CHAPTER 61

BIG TREE SILVICULTURE

Big tree silviculture (BTS) currently is a silvicultural guideline identifying practices that can be applied to accomplish specified forest management goals and objectives in selected stands. Big tree silviculture refers to the cultivation of long-lived, large diameter trees, either as entire even-aged stands or as reserve trees within stands of smaller sized trees. Big trees are retained until they approach senescence (biological maturity). The management of large trees can provide a variety of benefits, but can also incur costs.

Potential benefits of BTS:

1. Aesthetics
   a. Provide visually unique stands and trees (big old trees)
   b. Provide diversity in current and future stands
   c. Reduce unobstructed line of vision
   d. Break-up clearcut look
2. Wildlife and plant populations, habitat, and biodiversity
   a. Altered populations. Some desired species may be more abundant.
   b. Protect areas of special concern (special habitat)
   c. Habitat diversity
   d. Buffer adjacent stands (habitat)
   e. Travel corridors
   f. Future coarse woody debris
   g. Cover
   h. Den and nest trees
   i. Food (foraging, hunting)
   j. Display locations
3. Timber Production
   a. Produce large diameter sawtimber
   b. Reserve high quality trees for future harvest
4. Water and Soil Quality
   a. Reduce run-off
   b. Reduce erosion
   c. Maintain water and nutrient cycles
5. Miscellaneous
   a. Protect cultural resources
   b. Preserve landmarks, such as marker trees and witness trees

Potential costs of BTS:

1. Aesthetics
   a. Cluttered forests – less order – more mortality and decay.
2. Wildlife and plant populations and habitat
   a. Altered populations. Some desired species may be less abundant, with less habitat.
   b. Potential for increased predation of some wildlife
3. Timber Production
   a. Reduced timber volume growth and productivity rates (MAI)
   b. Susceptible to stem and crown damage during stand harvests
   c. Reserve trees susceptible to epicormic branching following stand rotation
   d. Reserve trees susceptible to crown dieback and mortality following stand rotation
   e. Reserve trees susceptible to wind throw on wet or shallow soils, or for shallow rooted species
   f. Reserve trees can shade and reduce vigor of nearby regeneration
   g. Damage to younger stand if reserves are harvested during mid-rotation
4. Miscellaneous
   a. Provide potential sites for pathogen breeding and maintenance

History

The initial formal recommendation advocating for the application of big tree silviculture on State Forest lands is presented in the *Final Report – Governor's Committee To Review Timber Management Policies On State-Owned Lands – March, 1974*. The recommended policy stated:

- "Because of the unique recreational values of old growth and big trees, as well as the need for large timber by some industries, 'big tree silviculture' and longer rotations than at present should be used in State Forests."
- "High intensity forest management for maximum timber production … would be limited."

Some comments included:

- "Therefore, State Forests should generally be managed for recreation and long rotation species, except for those sites unusually adapted to shorter rotation species."
- "Sites not suitable for such production naturally would not be managed in this fashion."
- "A policy for larger basal tree size and for stands of greater maturity in State Forests will have an important effect upon local wildlife management."
- "The implementation of this policy would significantly change the character of the State Forests."

This report recommends that, on State Forests, management should encourage the dominance of long-lived species, and stands should be managed on extended rotations.

These policy recommendations were interpreted by DNR Forestry and used to develop the Big Tree Silviculture policy and guidelines detailed in the Silviculture Handbook in 1977. In summary:

- "Big tree silviculture … is to govern the management of selected types on state forests … to achieve the objective of old growth timber and aesthetic desirability … will take precedent over maximizing timber yields."
- The application is limited to five cover types (red pine, white pine, red oak, northern hardwood, hemlock-hardwood), where rotation ages "will be extended to approach biological maturity."
- In addition, the concept should be applied to three species (red pine, white pine, hemlock) as individual trees or clumps in stands of other non-BTS cover types (e.g. white pine standards in aspen stands).

The big tree silviculture policy and guidelines in the Silviculture Handbook were updated in 1990. There were two major changes:

- The role of old-growth was reduced, because "old growth has important ecological implications that are not yet fully understood … These guidelines may be modified in the future as we improve our understanding of the structure and function of old growth forests." Therefore, the objective of big tree silviculture was revised "to achieve the objective of aesthetic desirability."
- Forest habitat types were integrated to identify site types where large, vigorous, long-lived trees could be expected to develop. Big tree silviculture was then limited to specific species on specific site types.

From 1990 until 2006, big tree silviculture stated that, on State Forests, when specific cover types or tree species occur on specific sites, they will be managed to an age approaching biological maturity before harvesting. Every acre that meets the species and site requirements will be managed on an extended rotation.

In 2006, DNR Division of Forestry leadership reviewed and rescinded the big tree silviculture policy. Section 28.04, Wis. Stats., identifies the purpose of the State Forests. Chapter NR 44, Wis. Adm. Code, Rules for Master Planning, details the master planning process, and guides the allocation of land to different management goals and strategies. Big tree silviculture is now maintained as a silvicultural guideline to accomplish predetermined management goals and objectives in selected stands.

Stands of Trees

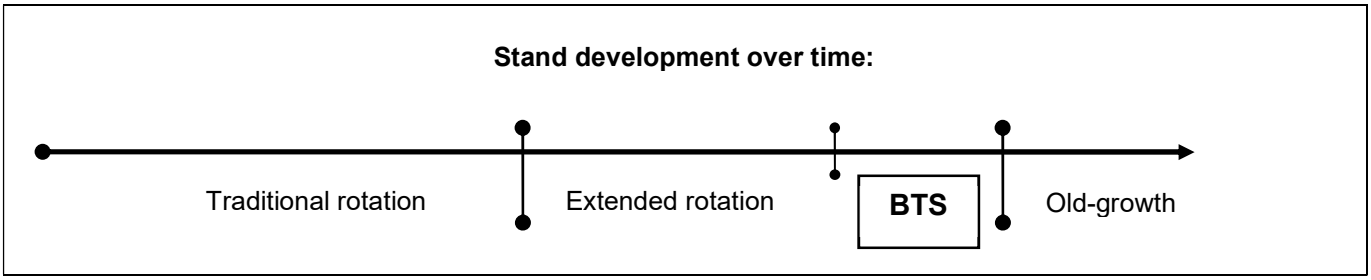
In extended rotations, mature stands are dominated by relatively large trees, older than their traditional rotation age, yet younger than their pathological rotation age (average life expectancy). They are managed for both commodity production and the development of some social and ecological benefits associated with older forests dominated by big trees. These stands can be even-aged or uneven-aged. Most trees eventually will be harvested for timber production, although some trees can be reserved to live out their natural lifespan.

Big tree silviculture is applied to develop specific stand characteristics which are a subset of potential conditions developed through extended rotations.

- BTS only applies to the management of **even-aged stands**.
- BTS is restricted to species and sites where stands of large diameter trees can be grown

Big Tree Silviculture Potential Forest Cover Types and Corresponding Site Types	
Forest Cover Types	Habitat Type Groups (site types)
Red Pine	Dry, Dry-mesic
White Pine	Dry, Dry-mesic, Mesic, Wet-mesic
Oak (red, white, bur)	Dry-mesic, Mesic
Oak (swamp white)	Wet-mesic, Wet
Central Hardwood	Dry-mesic, Mesic

- BTS only covers the period near the end of an extended rotation. Stands managed under BTS will be carried to the later stages of an extended rotation, nearing senescence (approaching biological maturity).



Big tree silviculture potentially can be applied to even-aged stands comprised of relatively long-lived tree species growing on sites that can support vigorous growth and the development of large trees. Stand and tree health should be monitored and managed. Although expected rotation ages should be identified, actual rotation ages will depend on stand vigor.

Big tree silviculture only applies to even-aged cover types. For **uneven-aged stands**, BTS would be analogous to extended rotations. Where similar management objectives are delineated for uneven-aged types (e.g. northern hardwood, hemlock, white cedar), apply extended rotation concepts and guidelines to develop large, long-lived trees. Designate and retain some reserve trees to live out their natural lifespan. These uneven-aged stands will contain trees of many different ages and sizes, including some old, senescent individuals.

The forest cover type chapters within this handbook provide management guidelines applicable to extended rotations. The DNR Old-growth and Old Forests Handbook (2480.5) provides definitions, considerations, and management guidelines by major forest type for extended rotations, as well as for managed and reserved old forest and old-growth.

Reserve Trees (standards, leave trees, legacy trees, green tree retention)

Reserve trees are scattered individuals, groups, or patches retained to reach greater ages and larger sizes than the stand matrix. They may be the same species that dominate the main stand, but often are longer lived associated species. Reserves can be retained in even-aged and uneven-aged stands. In even-aged management, reserve trees function as stand legacies, providing an ecological connection between stands (developmental stages). Depending on management objectives, reserve trees may be harvested or retained to live out their natural lifespan.

Reserves can be uniformly or irregularly distributed individual trees, small groups, larger patches (usually <2 acres, based on DNR Recon protocol), or any mixture thereof. Reserve trees should not significantly inhibit the vigor of the younger stand. In general, the canopy cover of reserve trees should be maintained below 20% to limit excessive shading.

Big tree silviculture is applied to develop specific reserve tree characteristics which are a subset of potential conditions developed through standard reserve tree management.

- BTS applies to reserve tree management in even-aged or two-aged stands; it does not apply to reserves in uneven-aged management.
- BTS is restricted to species and sites where relatively long-lived, large diameter trees can be grown
- BTS reserve trees will be retained until they near senescence (approach biological maturity) or longer. Some trees will be retained to live out their natural lifespan and to produce large diameter snags and coarse woody debris.

For big tree silviculture, reserve trees are expected to continue to grow and to survive, so they should be vigorous trees, relatively long-lived species, and growing on sites that can support continued growth and the development of large trees.

Big Tree Silviculture – Potential Reserve Tree Species by Site Types	
Habitat Type Groups (site types)	Reserve Tree Species
Dry	Red pine, White pine
Dry-mesic	Red pine, White pine, White spruce, Oaks (red, white, bur)
Mesic	White pine, White spruce, Oaks (red, white, bur), Shagbark hickory, Basswood, Sugar maple, Beech, Yellow birch, Hemlock
Wet-mesic	White pine, White spruce, Swamp white oak, Yellow birch, Hemlock, Cedar
Wet	White pine, Swamp white oak, Hemlock, Cedar

Within this handbook, see Chapter 21, Natural Regeneration, and Chapter 24, Marking Guidelines, for additional discussion of reserve tree management. In addition, the forest cover type chapters provide species specific information applicable to reserve tree management.

WISCONSIN DEPARTMENT OF NATURAL RESOURCES
NOTICE OF FINAL GUIDANCE & CERTIFICATION

Pursuant to ch. 227, Wis. Stats., the Wisconsin Department of Natural Resources has finalized and hereby certifies the following guidance document.

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Silviculture Handbook

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STATUTORY AUTHORITY OR LEGAL CITATION

S. 823.075, Wis. Stats. & NR 1.25, Wis. Admin. Code

DATE SENT TO LEGISLATIVE REFERENCE BUREAU (FOR PUBLIC COMMENTS)

2/10/2020

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4/6/2020

DNR CERTIFICATION

I have reviewed this guidance document or proposed guidance document and I certify that it complies with sections 227.10 and 227.11 of the Wisconsin Statutes. I further certify that the guidance document or proposed guidance document contains no standard, requirement, or threshold that is not explicitly required or explicitly permitted by a statute or a rule that has been lawfully promulgated. I further certify that the guidance document or proposed guidance document contains no standard, requirement, or threshold that is more restrictive than a standard, requirement, or threshold contained in the Wisconsin Statutes.

Carmen Hardin — March 27, 2020

Signature — Date