

White Pine Decline Risk Assessment in Maine



White Pine Decline

- Tree mortality 1997-2000
- Thinning crowns
- Southern Maine
 - ✓ Scattered locations
 - ✓ Simultaneous appearance
- Dense, pole-size stands

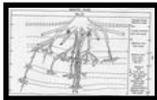
Past Agricultural Uses and Pine Forests

- Field abandonment
 - ✓ By 1940 total number of farms in Maine declined by 80 %
 - ✓ From 1872-1995 over 7 million acres converted back to forest
- Consequences
 - ✓ Plow pans
 - ✓ Soil compaction
 - ✓ Favored white pine establishment on many diverse sites



Harvard Forest Diagram

Rooting Habits of White Pine



Normal Rooting (Loring 1961)

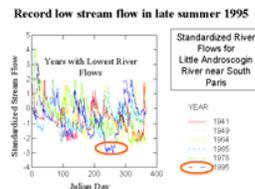


2000

- Normal Rooting
 - ✓ Grows best in deep, well drained soils
 - ✓ Lacks a taproot.
- Restricted Rooting
 - ✓ Soil barriers inhibit root penetration
 - ✓ Barriers include plow pans, high water tables, bedrock, and texture changes (lithological discontinuity)
 - ✓ Lack of roots deeper in the soil keeps trees from getting water during droughts

White Pine Decline is Incited by Drought

- Most (64%) dead trees had last year of growth in 1996-1997
- Severe drought in 1995



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White Pine is Predisposed to Mortality Incited by Drought in Stands with:

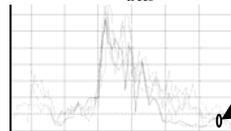
1. Shallow rooting depths

- 12 inches or less to rooting restriction
- Causes of restrictions
 - ✓ Lithological discontinuity
 - ✓ Plow layer
 - ✓ Water table
 - ✓ Bedrock



2. Dense Stands

Cross-dating of cores from killed & living trees

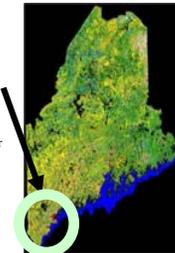


- About 30% of trees killed in affected stands
- 495 stems/ha, 23 cm dia in high mortality plots
- 273 stems/ha, 37 cm dia in low mortality plots
- Killed trees were slower growing (see graph)
- Insects and fungi secondary

Risk Assessment for White Pine Decline

Estimate amount of white pine stands growing on soils with rooting restrictions:

- Completed for York and southern Oxford Counties
- Stand Selection
 - ✓ Overlaid satellite image of cover types with soil map
 - ✓ Randomly selected sites where conifer type overlays soil type where rooting restrictions are possible
 - ✓ Sampled 40 sites where owners were willing to cooperate



Satellite Image with Cover Types
Conifer type in green



York County, Maine
Blue areas indicate where conifer type overlays soils with possible rooting restrictions
Symbols indicate sample sites



Measurements:

- Four subplots per site
- Depth to soil restriction
- Basal area of stand and white pine
- Site index for five white pine
- Regression between site index and depth to rooting restriction
- Completed 40 sites in 2003

State Inventory Plots and Potential Risk to Decline

- 56 inventory plots in York County
- Locations identified on soil maps
- 31 plots on soils with possible rooting restrictions

Outcomes

- 7.5% (3 of 40 plots) of white pine stands had hazardous rooting restrictions of less than 12 inches deep on susceptible soils
- Rooting restrictions deeper than 12 inches were found on 52.5% of the stands.
- Relationship between white pine site index and depth to rooting restrictions will be analyzed
- Developing management guidelines for identifying stands that should be maintained at low densities.

