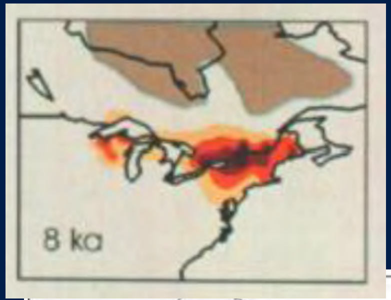
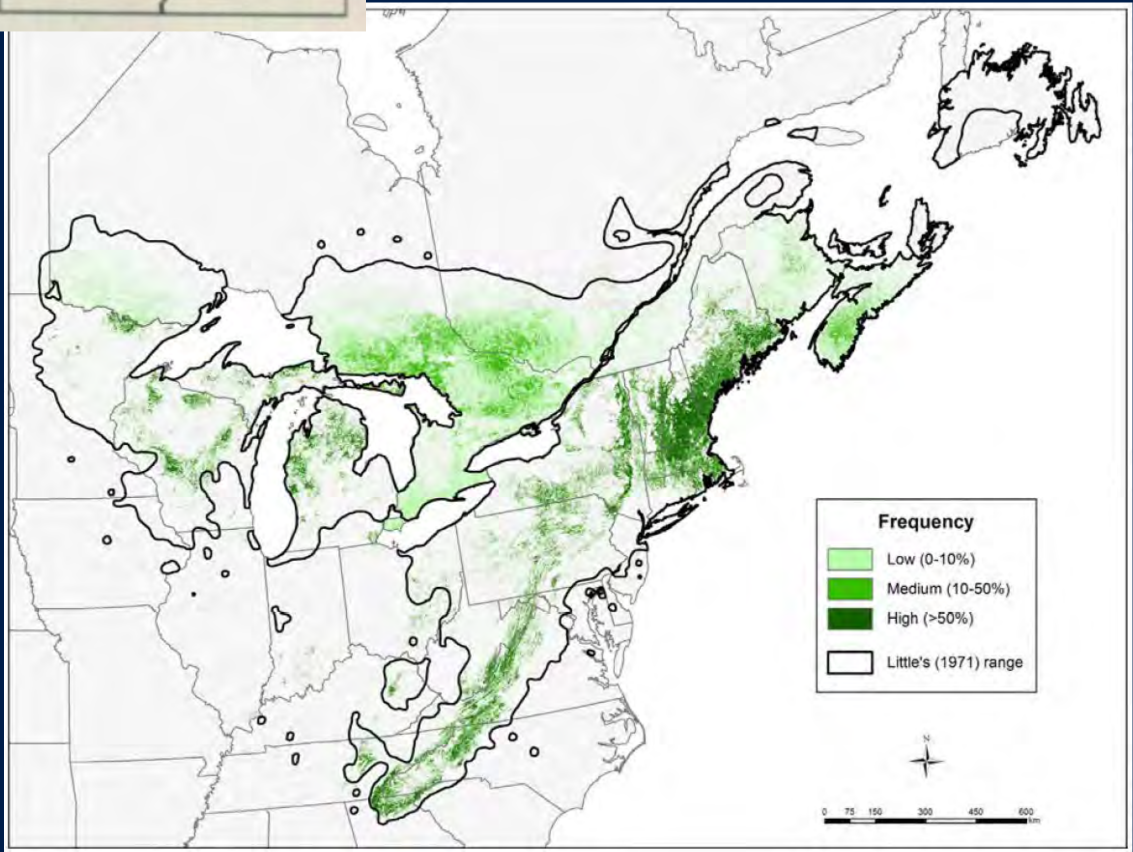
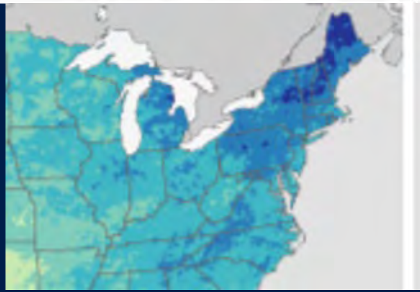






THE UNIVERSITY OF MAINE
1865

Eastern White Pine: Past, Present, and Future

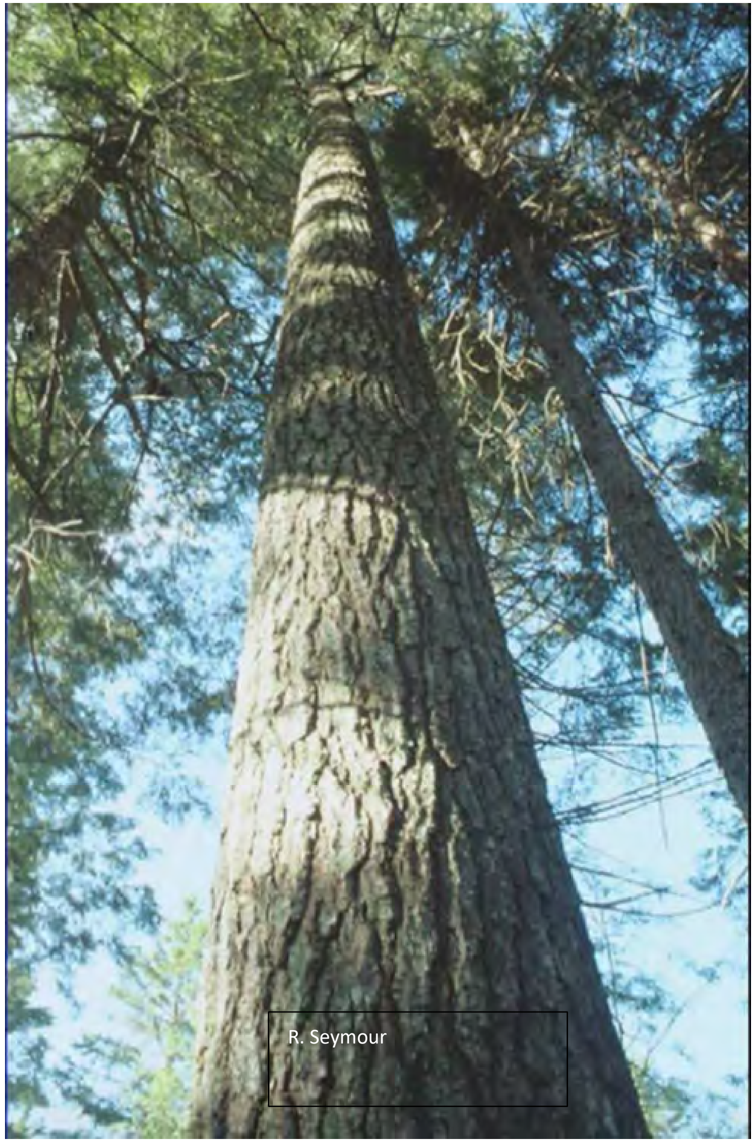
Dr. William H. Livingston
School of Forest Resources
University of Maine

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.



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

ELSEVIER

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

Check for updates

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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Maine Agricultural and Forest Experiment Station

Miscellaneous Publication 764

June 2019 • ISSN: 1070-1508

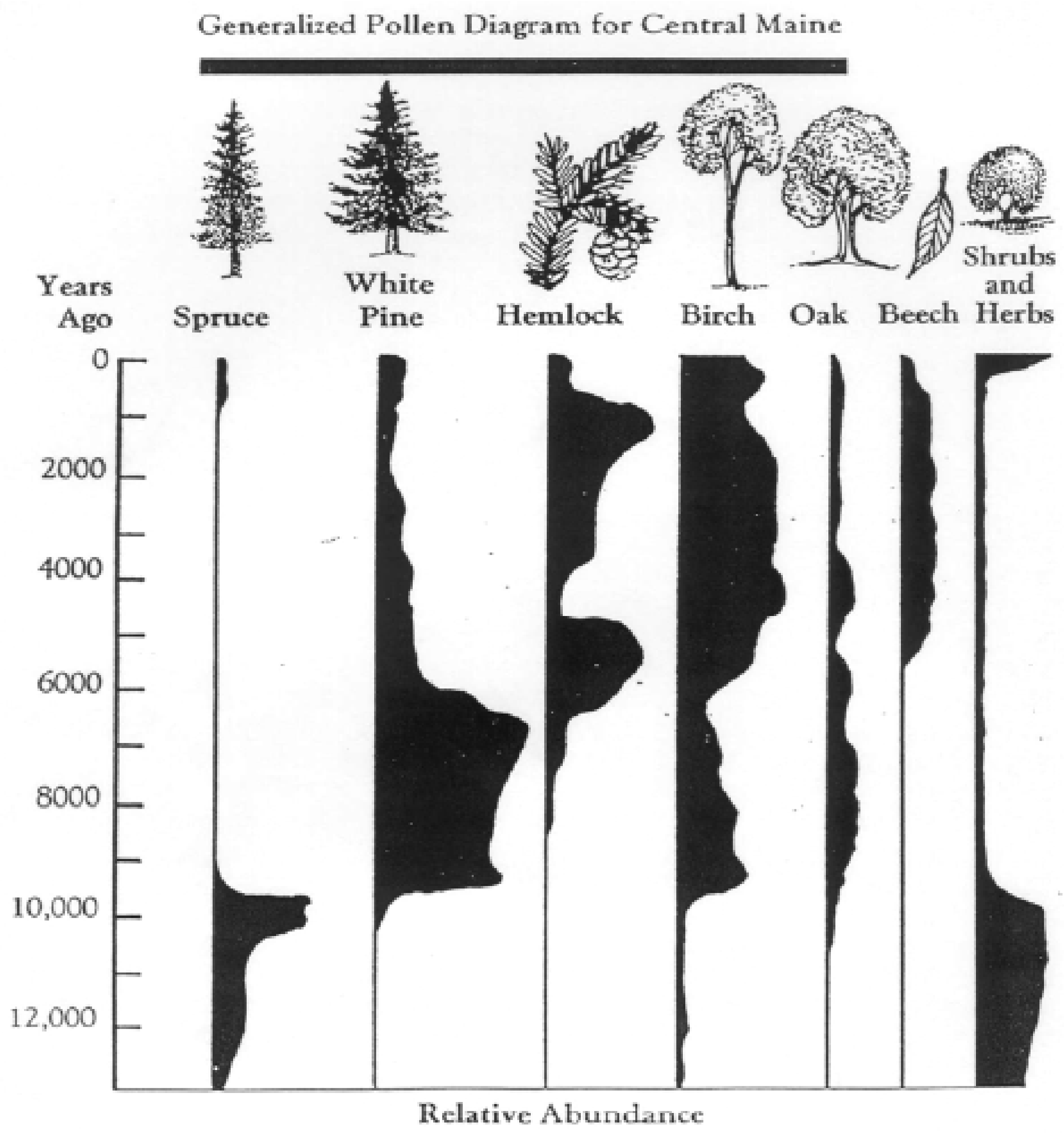
Field Manual for Managing Eastern White Pine Health in New England

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

College of Natural Sciences, Forestry, and Agriculture

13,000 Years of Development

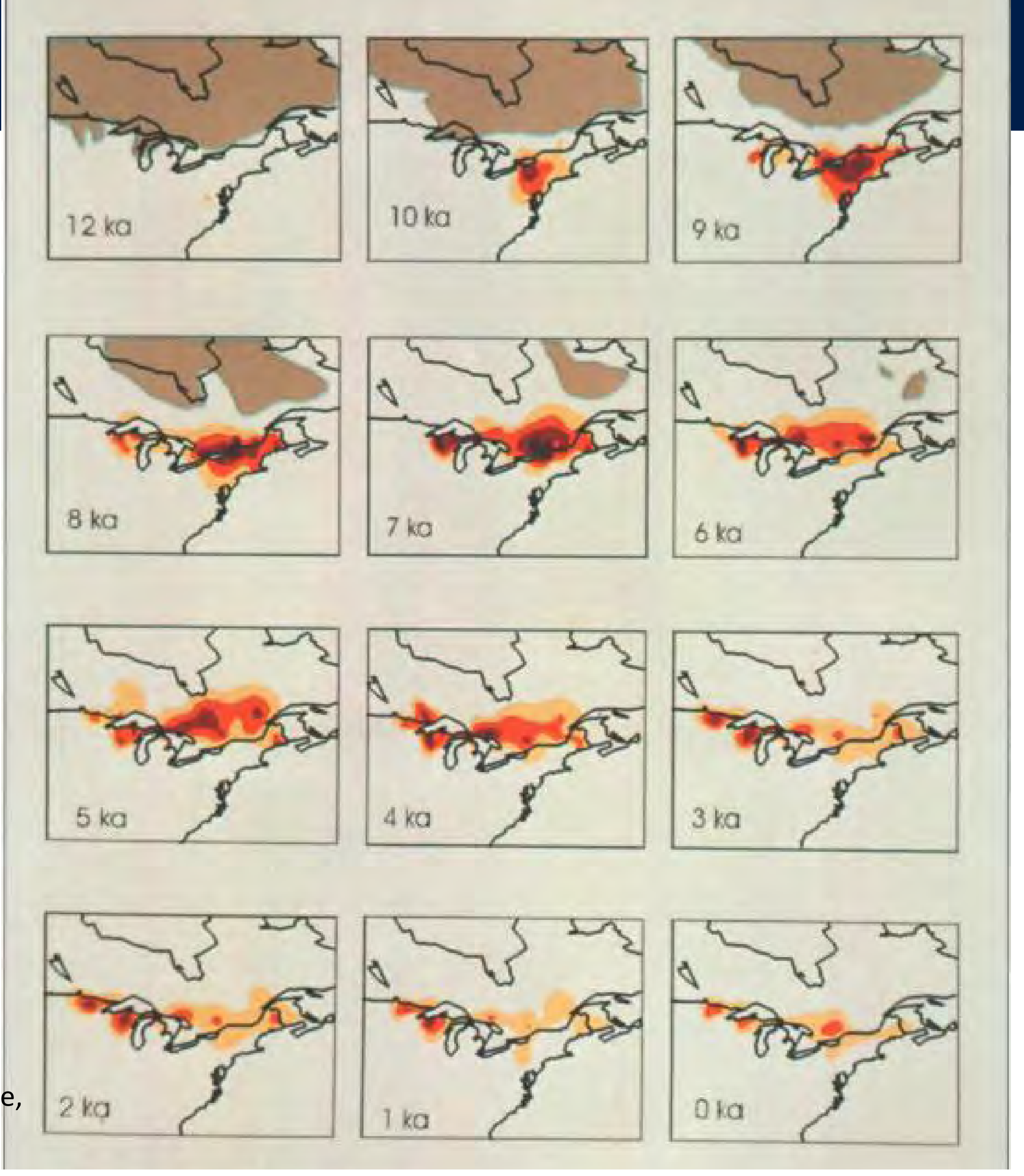
- Pollen preserved in bog and lake bottoms indicate abundance of trees over time
- Climate after glaciation cool and moist – no white pine
- 9000 to 6000 years ago – warmer than today (4F), dryer, more fire, period of highest amount of white pine
- 6000 to present – cooler, more moisture, less pine
-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

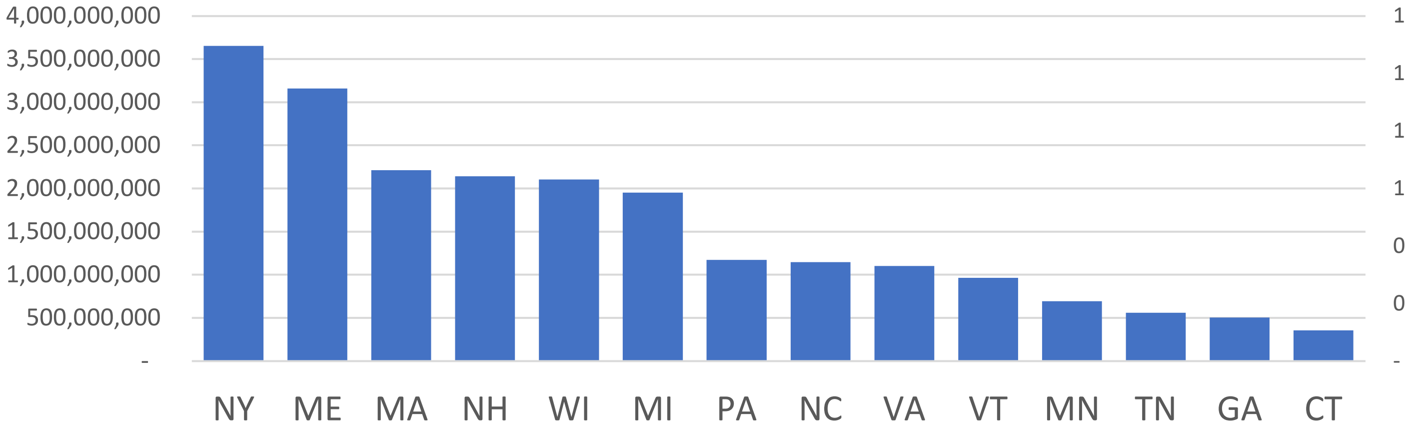
- Optimum develop where precipitation exceeds but near evapotranspiration
- Evapotranspiration varies with temperature
  - Evapotranspiration > precipitation
    - Western limit – less precipitation
    - Southern limit – higher temperatures
  - Precipitation much higher than evapotranspiration
    -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



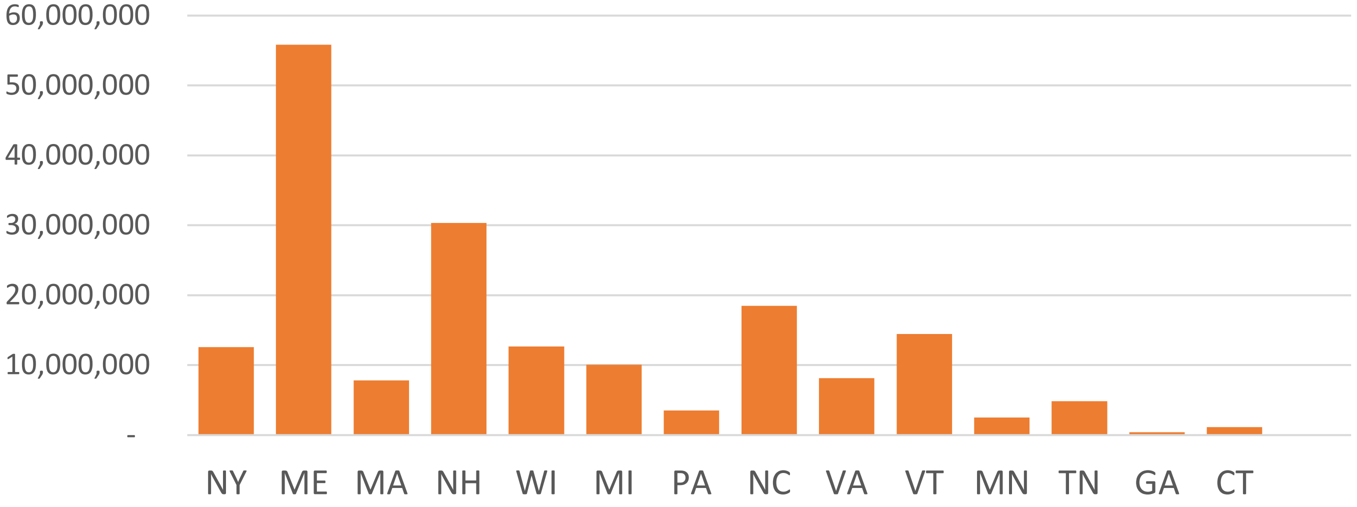
Jacobson, G.L., and A. Dieffenbacher-Krall. 1995. White pine and climate change, insights from the past. Journal of Forestry , July issue. P. 39-42.

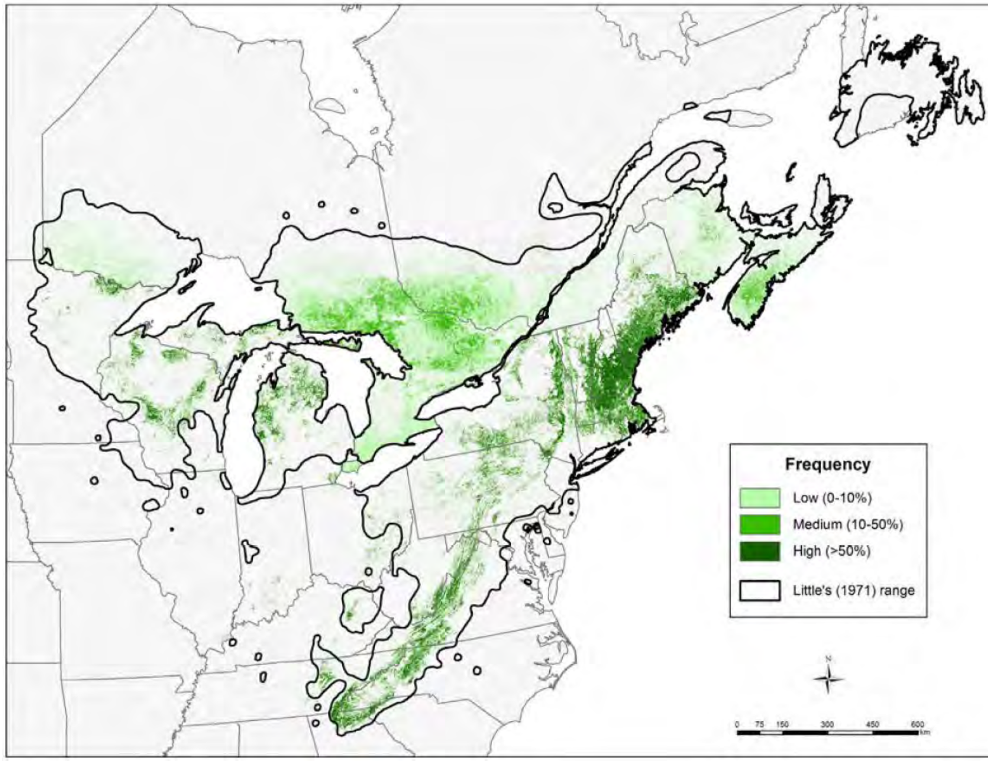
Current Status of Eastern White Pine

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

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

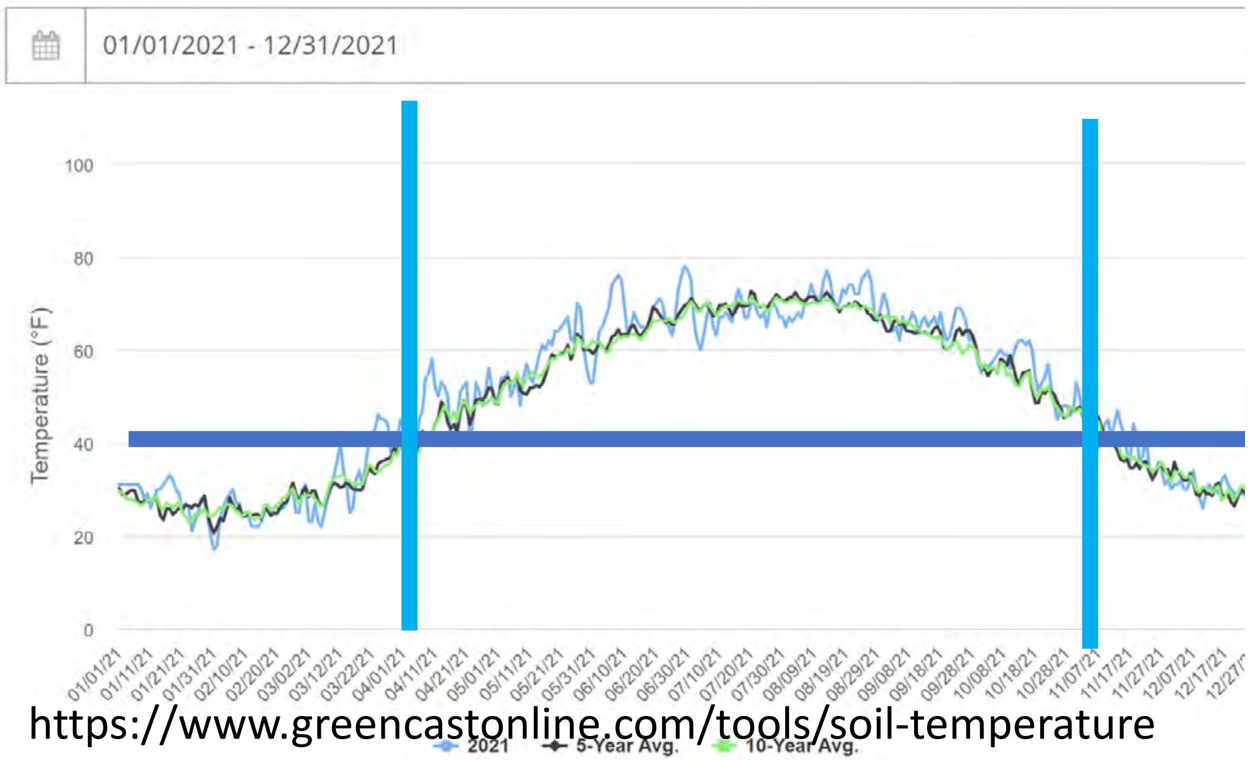
Location	July high avg	January low avg	Annual precip. avg	Total Snow Accum. Avg.	Last spring frost	First fall frost
Augusta, ME	79	8	44	67	May 1	Oct 1
Galax, VA	82	21	43	16	Apr 29	Oct 11
Spruce Pine, NC	81	22	53	13	Apr 29	Oct 11

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



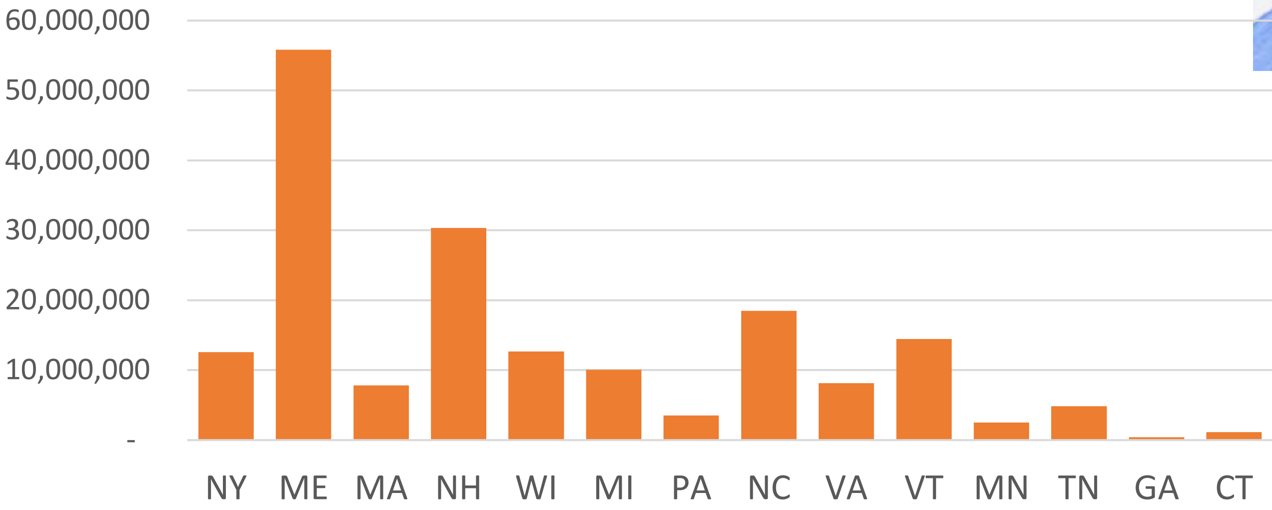
https://www.greencastonline.com/tools/soil-temperature

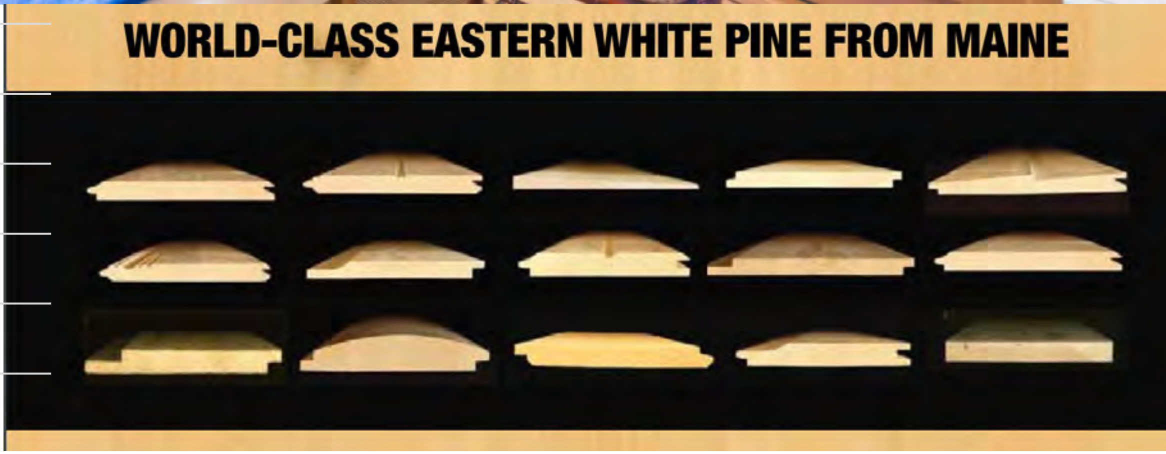
Average Soil Temperature in Spruce Pine, NC

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





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

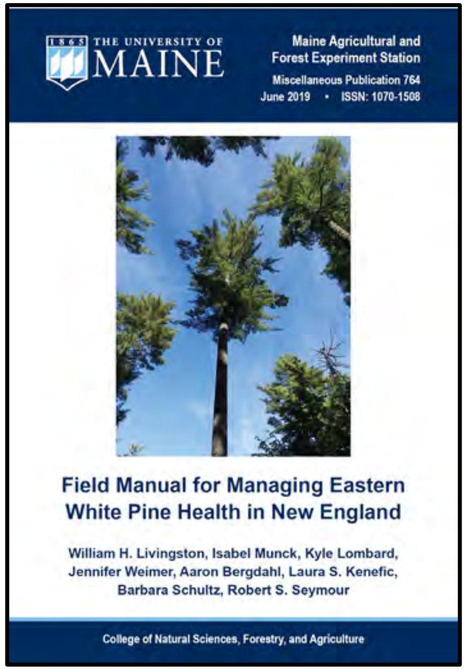
<table>
<tr><th>Stresses</th><th>Risk Factors</th><th>Management</th></tr>
<tr><td>White pine weevil</td><td>Full sunlight favors thick leaders on regeneration</td><td rowspan="2">Regeneration under partial shade
• Less sun, small diameter leaders
• Less dew
High sapling density – straighter trees, less Ribes</td></tr>
<tr><td>White pine blister rust</td><td>Ribes, moist conditions</td></tr>
<tr><td>Decline:
Competition, drought
Pine bast scale
Caliciopsis cankers
Bark beetles</td><td>Soil restrictions < 30 cm
Abandoned fields

Dense pole-size stands</td><td>Site selection – sandy loam:
Minimize hardwoods
Avoid shallow roots</td></tr>
<tr><td>White pine needle damage</td><td>Wet springs</td><td>Low-density management
Less competition stress
Crowns dry-out faster</td></tr>
</table>

Eastern White Pine Management Institute

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

Eastern White Pine Managememt Institute

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

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June 23-24, 2022, Concord, NH

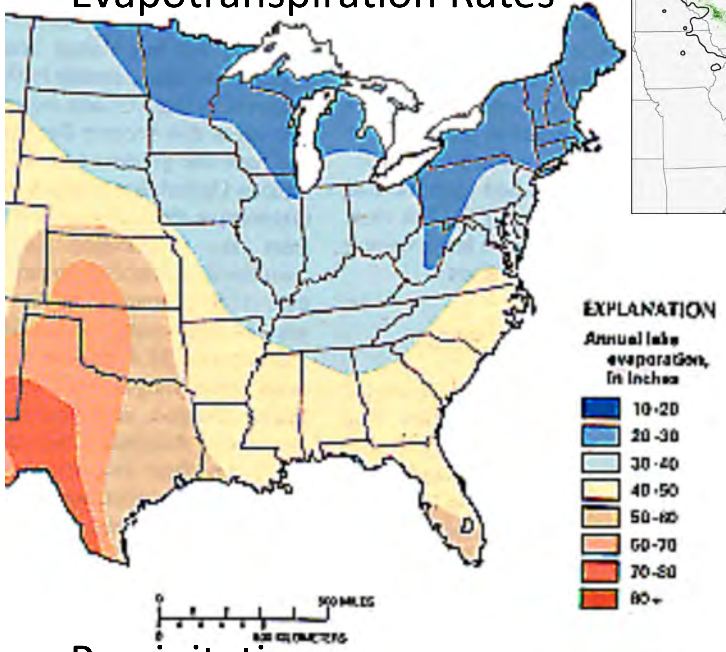
Zach Olinger	VA Dept. of Foresty	Management of eastern white pine on the Blue Ridge Plateau
Jim Phillips	Avery Timber Resources	Management of eastern white pine in plantations and natural stands in western North Carolina
		Reports of EWP management from other locations
William Livingston Steve Roberge 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

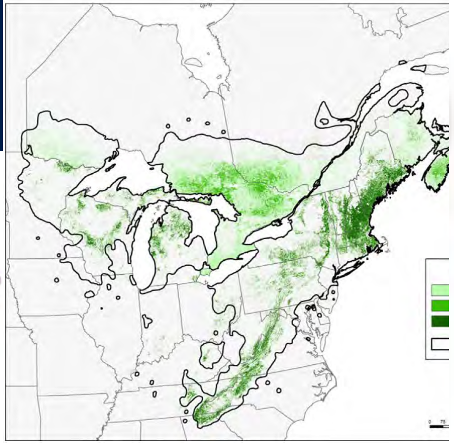
Symposium Proceedings to be published by the Center for Research on Sustainable Forests, University of Maine

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

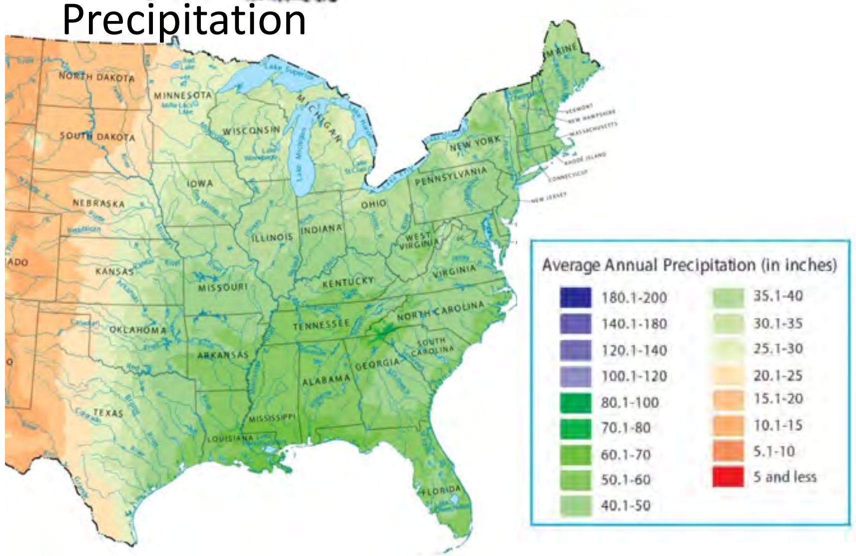
Evapotranspiration Rates



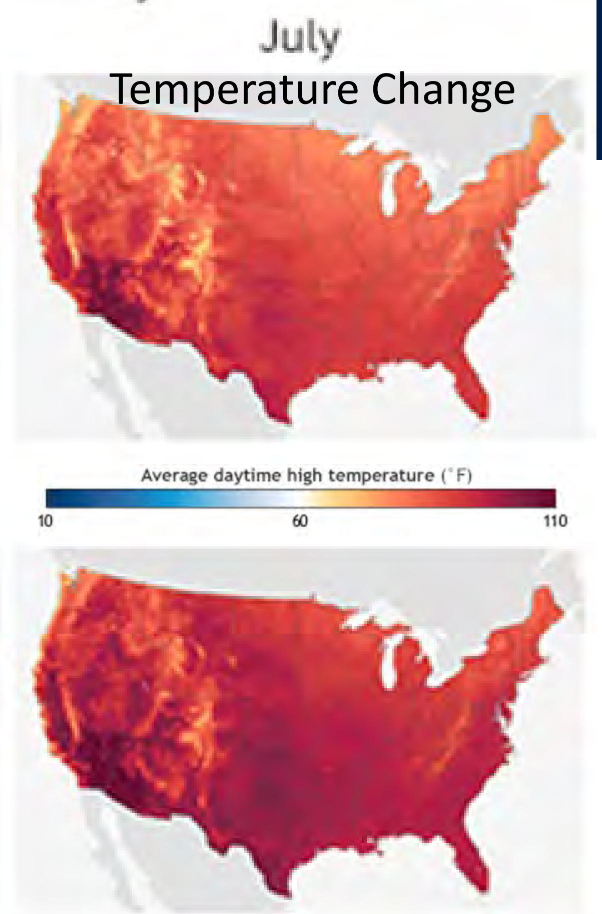


https://geochange.er.usgs.gov/sw/changes/natural/et/

Precipitation

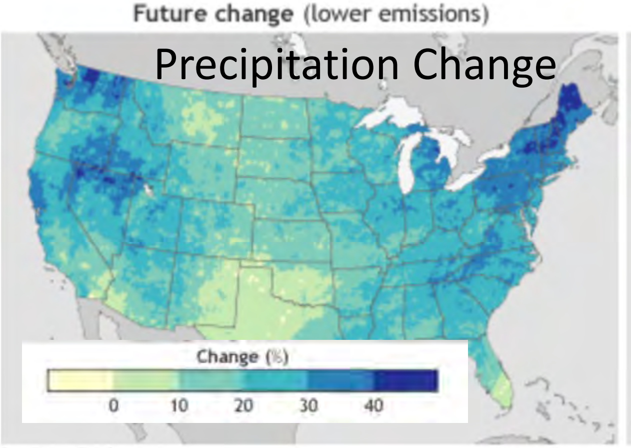


Temperature Change



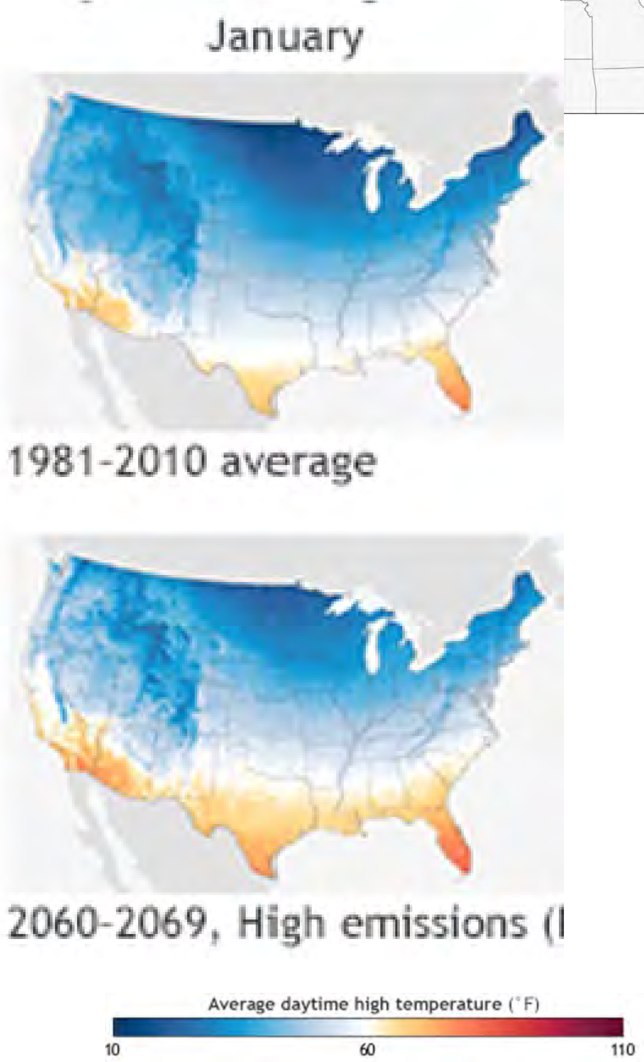
Climate.gov

Precipitation Change

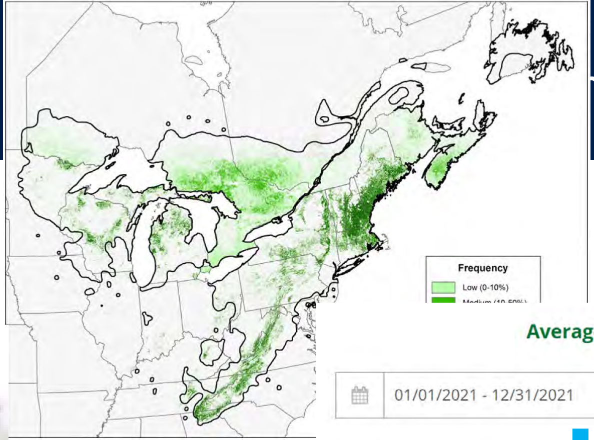


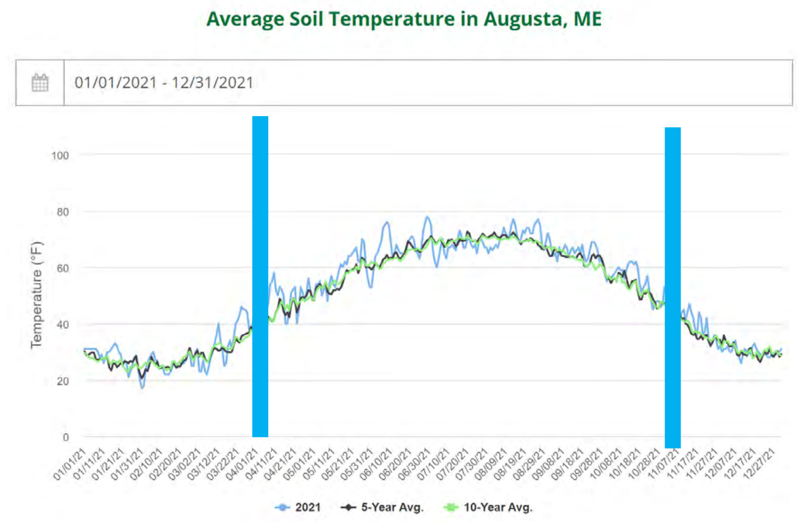
Future Climate & EWP

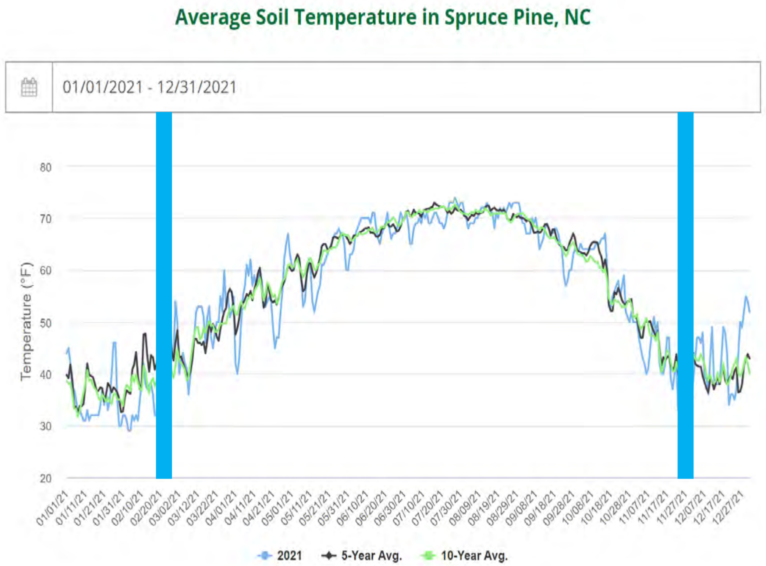
Temperature Change



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







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