

Northern White-Cedar

Guidance for Forest Managers

Laura S. Kenefic

U.S. Department of Agriculture
Forest Service, Northern Research Station



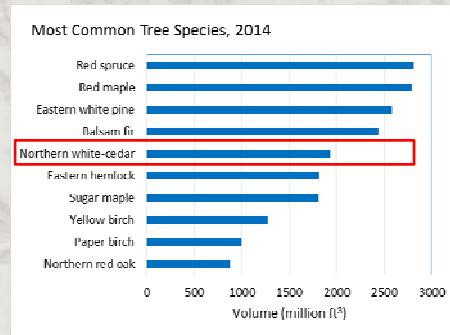
Natural Range of Northern White-Cedar



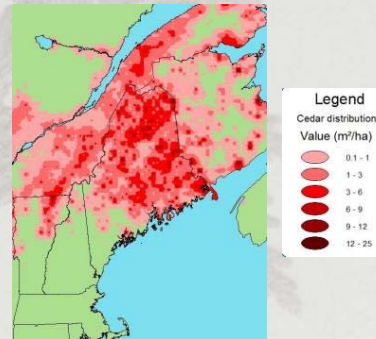
Source: Virginia Tech

Cedar in Maine

- One of the most abundant tree species



Forest Inventory and Analysis



Map: Eric Forget, Nova Sylva




Thuja occidentalis L.

- northern white-cedar
- mid- to very shade tolerant
- long-lived, 400 years
- abundant seeds 2-5 years
- seedlings, or layering on wet sites
- weak and brittle, prone to decay when living
- extremely resistant to decay after death



Photo by Phil Hofmeyer





Habitat Types

Lowland, swamp	Mid-slope, seepage	Upland
		
<small>Photos courtesy of Phil Hofmeyer</small>		<small>Photo courtesy of Catherine Larouche</small>

Damaging Agents

White-cedar

- Arborvitae leaf miner
- Browsing
- Decay
- Windthrow, uprooting
- Hydrologic changes
- Logging damage to roots, stems, and crown

 <small>https://www.ontario.ca/</small>	
	
<small>Photo courtesy of Catherine Larouche</small>	

Cultural Importance

Native Americans



Photo by Heather Perry

Commodity Production

White-Cedar



Photo from Maibec



<http://flwinternational.com/>

Biodiversity Considerations

White-Cedar



Photo by KaDonna Randolph



Photo by N.B. Hunter

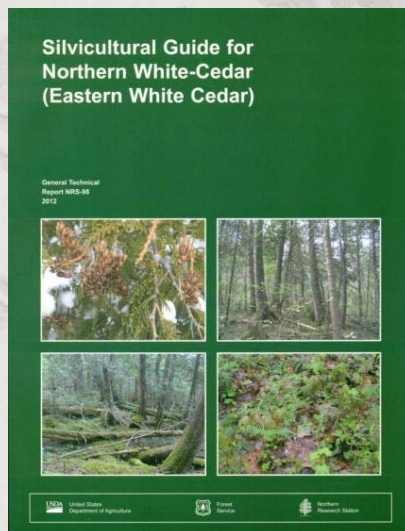


Source: Maine Natural Areas Program



Photo by Rick Dionne

White-Cedar Silvicultural Guide



Photos courtesy of Catherine Larouche and Phil Hofmeyer

<https://www.treearch.fs.fed.us/pubs/41699>

Stem Analysis: Observations

- 80% showed initial growth suppression followed by release
- Mean initial suppression > 60 years
- Some trees responded to release after 200 years



Hofmeyer et al. 2010

Number of Years to Reach a Given Size from stump height (1 ft.)

Size		Mean (years)	Range (years)
1 in. DBH	Sapling	42.0	9 - 86
5 in. DBH	Poletimber	96.0	28 - 171
9 in. DBH	Sawtimber	139.9	54 - 238
15 in. DSH	Shingle Stock	170.1	81 - 317

DBH = diameter at breast height, DSH = diameter at stump height

Hofmeyer et al. 2010

Establishment and Early Growth

- Seepage and upland: mineral soil, decayed wood



Photo courtesy of Catherine Larouche

- Lowland, swamps: mounds (hummocks)

Silvicultural Experiment

120 ft²ac⁻¹



Control

90 ft²ac⁻¹



Selection (25% removal)

60 ft²ac⁻¹



Shelterwood (50% removal)

90-ft. diameter gaps (0.15 acre)



Patch Cutting

Larouche et al. 2011

Observations

- Establishment
 - Best in selection and shelterwood cutting
 - Worst in patch cutting
- Growth of established seedlings
 - Positively correlated with light



Larouche et al. 2011

Influence of Herbivory

- Deer density: 0 versus 15 per mi²
- At both densities, many seedlings < 6 inches
- At high density
 - Few seedlings 6 to 12 inches
 - Almost none > 1 foot



Larouche et al. 2010

Sapling Recruitment

- Penobscot Experimental Forest, partial harvesting
- ~ 15 deer per square mile
- >90% of white-cedar seedlings and small saplings browsed (2005)



Photo courtesy of Catherine Larouche

Old-Growth White-Cedar

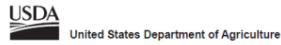


Photo credit: The Nature Conservancy



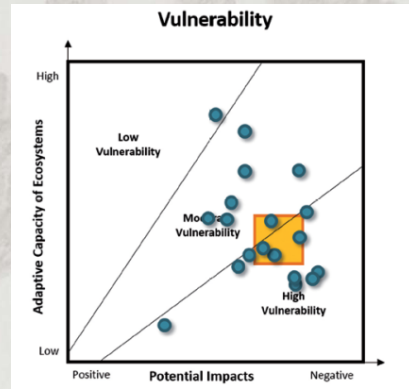
Photo courtesy of Catherine Larouche

Climate Change



**New England and Northern New York
Forest Ecosystem Vulnerability
Assessment and Synthesis:**
A Report from the New England Climate Change
Response Framework Project

Janowiak et al. 2018
General Technical Report NRS-173
<https://www.fs.usda.gov/treearch/pubs/55635>



Predicted climate change vulnerability of lowland mixed conifer forests

Key Points: Silvics White-Cedar

- Shade tolerant, slow growing
- Requires moisture-holding substrate
- Often originates beneath the canopy
- Seedlings or layers
- Withstands long periods of suppression
- Vulnerable to browsing
- Has increasing growth over time



Photo courtesy of Catherine Larouche,

Concerns

White-Cedar

- Vulnerable to damage and decay
- Loss of cedar from harvested mid-slope or upland stands
- Regeneration mechanism in managed lowland stands?
- Negative climate change impacts



Photo courtesy of Catherine Larouche

Recommendations: Regeneration

- Take advantage of what is already there
 - Establish
 - Protect
 - Release
- Control substrate and competition
- Consider browsing



Photo courtesy of Catherine Larouche

Recommendations: Tending

- Use intermediate treatments to improve growth of existing trees
- Protect stems and exposed roots during harvesting



Photo courtesy of Catherine Larouche

Irregular Shelterwood or Selection System

- Multiple treatment approach
 - Protect and release regeneration
 - Tend immature classes
- Treat patches (micro-stands) in mixed-species stands
- Retain seed trees for more than one rotation



Photo courtesy of Catherine Larouche

Additional Concerns

- Regeneration of cedar under high deer browsing pressure
 - Species associations
 - Structures
 - Habitat sustainability



Photo: Maine Dept. of Inland Fisheries and Wildlife



Additional Concerns

- Managing lowland cedar
 - Site impacts
 - Residual damage
 - Mode of regeneration
 - Species conversion



lkenefic@fs.fed.us

This presentation includes research by the following:

Rod Chimner, Michigan Tech; **Shawn Fraver**, University of Maine;
Phil Hofmeyer, Morrisville State College; **Laura Kenefic**, U.S. Forest
Service; **Catherine Larouche**, Ministère des ressources naturelles
et de la faune du Québec; **Jean-Martin Lussier**, Canadian Forest
Service; **Jean-Claude Ruel**, Université Laval; **Bob Seymour**,
University of Maine; **Gerald Storm**; **Nathan Wesely**, University of
Maine; **Olivier Villemaire-Cote**, Université Laval