Chapter 38

White Cedar Cover Type

Last Full Revision: 12/5/1990
Note- this chapter has not been fully revised since the restructuring of the Wisconsin Silviculture Guide, therefore some subject areas may be missing in the current version of this chapter.

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1 TYPE DESCRIPTION

1.1 Stand Composition and Associated Species

Stand Composition
More than 50 percent swamp conifers with northern white cedar (*Thuja occidentalis*) predominant.

Associated Species
Includes black spruce (*Picea mariana*), white spruce (*P. glauca*), tamarack (*Larix laricina*), balsam fir (*Abies balsamea*), eastern hemlock (*Tsuga canadensis*), black ash (*Fraxinus nigra*), red maple (*Acer rubrum*), yellow birch (*Betula allegheniensis*), paper birch (*B. papyrifera*), American elm (*Ulmus americana*), and quaking aspen (*Populus tremuloides*).

1.2 Silvical Characteristics*

Table 38.1. Summary of selected silvical characteristics.

Species	Northern white cedar
Pollination	Late April or early part of May.
Cones Mature	Cone formation begins by mid- to late June. Cone growth is complete by mid-August with cone-opening beginning anywhere from mid-September to late October. The interval between cone ripening and cone opening is short, about 7 to 10 days.
Seed Dispersal	Most seed is dispersed by November but some seed fall occurs throughout the winter. Seed is wind-disseminated, but because cedar trees are usually not very tall, the effective seeding range is 150-200 ft. except during unusually high winds.
Good Seed Years	Good seed crops occur every 3 to 5 years, with light to medium crops intervening. Seed production has been reported on stems as young as six years, but adequate seed production starts at 30 years of age and is best after 75 years of age.
Germination	Normally begins in May or June of year following seed dissemination. Cedar requires very warm germination temperatures (65 to 85°F). Seedlings usually develop on rotten wood, decayed litter, peat, or sphagnum moss, all of which provide warmer microsites with stable moisture regimes, but cedar does very well on seedbeds of exposed mineral soil. Seedlings are also aggressive on burns on both upland and swamp soils, and on skid rows where the moss has been compacted and will stay moist throughout the summer. Half to full sunlight produces the best germination and seedling establishment rates.
Seed Viability	Seed shows only a slight internal dormancy. Germinative capacity is only about 35 percent under test conditions (Schopmeyer, 1974).
Seedling Development	During the first several years, seedlings tend to develop taproots which are later replaced by fibrous root systems. Drying causes about one-third of all seedling mortality, but seedlings are resistant to damping-off fungi.
Growth	Northern white cedar generally grows more slowly than associated species, and is longer lived, reaching ages of 400 years or more on swamp or lowland sites. It is medium-sized, commonly 40 to 50 ft. tall and 2 to 3 ft. in diameter.

Species	Northern white cedar
	On average swamp sites in the Lake States it takes 80 to 100 years for cedar to grow to a 6-inch diameter.
Shade Tolerance	Northern white cedar is tolerant. On swamp sites it is generally shorter than its associates and is able to withstand extreme suppression for several years without ill-effect. It responds well to release at nearly all ages, especially on good well-drained sites.
Vegetative Reproduction	Layering is a common means of cedar regeneration in swamps. Branch layering accounted for over 60 percent of stems of cedar regeneration in northern Michigan swamps. Vertical stems from windthrown trees and layering by 5-year old seedlings also contribute to regeneration. Root or stump sprouts, and root suckers are rare, however.
Major Pests	Northern white cedar is resistant to insect pests and disease for the most part. White stringy butt rot (*Poria subacida*) and brown cubical butt rots (*Polyporus balsameus* and *P. schweinitzii*) are uncommon in young stands but do affect trees on swamp knolls or in drier portions of the swamp. To avoid, do not hold cedar stands beyond recommended rotation length. Because northern white cedar is a relatively shallow-rooted tree, it is subject to windthrow and uprooting. Threat of windthrow is greatest in overmature and over-dense stands. Apply proper management. Flooding, high water table, and slow-moving or stagnant ground water are critical conditions that reduce growth rates and in some cases kill entire stands. Keep swamp drainage patterns open by controlling beaver dam and road construction. Northern white cedar is preferred browse for white-tailed deer and snowshoe hares both in terms of palatability and nutrition. Browse damage can be extensive, retard tree growth, and eventually kill smaller trees. Snowshoe hare damage can usually be expected where alder accompanies cedar regeneration and sometimes is as great as deer browse damage. Eliminate or reduce adjacent deer and hare winter cover where browsing is a problem when regenerating cedar. According to preliminary research findings, deer tend to avoid cedar clearcuts that are 40 acres or larger, due to deeper snow and lack of protective cover.

* Mainly from Fowells (1965) except where indicated.

2 MANAGEMENT GOALS, LANDOWNER OBJECTIVES

The management objective should be identified in relation to other land management objectives using the habitat type, if known, as the preferred indicator of site potential. Possible alternatives for white cedar include managing to produce high quality, sustained yield of cedar posts and poles while maintaining good winter deer cover where needed.

3 LANDSCAPE, SITE, AND STAND MANAGEMENT CONSIDERATIONS

3.2 Site and Stand Considerations

3.2.1 Soils

Best growth occurs on neutral or alkaline mineral soils of limestone origin. In swamps, the site quality for cedar increases as the internal drainage improves and the depth of peat decreases. However, the composition of the organic material is more important than its depth. Peat comprised of moderately to well decomposed woody plants or sedges is preferred by white cedar.

3.2.2 Site Quality

3.2.2.1 Range of Habitat Types

Habitat types for swamp conifers were determined for upper Michigan (Coffman et al., 1980) and include TTM (Tsuga-Thuja-Mitella), TTS (Tsuga-Thuja-Sphagnum), PO (Picea-Osmunda), and PCS (Picea-Chamadaphne-Sphagnum). However, these types are based on very limited sampling and have not been adequately studied to offer useful management information.

5 SILVICULTURAL SYSTEMS

Even-age management will be applied with thinning where stands become overstocked.

Medium quality sites of middle-aged cedar have demonstrated net growth at the rate of 4 to 5 sq. ft. per year when thinned to 90 to 150 sq. ft. of residual basal area. Site index curves for white cedar are provided in Figure 38.1.

5.1 Seedling / Sapling Stands

Allow natural development. In very dense stands, cedar may need release.

5.2 Intermediate Treatments

5.2.2 Thinning

If stand is essential for deer shelter and subject to heavy browsing, reduce stocking level to 150 sq. ft. of residual as stand becomes operable. A heavy canopy is essential for good deer shelter. Do not attempt to regenerate stands essential to winter deer shelter. Research is being conducted which will provide a management prescription for regeneration of these stands.

If stand is not essential for deer shelter and is subject to only light browsing, and if it is at least 20 years prior to rotation, reduce stocking level to 120 sq. ft. in sawtimber or 90 sq. ft. in poles as stand becomes operable. Never remove more than 35 percent of a stand's total stocking at one time. Discriminate against other species during thinning if a heavy proportion of cedar is desired in the next rotation.

5.3 Natural Regeneration Methods

Advance cedar regeneration is a reliable source for the next stand only if it is young, vigorous stock of seedling origin. Many of the cedar stems that remain after clearcutting are old and probably originated by layering. More research is needed on cedar regeneration techniques. Clearcutting, burning or skidding slash, and direct seeding have not provided conclusive results. However, shelterwood cuts have been tried on the Menominee Reservation and the Nicolet National Forest with some promising results. These shelterwood cuts were made at the 60 to 80 percent crown closure level.

Balsam fir should be removed from cedar stands by 70 years of age to avoid losses due to butt rot. Some fir may be retained to maintain proper stocking levels. However, balsam fir frequently takes over cedar sites if it is allowed to remain in the stand and to comprise a portion of the seed source for future regeneration.

Black spruce and tamarack generally produce more seed and grow faster than cedar and should be removed from the seed source if a relatively pure cedar stand is desired.

To minimize overstocking, the forest manager should survey cedar regeneration four years after site preparation and remove seed source when adequate regeneration is attained.

5.3.1 Even-Aged Regeneration Methods

5.3.1.1 Clearcut

If vigorous advance regeneration exists that will provide 60 percent millacre stocking after harvest, clearcut entire stand at rotation age.

5.3.1.2 Strip Clearcut

If advance regeneration is inadequate, apply strip clearcutting. Divide the stand into strips 2 chains wide at a right angle to the prevailing wind direction. Clearcut the most leeward strip and each successive third strip.

When 60 percent millacre stocking of one-foot tall seedlings has been attained, clearcut the next series of strips windward of the newly regenerated strips. When the second series of strips has regenerated, cut the last series of strips, leaving scattered dominant seed trees at 100-ft. spacing to regenerate the final strip. Planting or direct seeding can be undertaken in place of leaving seed trees or in the case of seed tree failure.

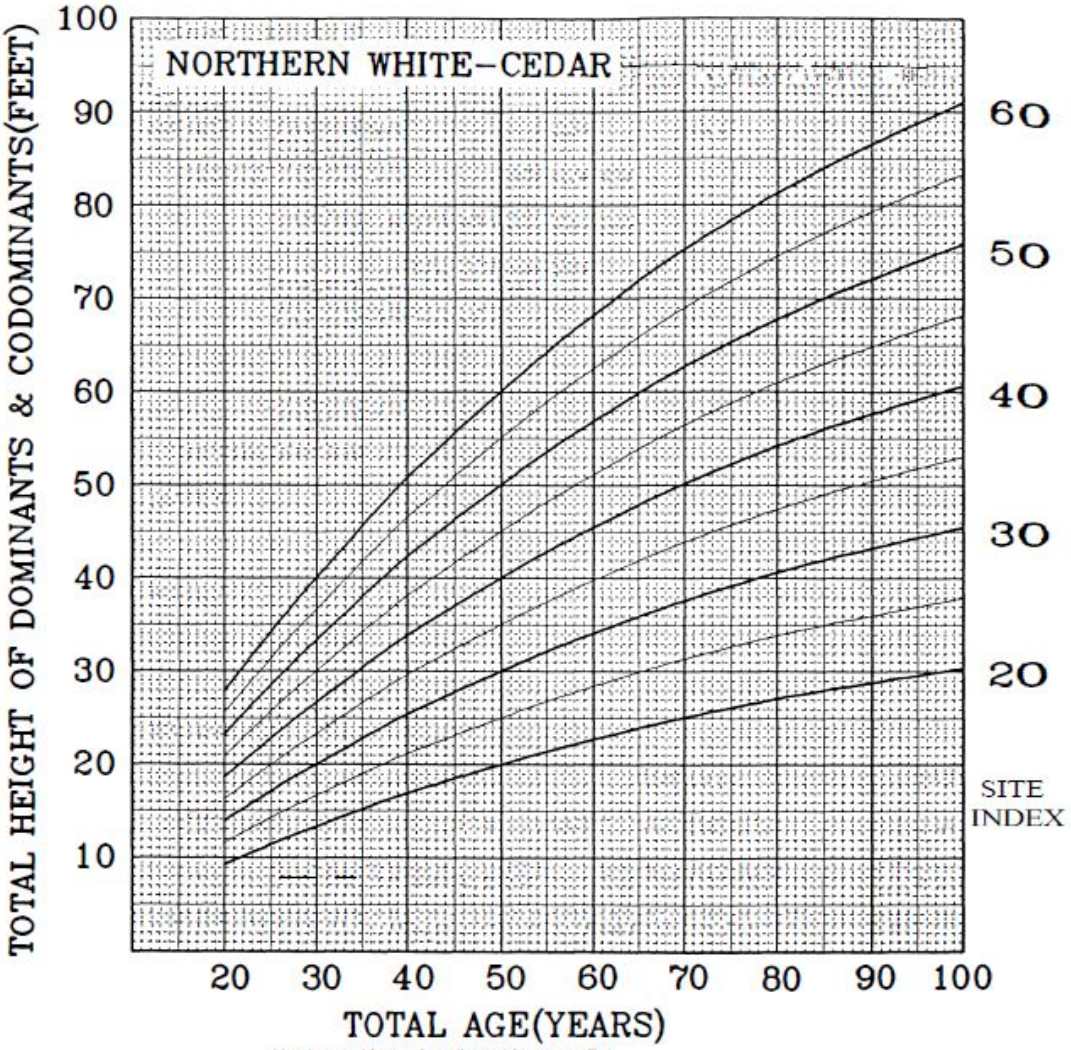
All residual stems larger than 2 inches DBH should be removed to favor regeneration as each strip is cut or shortly thereafter.

As each strip is cut, prevent heavy accumulation of slash by whole tree logging, tree length skidding with slash disposition at landing, or bunching of slash to ensure adequate seed bed. Either compaction or burning will also be necessary if the site is covered with feather mosses.

Extensive presence of alder may require shearing, chopping or flailing to reduce competition that would retard seedling growth. Tamarack should be favored as a seed source where alder is sheared because of its relatively fast growth rate.

8 APPENDICES

Rotation Age					
Site Index	60	50	40	30	20
Rotation Age	80	90	100	110	120



Northern white-cedar (Gevorkiantz 1957e)
Lake States
Number of plots and number of dominant and codominant trees not given
Total height and total age, anamorphic, equation not given
Convert d.b.h. age to total age by adding years according to site index (BH = 0.0):
SI: 20 30 40 50 60
Years: 20 15 15 10 10

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.9730	1.0000	-0.0154	1.0895	0.0000	0.99	0.66	1.7
SI	0.5068	1.0000	-0.0154	-1.0895	0.0000	0.99	0.66	1.7

Figure 38.1. Site index curve for northern white cedar in the Lake States (Carmean et al. 1989).

9 REFERENCES

Benzie, J. W. 1963. Research Paper LS-4, Cutting methods in mixed conifer swamps - upper Michigan. USDA-Forest Service, Lake States For. Exp. Sta.: St. Paul, MN.

Carmean, W. H., J. T. Hahn, and R. D. Jacobs. 1989. General Technical Report NC-128, Site index curves for forest tree species in the eastern United States. USDA-Forest Service, North Central For. Exp. Sta.: St. Paul, MN.

Coffman, M. S., E. Alyanak, J. Kotar, and J. E. Ferris. 1980. *Field guide to habitat classification system for upper peninsula of Michigan and northeast Wisconsin*. Michigan Technological Univ.: Houghton, MI. 144 pp.

Craighead, F. C. 1950. Miscellaneous Publication No. 657, Insect enemies of eastern forests. USDA-Forest Service: Wash., D. C.

Foltz, B. W., and W. F. Johnston. 1968. Research Note NC-61, Gross basal area growth of northern white cedar is independent of stand density over a wide range. USDA-Forest Service, North Central For. Exp. Sta.: St. Paul, MN.

Fowells, H. A. 1965. Agric. Handbook No. 271, *Silvics of forest trees of the United States.* USDA-Forest Service: Wash., D. C. p. 679-685.

Godman, R. M. 1958. Station Paper No. 67, Silvical characteristics of northern white cedar. USDA-Forest Service, Lake States For. Exp. Sta.: St. Paul, MN.

Hutchinson, J. G., (ed.). 1989. Northern Hardwood Notes. USDA-Forest Service, North Central For. Exp. Sta.: St. Paul, MN.

Johnston, W. F. 1977. General Technical Report NC-35, Manager's handbook for white cedar in the north central states. USDA-Forest Service, North Central For. Exp. Sta.: St. Paul, MN.

Johnston, W. F. 1975. Reproducing lowland conifer forests. J. Forestry, vol. 73, no. 1, p. 17-20.

Johnston, W. F. 1972. Research Note NC-133, Balsam fir dominant species under rethinned northern white cedar. USDA-Forest Service, North Central For. Exp. Sta.: St. Paul, MN.

Roe, E. I. 1947. Technical Note No. 279, Thinning in cedar swamps. USDA-Forest Service, Lake States For. Exp. Sta.: St. Paul, MN.

Schopmeyer, C. S. 1974. "*Thuja* L. (Arborvitae)" in Agric. Handbook No. 450, *Seeds of woody plants in the United States.* C. S. Schopmeyer, ed. USDA-Forest Service: Wash., D. C. p. 805-809.

Stout, B. M. 1961. Timber management guide for the national forests of the north central states: mixed conifer swamp type. USDA-Forest Service: Wash., D. C.

Verme, L. J. 1965. Swamp conifer deer yards in northern Michigan--their ecology and management. J. Forestry, vol. 63, no. 7, p. 523-529.

Zasada, Z. A. 1952. Station Paper No. 27, Reproduction on cutover swamplands in the upper peninsula of Michigan. USDA-Forest Service, Lake States For. Exp. Sta.: St. Paul, MN.