

Updates on Insect Pests of Eastern White Pine, Including Southern Pine Beetle Outbreak in NC in 2000



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



EWP Insect Pests

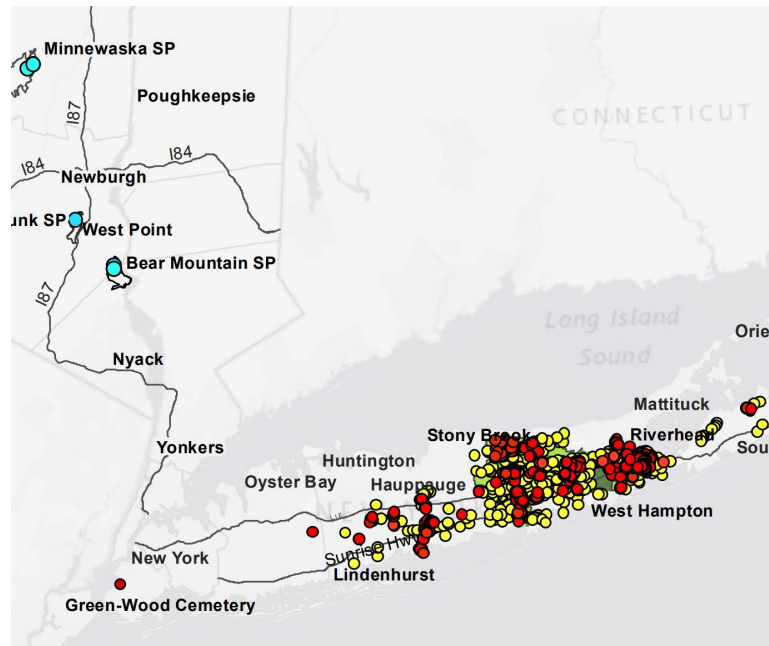
- 277 known insect and fungal stress agents
- 23 are significant
- Common insect pests not affecting management
 - Pine leaf adelgid (*Pineus pinifoliae*)
 - Pine bark adelgid (*Pineus strobi*)
 - White pine aphid (*Cinara strobi*)
 - Eastern pine shoot borer (*Eucosma gloriola*)
 - *Ips pini* bark beetle and stressed trees



Figure 3. Egg galleries of *Ips* sp. radiating from nuptial chamber. Photo: Jerald E. Dewey, USDA Forest Service, Bugwood.org.

EWP Insect Pests

- Pine bast scale
- White pine weevil
 - Limits the use of EWP plantations in the north
 - Not limiting in the south
- Southern pine beetle
 - Range is expanding into the Northeast
 - Has affected white pine in the Southeast



Costanza et al. 2018, *Forest Ecology and Management* 423:3–17



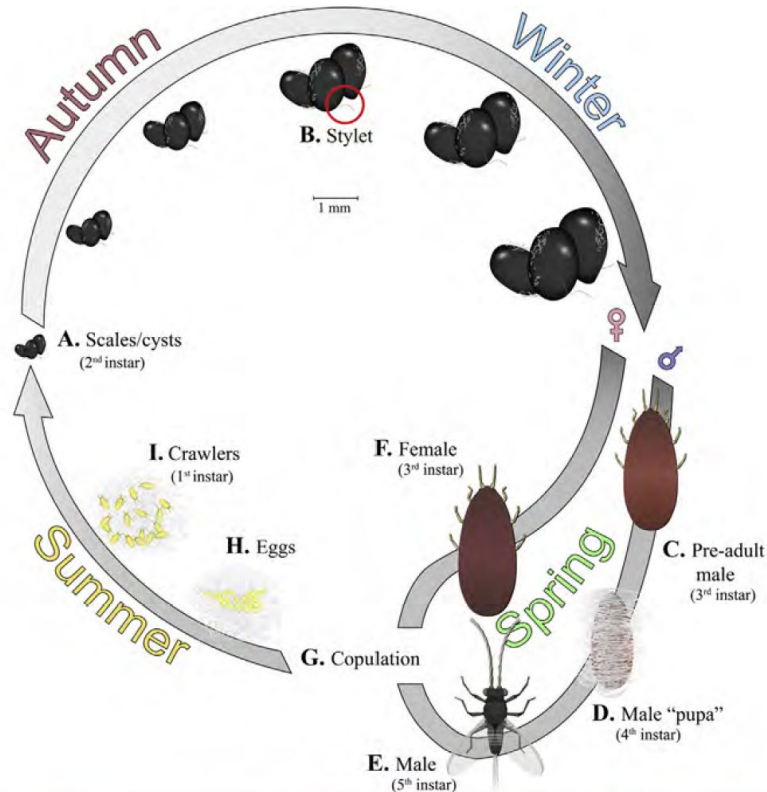
USFS Insect & Dis Leaflet 21



USFS Insect & Dis Leaflet 49

Pine Bast Scale

- *Matsucoccus macrocicatricies*
- Related to red pine scale, but restricted to EWP
- Native



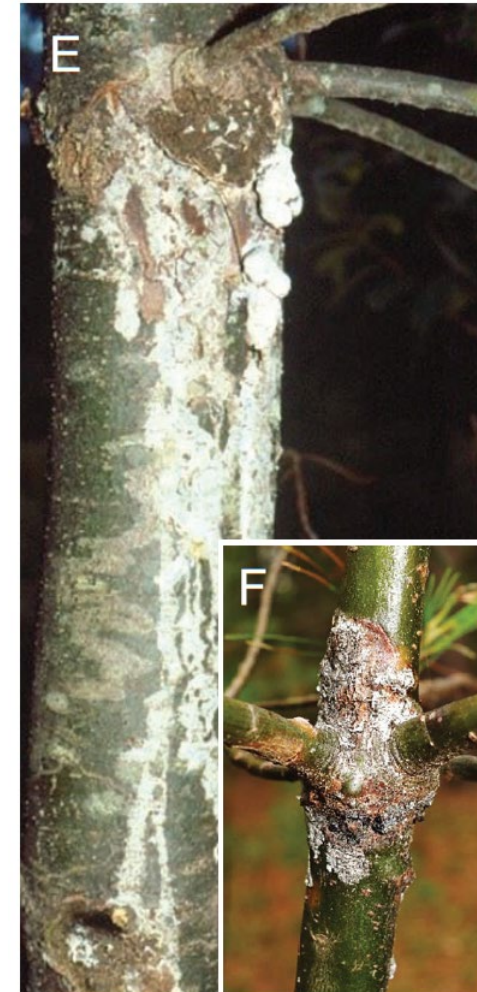
Costanza et al. 2018, Forest Ecology and Management 423:3–17

Pine Bast Scale

- Feeds at whorls of young stems
- Associated with 2 fungi
 - Septobasium (E)
 - Caliciopsis (F)
- Capable of killing branches (C), problem in Virginia
- Probably involved in decline of stressed EWP stands



Livingston et al. (2019), Maine
Agr. For. Exp Stn MP764



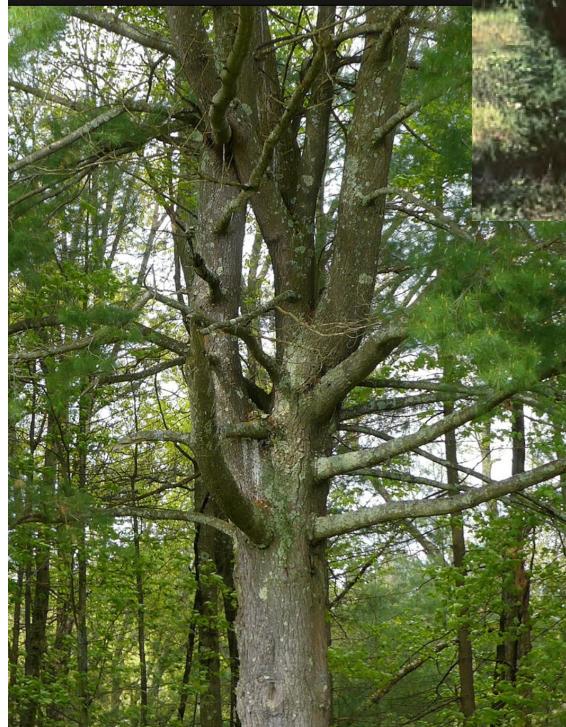
White pine weevil – Life Cycle and Damage

- Found on 20 conifers including eastern white pine, Norway spruce, (*Picea abies* L.), Sitka spruce [*P. sitchensis* (Bong.) Carrière], and Engelmann spruce (*P. engelmannii* Parry ex Engelm.)
- Adults overwinter in duff layer
- Emerges in May-June, lays eggs at base of expanding candle of terminal whorl
- Larvae feed on phloem, under the bark, causing terminal shoot to wilt and die
- Pupation and adult emergence in July
- Adults feed on pine shoots until going to duff layer to overwinter



Damage

- Killed terminal branch results in deformed stem
- Worse in open locations
- Katovich & Mielke, 1993
 - Weevil attacks cause the **greatest damage in more northern locations**
 - 42-100% of trees, starting a 3 ft high



Little Damage in Virginia and North Carolina

- Katovich & Mielke, 1993: Weevils are **almost non-existent in the southern part** of the range of white pine.
 - One study: 40% of overstory in 15-24 old plantations show damage
 - My recent visit to plantations saw one damaged leader in 1 of 6 locations
 - WHY?

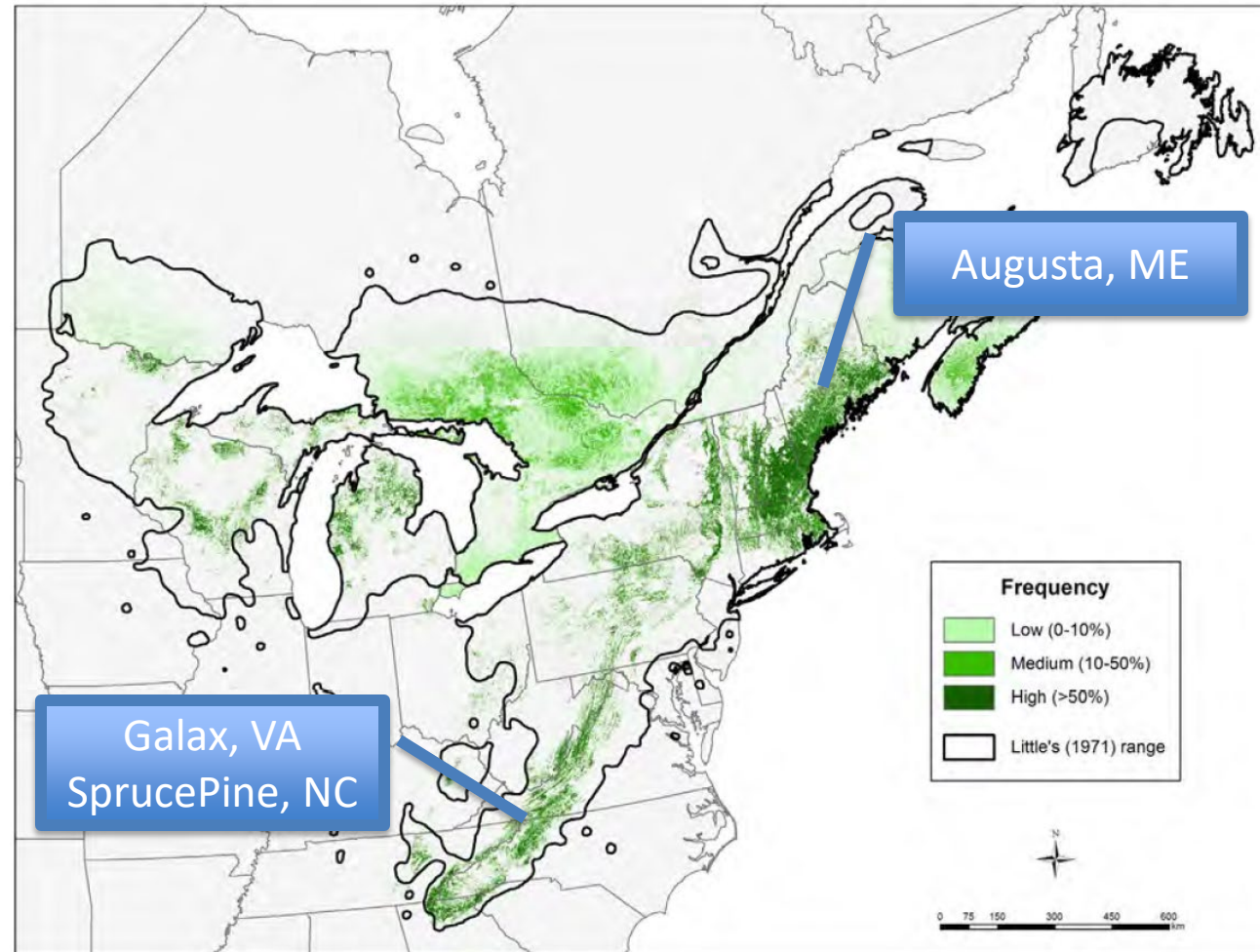


Little Damage in Virginia and North Carolina: Why?

- Not genetic (provenance studies)
- Winter mortality in duff layer
 - Predators (shrews) kill 13%
 - Prescribed fire?
 - Katovich & Mielke, 1993: Abiotic factors likely most important factors in winter mortality
 - Climate



Climate Differences between Maine and VA/NC White Pine Regions



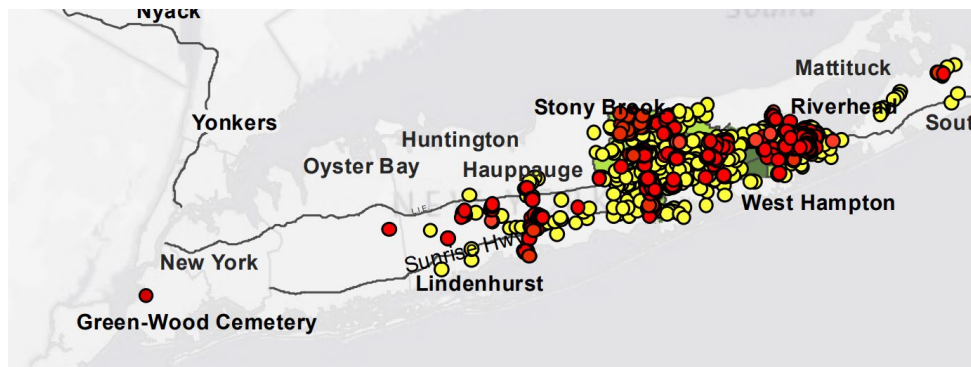
Climate Differences between Maine and VA/NC White Pine Regions

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

- *Dendroctonus frontalis*
- Yellow pines
 - 2-3 needle pines
 - Southern pines
 - Outbreaks can kill trees worth billions of board feet in the south
- Killing pitch pine on Long Island, NY, since 2014

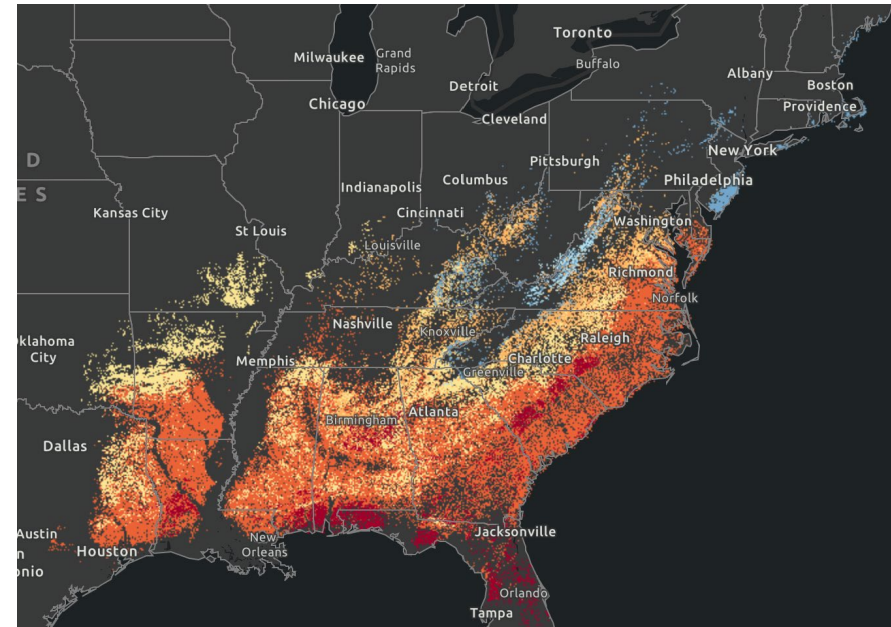
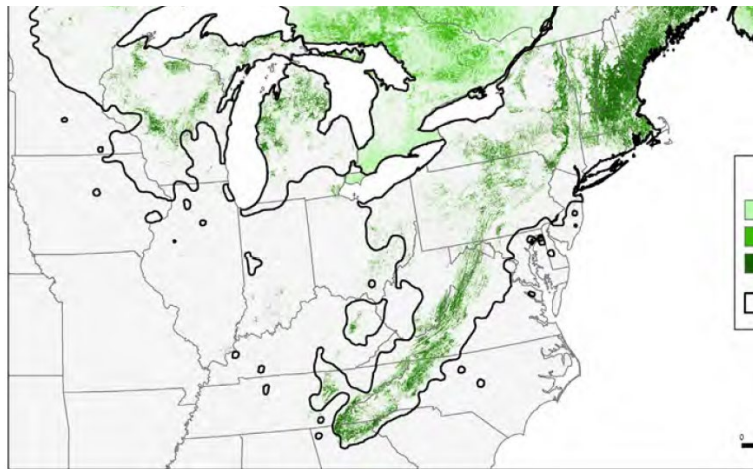


USFS Insect & Dis Leaflet 49

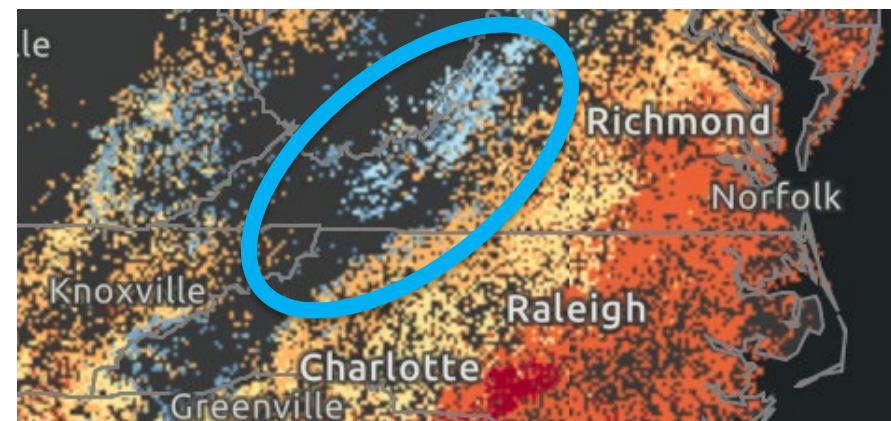


Eastern White Pine & Southern Pine Beetle

- Ranges overlap

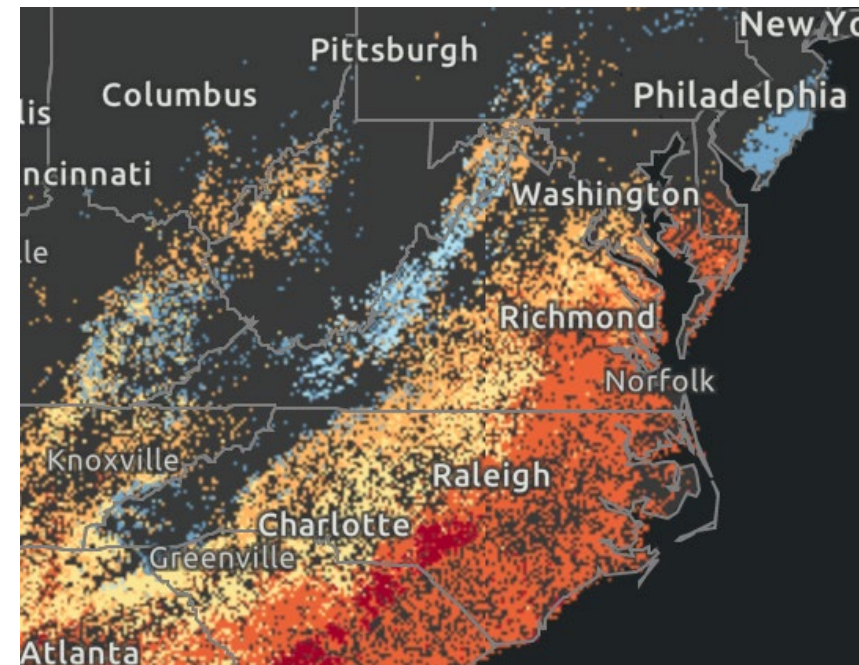
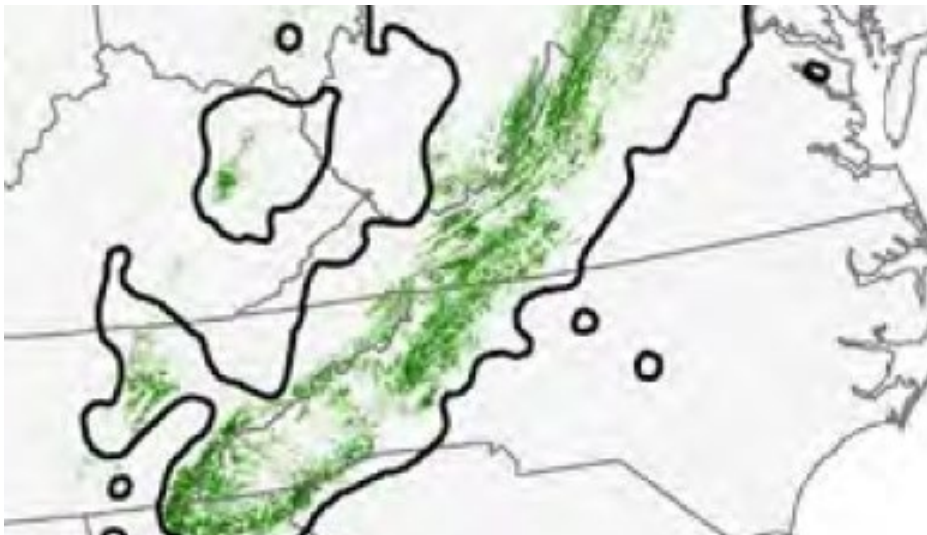


<https://usfs.maps.arcgis.com/apps/MapSeries/index.html?appid=bf092f00e070454f963a7cd3792d45cf>



Eastern White Pine & Southern Pine Beetle

- EWP grows on Blue Ridge Plateau, above 2000-3500 ft
- Not a preferred host for SPB
- Near SPB infested pitch pine and Virginia pine
- SPB can kill EWP near infested stands of yellow pines
- Unprecedented SPB outbreak did occur in EWP during 1998-2002



Eastern White Pine & Southern Pine Beetle

- Based on information researched by Paul Merten, forest entomologist, USFS Forest Health Protection section, Asheville, NC
- Usual SPB infested trees are near a SPB outbreak in yellow pines.
- From 1998 to 2002 the pest destroyed \$59.5 million worth of timber in North Carolina
- SPB spreading in EWP stands during this outbreak



Southern Pine Beetle Outbreak in Eastern White Pine 1998-2002

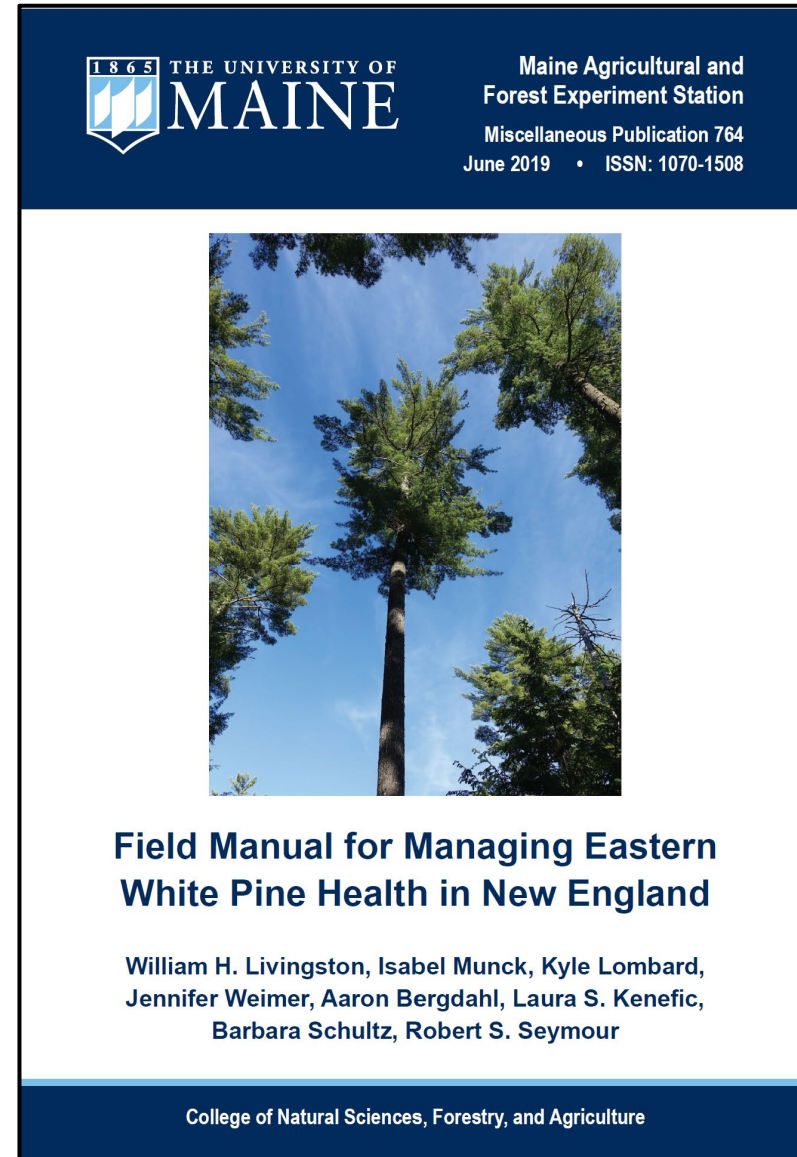
Key Factors

- 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 ft²/ac
 - Prolonged drought period
- Outbreaks collapsed more rapidly than seen in yellow pine stands



Eastern White Pine Health & Silviculture

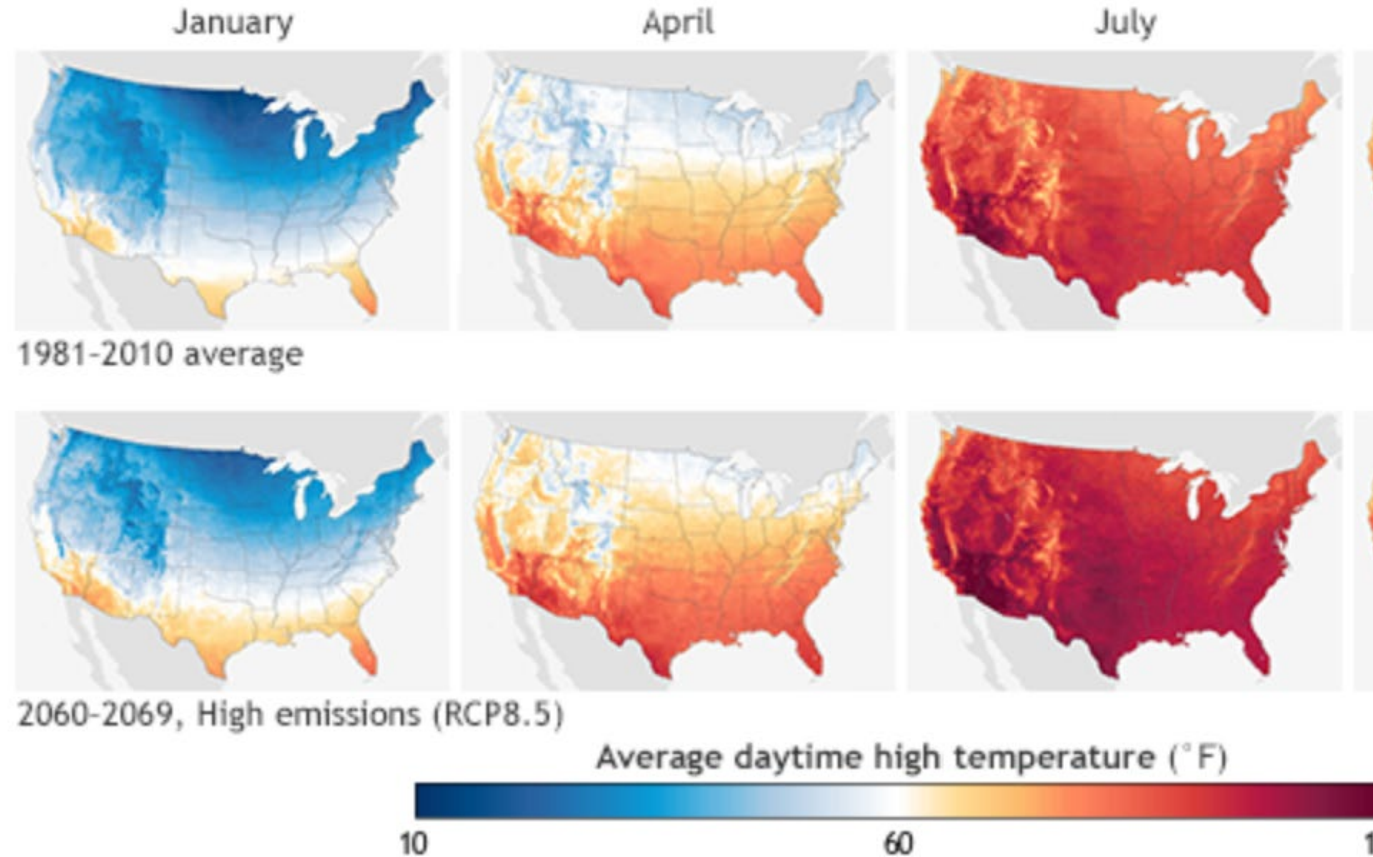
- Proper site selection
 - Better rooting reduces drought risk
 - Less Ribes reduces WPBR risk
- High density saplings under shelterwood
 - Reduce WPW and WPBR risk
- Low density pole and sawtimber stands
 - Reduce risk of drought damage
 - Reduce risks to Caliciopsis, pine bast scale, bark beetle, and white pine needle damage
- Produce high quality white pine timber



Climate Change and Eastern White Pine Insect Pests

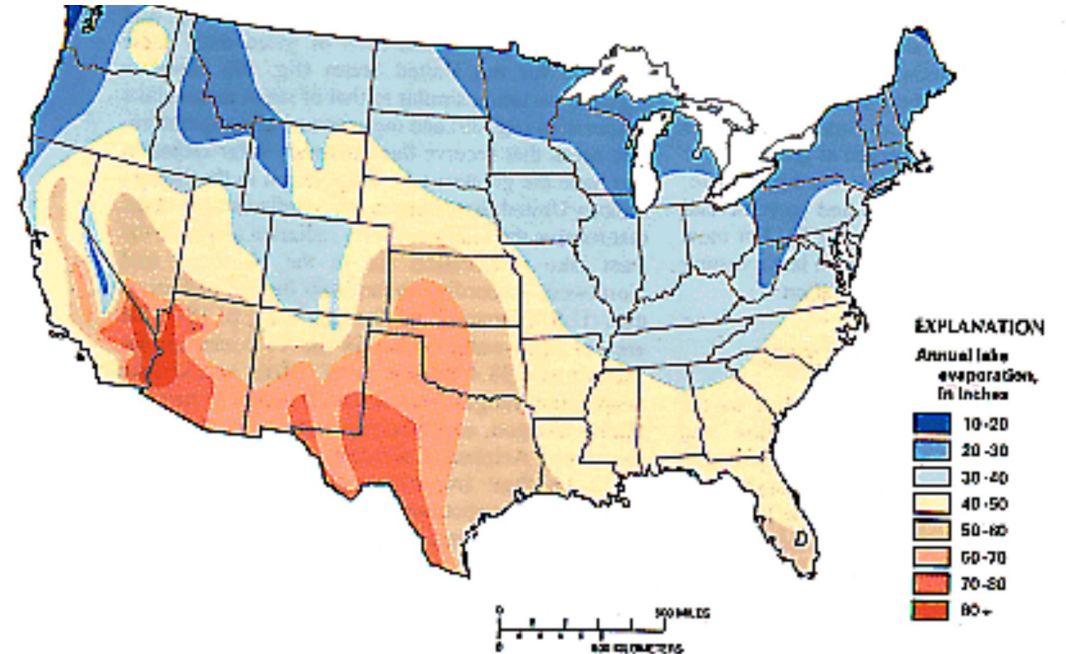
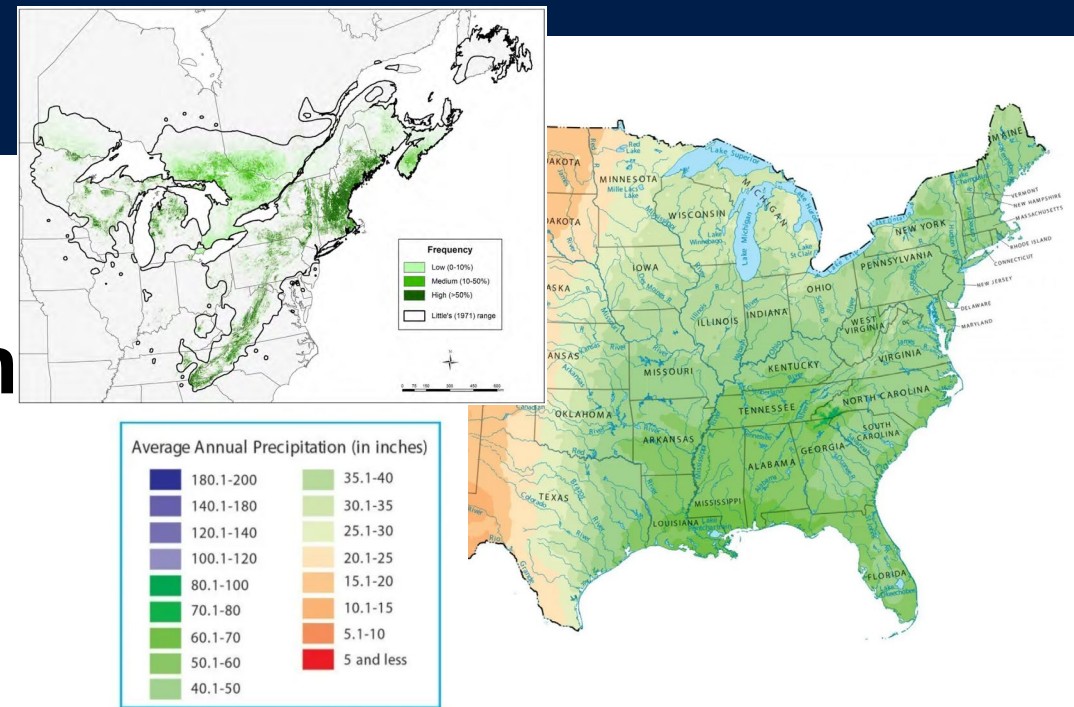
- Winters:
 - Warmer winters with less snow –
 - Less white pine weevil?
 - More southern pine beetle?
- Summers: If temperatures and precipitation change little
 - Managed EWP stand should be OK
 - Dense stands and/or stands on off-site remain vulnerable to damage and mortality by:
 - Pine bast scale/Caliciopsis
 - Ips bark beetle (and southern pine beetle?)
- Summers: If temperatures increase but precipitation stays the same

Projected changes in U.S. temperatures by mid-century



Eastern White Pine Needs Precipitation > Evapotranspiration

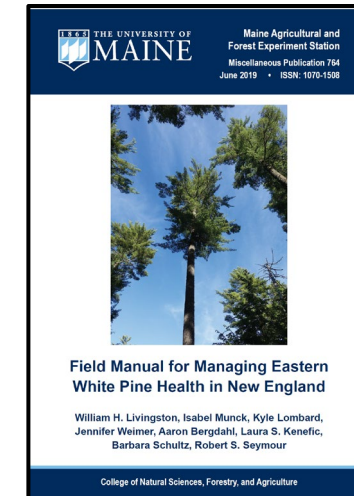
- Balance between precipitation and evapotranspiration sets range limits for eastern white pine
- Precipitation < evapotranspiration sets southern and western limits
- In areas where increased summer temperatures/evapotranspiration approaches precipitation levels
 - EWP shuts down photosynthesis to avoid damaging transpiration losses
 - Tree growth and health weakens
 - More mortality due to bark beetles



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



Eastern White Pine and Insect Pests

- North: Minimize weevil risks
 - High density in young ages
 - Regenerate under partial shade
 - Warmer winters may reduce risk
- South and North: Minimize drought related decline problems
 - Proper site selection
 - Use low stand densities as trees mature

