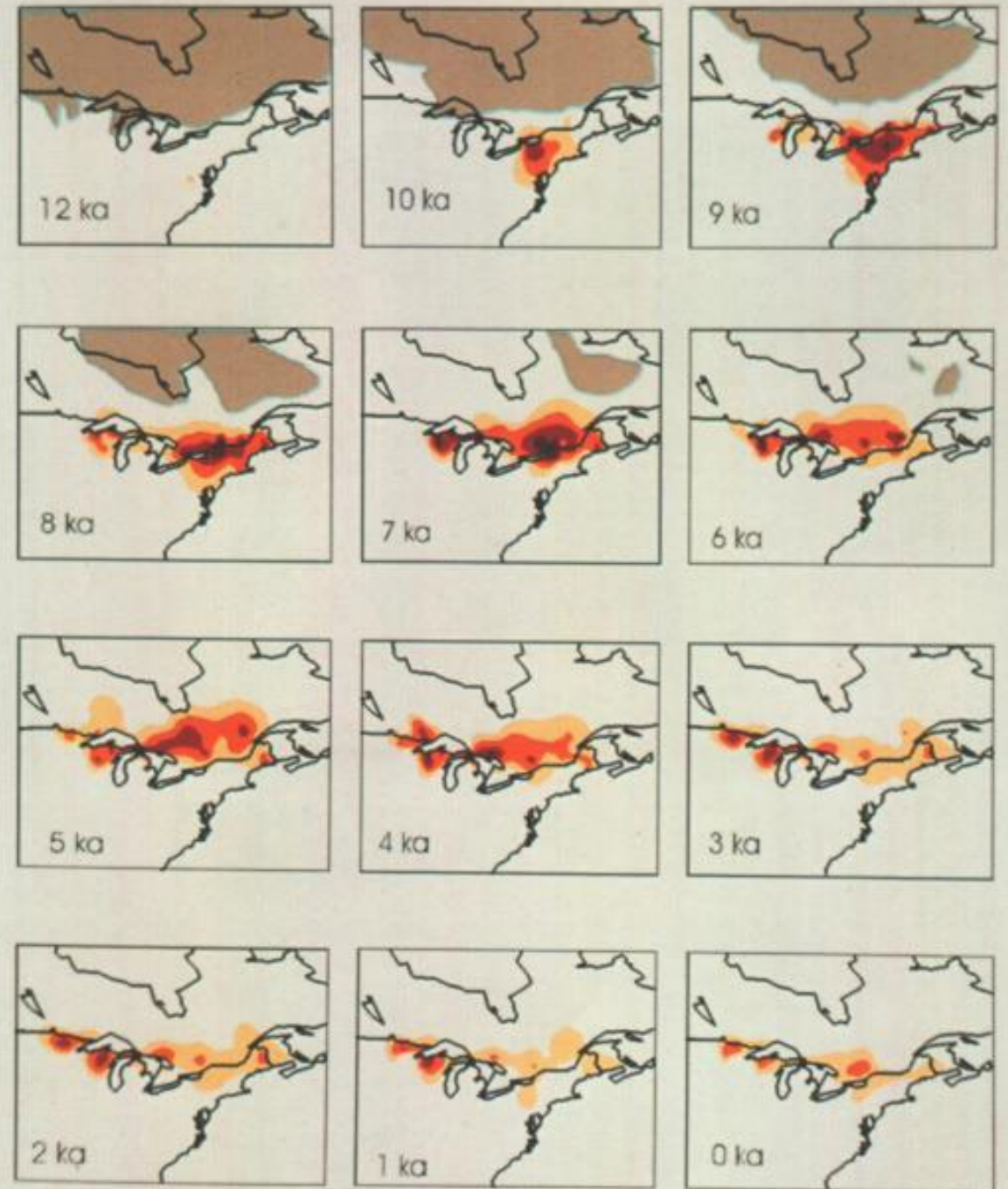
- Pollen preserved in bog and lake bottoms indicate abundance of trees over time
- Climate after glaciation cool and moist – no white pine
- 9000 to 6000 years ago – warmer than today (4F), dryer, more fire, period of highest amount of white pine
- 6000 to present – cooler, more moisture, less pine
- Field abandonment in north and south results in increasing abundance of white pine

Jacobson, G., and R. Davis. 1988. Temporary and transitional: the real forest primeval. *Habitat* 5(1):26-29

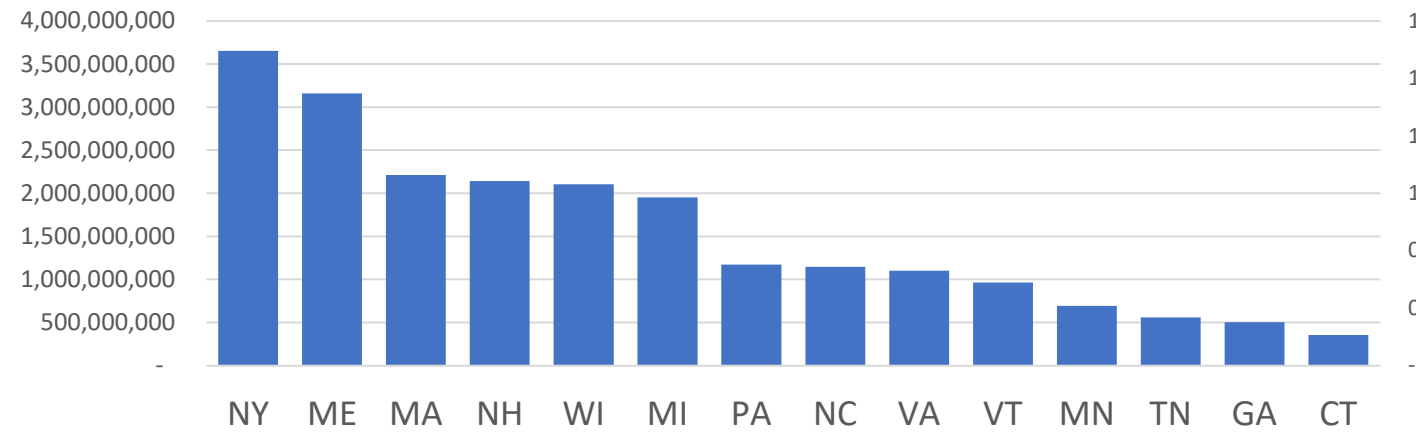


13,000 Years of Development

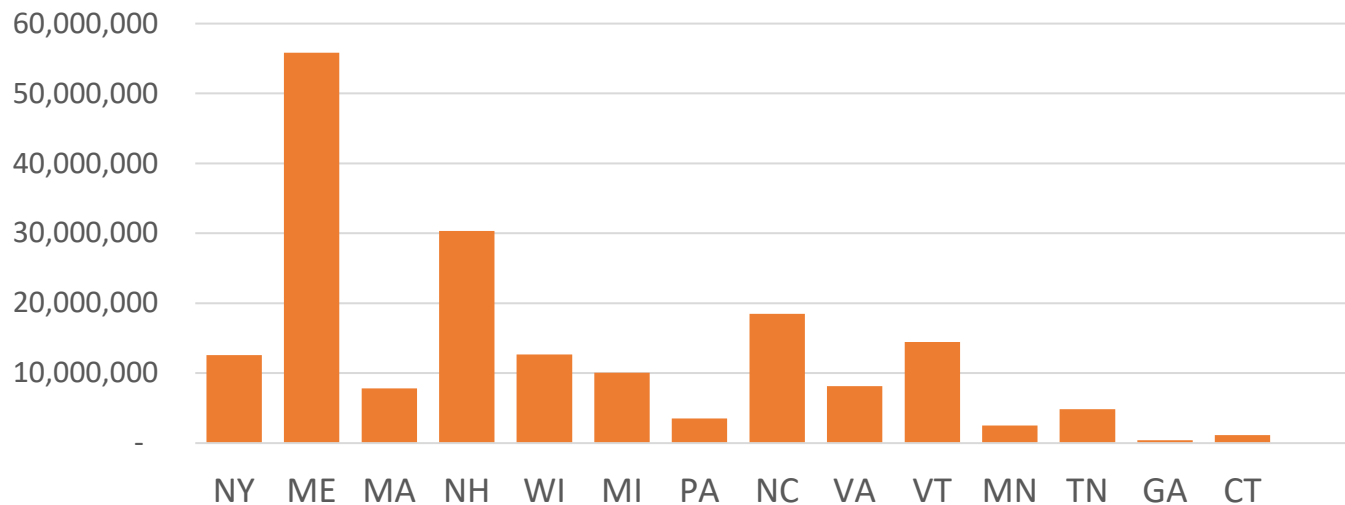
- Optimum develop where precipitation exceeds but near evapotranspiration
- Evapotranspiration varies with temperature
 - Evapotranspiration > precipitation
 - Western limit – less precipitation
 - Southern limit – higher temperatures
 - Precipitation much higher than evapotranspiration
 - Northern limit – cooler temperatures



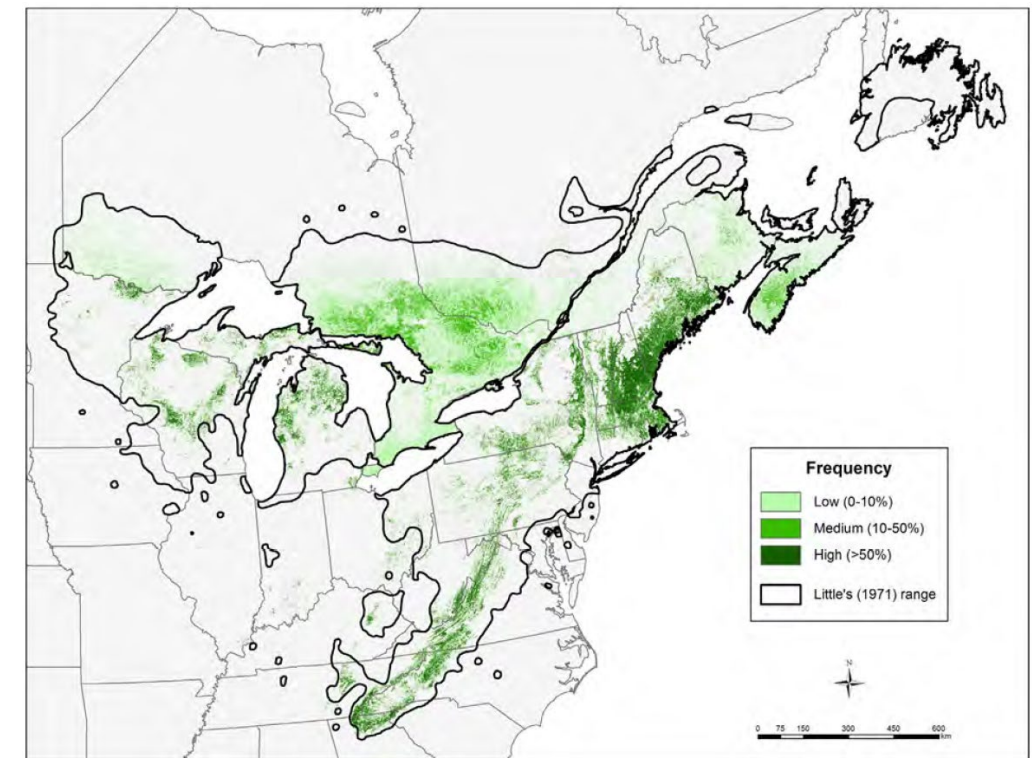
Net merchantable bole volume of live trees (at least 5 inches d.b.h./d.r.c.),
in cubic feet, on forest land



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



Current Status of Eastern White Pine



0.65% annual mortality

Slide 7

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

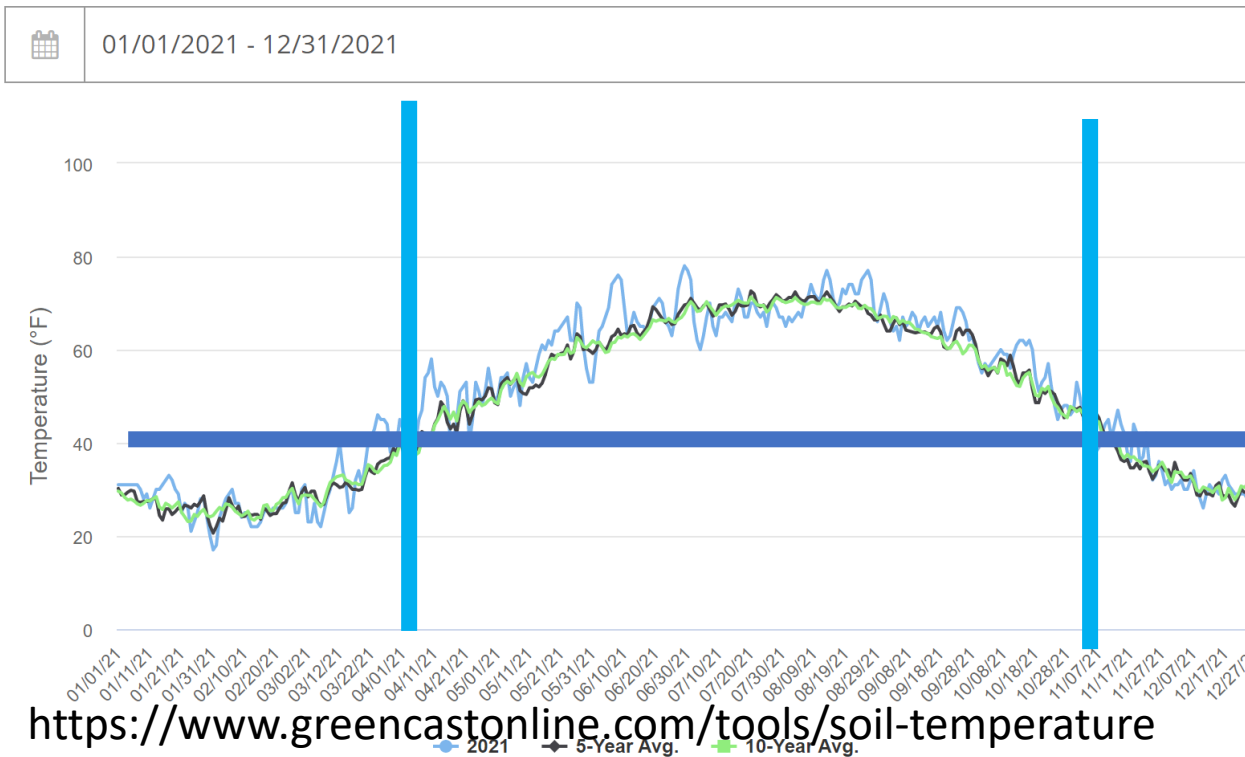
| Location | July high avg | January low avg | Annual precip. avg | Total Snow Accum. Avg. | Last spring frost | First fall frost |
|-----------------|---------------|-----------------|--------------------|------------------------|-------------------|------------------|
| Augusta, ME | 79 | 8 | 44 | 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?

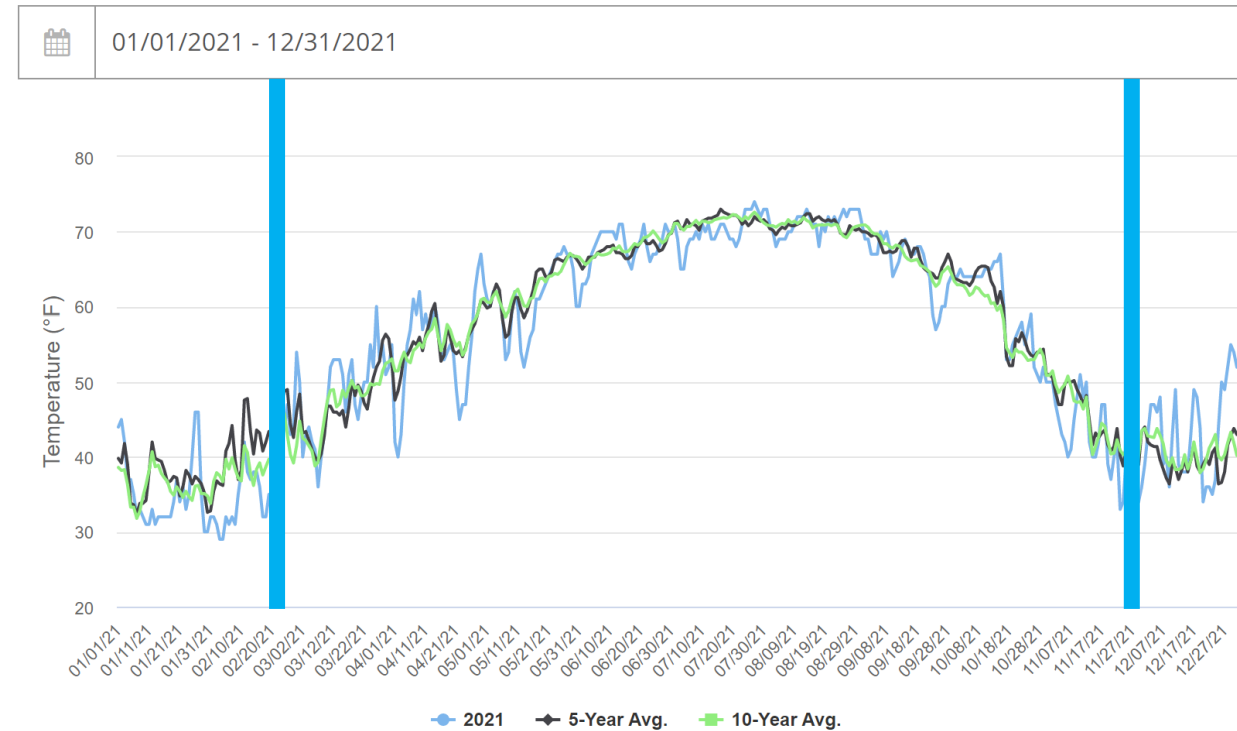
- Soil temperatures >40F needed for significant root activity
 - Augusta >40F April 1 to November 1: 7 months
 - Spruce Pine >40F March 1 to December 1 – 9 months, two more months of root activity
 - Both locations reach 70 F in summer

Average Soil Temperature in Augusta, ME



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

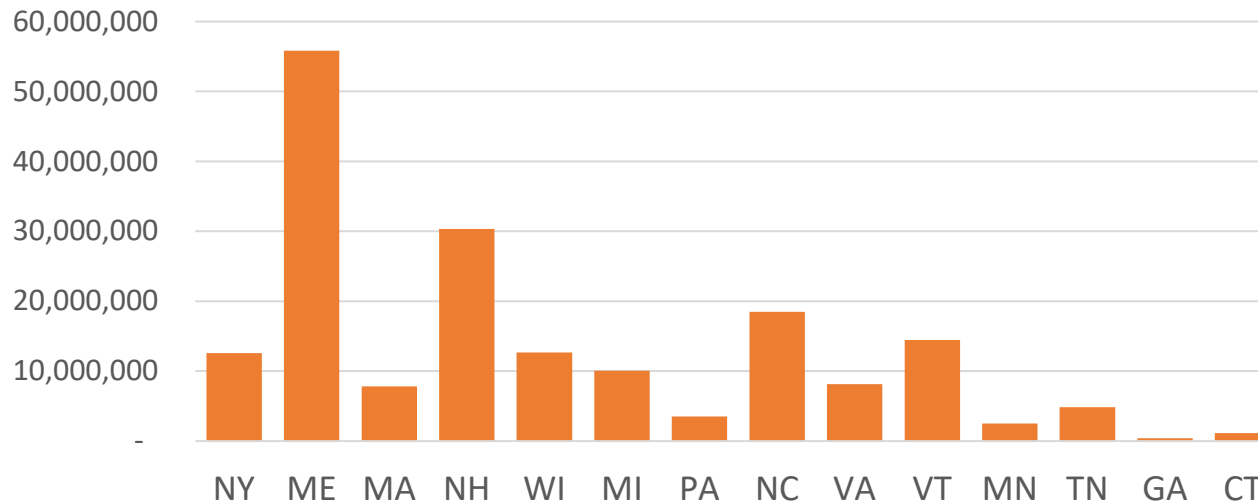
Average Soil Temperature in Spruce Pine, NC



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



WORLD-CLASS EASTERN WHITE PINE FROM MAINE



Markets in Virginia/NC

- Sawtimber: Mills in NC want a minimum 2 ft node
 - Cut out whorls
 - Use clear wood for products (window frames)
 - No grades
- Smaller: Lower branches removed from trees to make Christmas garland



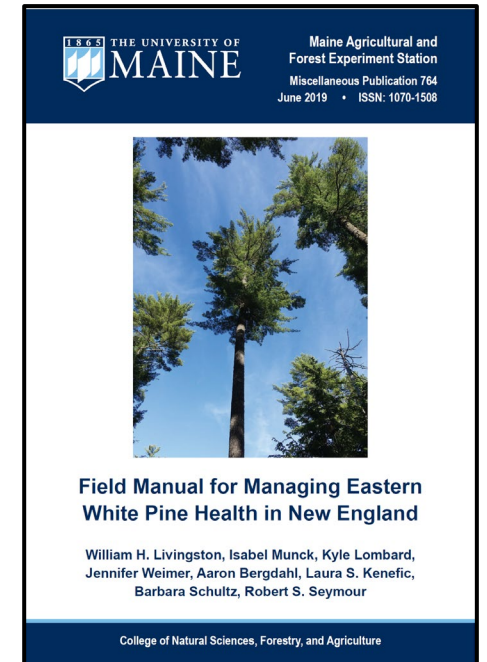
Stresses, Risk Factors, and Management

| Stresses | Risk Factors | Management |
|---|--|---|
| White pine weevil | Full sunlight favors thick leaders on regeneration | Regeneration under partial shade <ul style="list-style-type: none"> • 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 | Site selection – sandy loam: Minimize hardwoods Avoid shallow roots |
| | Dense pole-size stands | Low-density management Less competition stress Crowns dry-out faster |
| White pine needle damage | Wet springs | |

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 eastern 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 |

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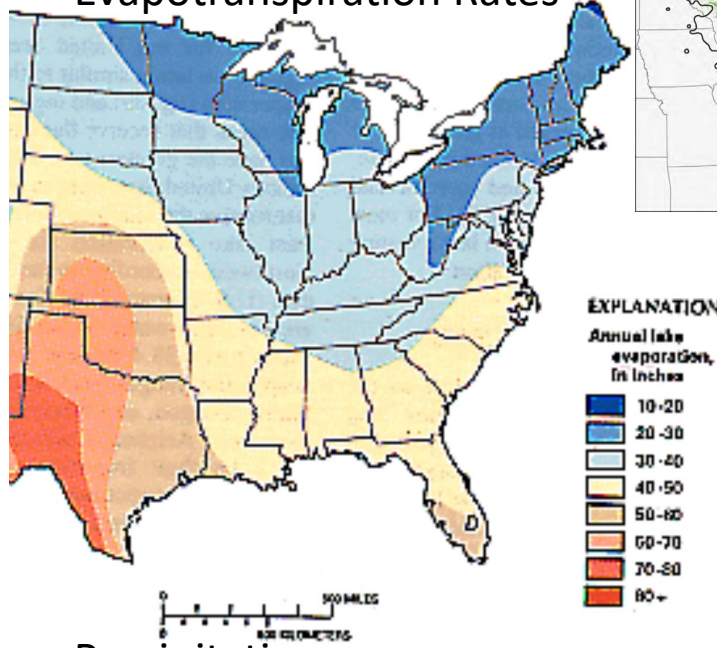
| | | |
|--|-----------------------------------|--|
| Zach Olinger | VA Dept. of Forestry | Management of eastern white pine on the Blue Ridge Plateau |
| Jim Phillips | Avery Timber Resources | Management of eastern white pine in plantations and natural stands in western North Carolina |
| | | Reports of EWP management from other locations |
| William Livingston Steve Roberge Nick Brazee | EWP Multi-state Project, EWPMI | Future directions for eastern white pine research and outreach |
| | | Tour of EWP Sawmill |
| | Bear Brook State Forest | Workshop on recognizing and quantifying white pine needle damage and Caliciopsis symptoms |
| | Bear Brook State Forest | Workshop on low density management of white pine |

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

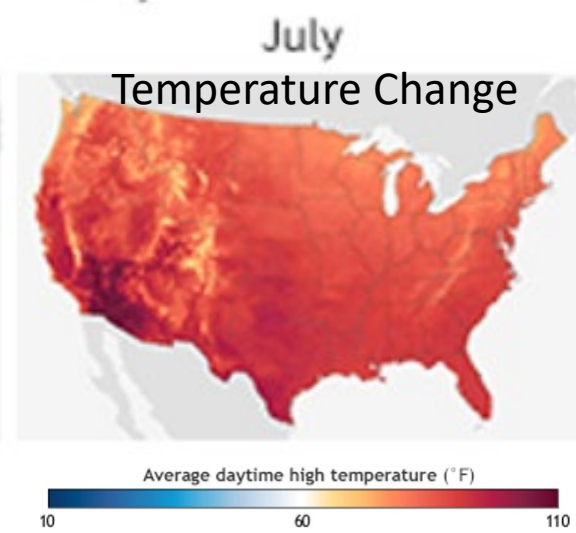
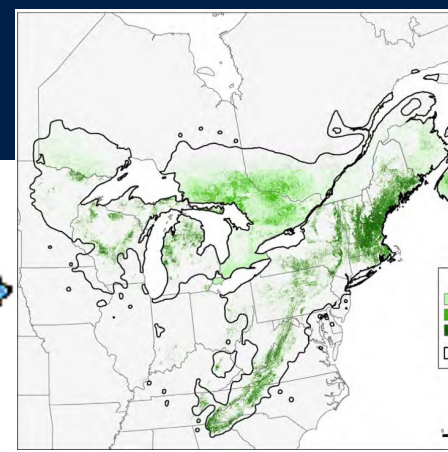
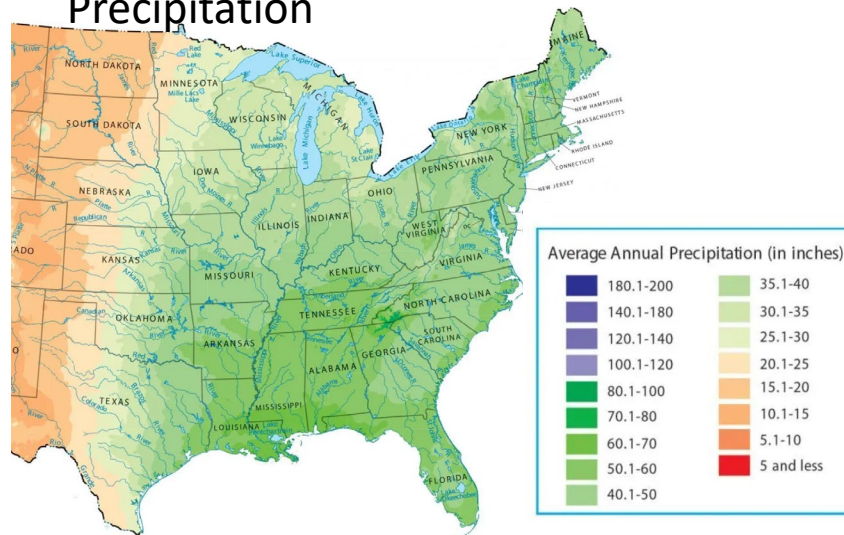
Future Climate & EWP

- 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

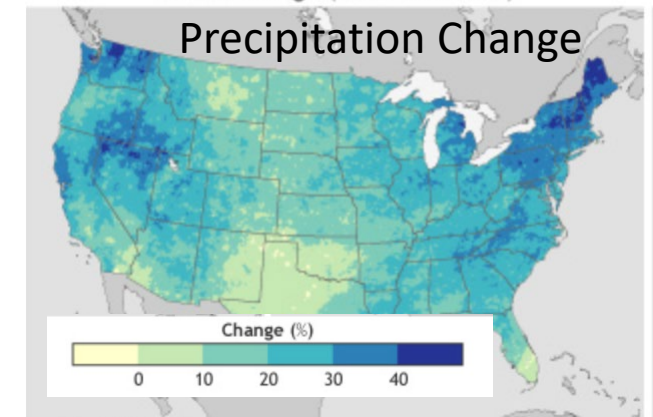


Precipitation



Climate.gov

Future change (lower emissions)



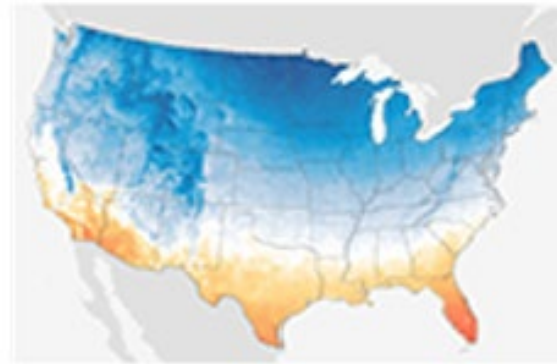
Future Climate & EWP

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

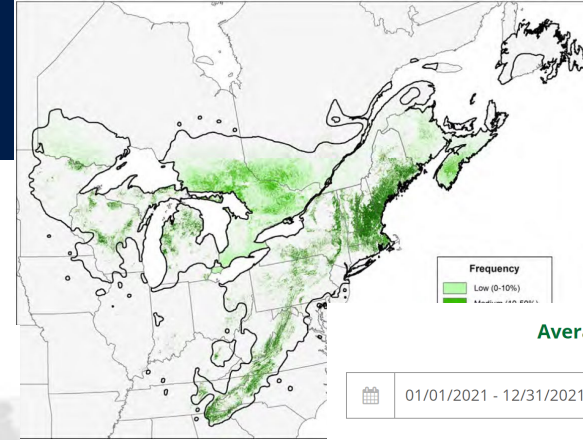
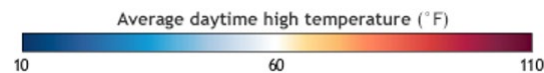
Temperature Change
January



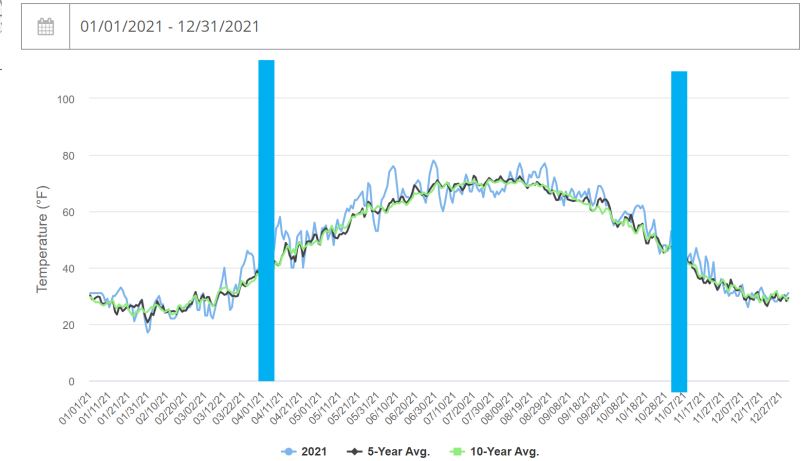
1981-2010 average



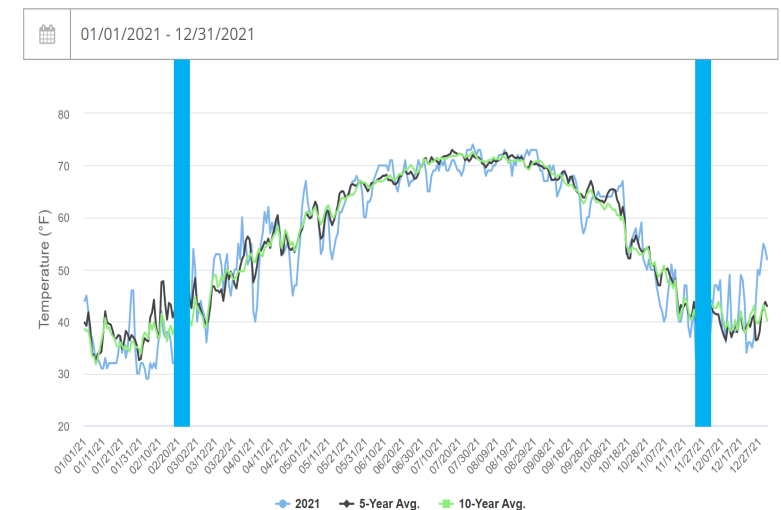
2060-2069, High emissions (I



Average Soil Temperature in Augusta, ME



Average Soil Temperature in Spruce Pine, NC



Future of Eastern White Pine

- Challenges to management and abundance:
 - How well precipitation compensates for increased summer temperatures – will drought and bark beetle losses increase?
 - Under-utilized in much of the range
 - Weak markets for small trees
- Resource will remain abundant and valuable because:
 - Excellent natural regeneration
 - Warmer winters will result in increased growth and less weevil
 - Responds well to management for reducing risks and increasing growth and value
 - Excellent markets for sawtimber in New England

