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Silviculture Update for WCFA

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Topics for Today

- Public Review of Guidance
- Chapter 21 (Natural Regeneration) Update
- Red Pine and Aspen Rotation Age Update
- Chapter 24 (Marking and Retention Guidelines) Update
- Chapter 40 (Northern Hardwoods) Update
- Redefinition of the Silviculture Handbook

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Public Review of Guidance

A work in progress…

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Chapter 21

Natural Regeneration

Chapter 21 Ad-hoc Team

Name	Organization
Mike Amman	Bayfield County
Jeremiah Auer	WDNR
Dustin Bronson	WDNR
Richard Congdon	Prentiss & Carlisle, Large landowners
Greg Edge	WDNR
Kristofer Gray	Verso, Consulting Forestry
Ben Knaack	Tigerton Lumber Company, Large landowners/land managers
Jason Langenecker	Douglas County
Chris Plzak	WWOA, Small property owners
Kevin Ponsler	Biewer Wisconsin Sawmill, Inc., Consulting forestry
Greg Rebman	WWOA, Small property owners
Andy Stoltman	WDNR
Tom Vanden Elzen	WDNR

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Natural Regeneration

- Ad Hoc team revised the "Establishment and Evaluation of Adequate Natural Regeneration" section of Chapter 21
- Includes expanded information on regeneration survey methods, including the new Forest Regeneration Metric (FRM) protocol
- Comprehensive natural regeneration guidelines by cover type
- FRM field datasheet
- Published on 1-04-19

Red Pine and Aspen Rotation Ages

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Rotation Age Ad Hoc Team

Name	Organization
Greg Edge	WDNR
Julie Ballweg	WDNR
Scott Bowe	UW-Madison
Mike Demchik	UW-Stevens Point
Chris Burke	Steigerwaldt
Sara Deterville	Verso
Dean Bowe	Lincoln County
Ron Eckstein	Wildlife Society
Scott Fisher	WWOA
Craig Johnston	UW-Madison
Amy Morales	WDNR
Chris Schmitz	WNDR

WDNR Rotation Guidance - Background

- Wis. Stats. S. 77.01 – The Forest Crop Law codified "protecting from destructive or premature cutting the forest growth of this state" as a primary purpose
- Historically the Department has used "Culmination of Mean Annual Increment (CMAI)" or the maximum sustained yield to define maturity
- CMAI (biological rotation) is highly recognized and consistently defined
- Silviculture Handbook has used CMAI to define the low end of generally accepted rotation ages

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Wisconsin Forest Practices Study (WFPS) 2017 Aspen and Red Pine Rotation Age Recommendation and Assignment

Recommendation - "Establish guiding principles that allows flexibility in rotation ages depending on site potential. Guiding principles should recognize that the timing to rotate a particular stand can be influenced by unique stand conditions and other considerations such as landowner objectives, operability, markets, economics, social and ecological considerations."

Assignment – "The Wisconsin Silviculture Guidance Team Rotation Ad Hoc Team will continue to define flexible rotation age guidance for aspen and red pine based on an examination of current research, actual stand data, and WFPS study results."

Rotation Ad Hoc Strategy

1) Field Survey – What are foresters recommending? How much flexibility?
2) Lake State's guides
3) Peer-reviewed literature
4) Studies – WFPS, Minnesota Study, Wisconsin case studies

Defining "economic rotation"

- Ad hoc team defined economic rotation based on maximization of net present value (NPV) or Soil Expectation Value (SEV)
- Compares the annual growth of timber against the cost of holding for an additional year
- Widely recognized and accepted
- Repeatable, but dependent on multiple parameters

Figure 32.4. Economic, biological, and extended rotation length recommendations for red pine.

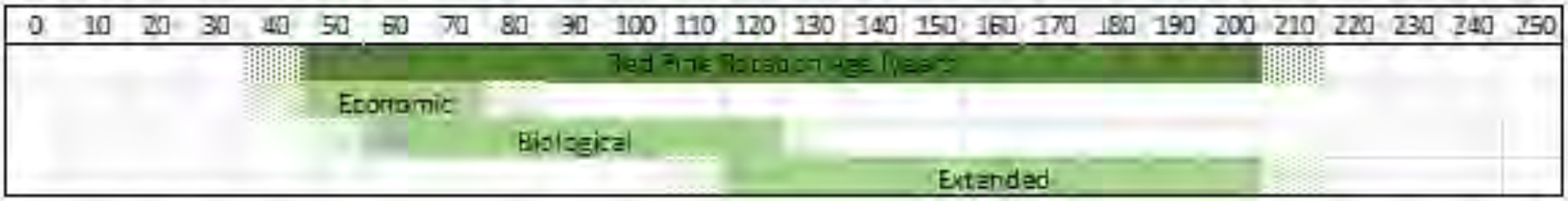
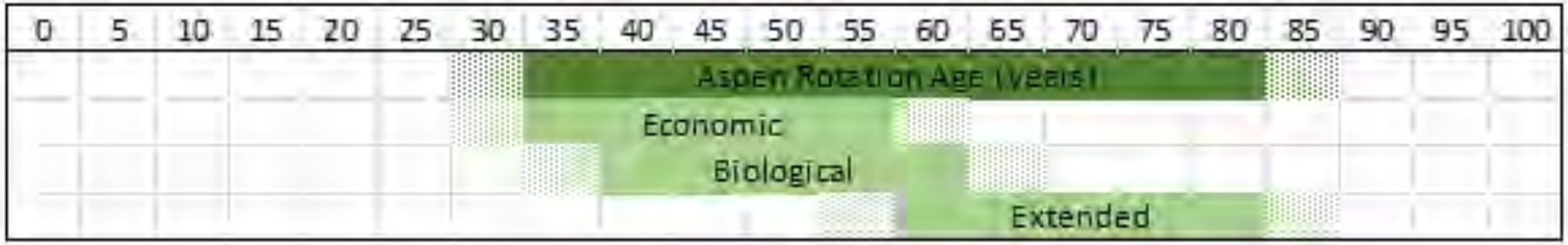


Figure 43.13. Economic, biological, and extended rotation length recommendations for aspen.



Are rotations set in stone?

"This guide in no way lessens the need for technical skill and sound silvicultural judgment when selecting proper practices to achieve the intended integrated resource management objectives."

"The practice of silviculture is as much an art as a science. The management recommendations are basic guidelines. … . They are not rules for every situation. The forester may adapt them to accommodate conditions specific to the stand being managed."

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Chapter 24

Marking and Retention Guidelines

Chapter24: Tree Marking Guidelines Ad hoc Team Members

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Chapter24: Tree Marking Guidelines Ad hoc Team Revisions

1. Addition: WDNR Growing Stock Classification (GSC)
   a) WFPS Assignment 2.1, 2.2, 2.3
2. Revision: Common Priorities for Removal and Retention
   a) WFPS Assignment 1.1
3. Addition: General Criteria for Assessing Success
   a) WFPS Assignment 1.1
   b) Note: Move of "Marked Stand Evaluation Procedure" to WDNR website
4. Addition: Marking Guide Templates
   a) WFPS Assignment 3.1

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1. Addition: WDNR Growing Stock Classification (GSC)

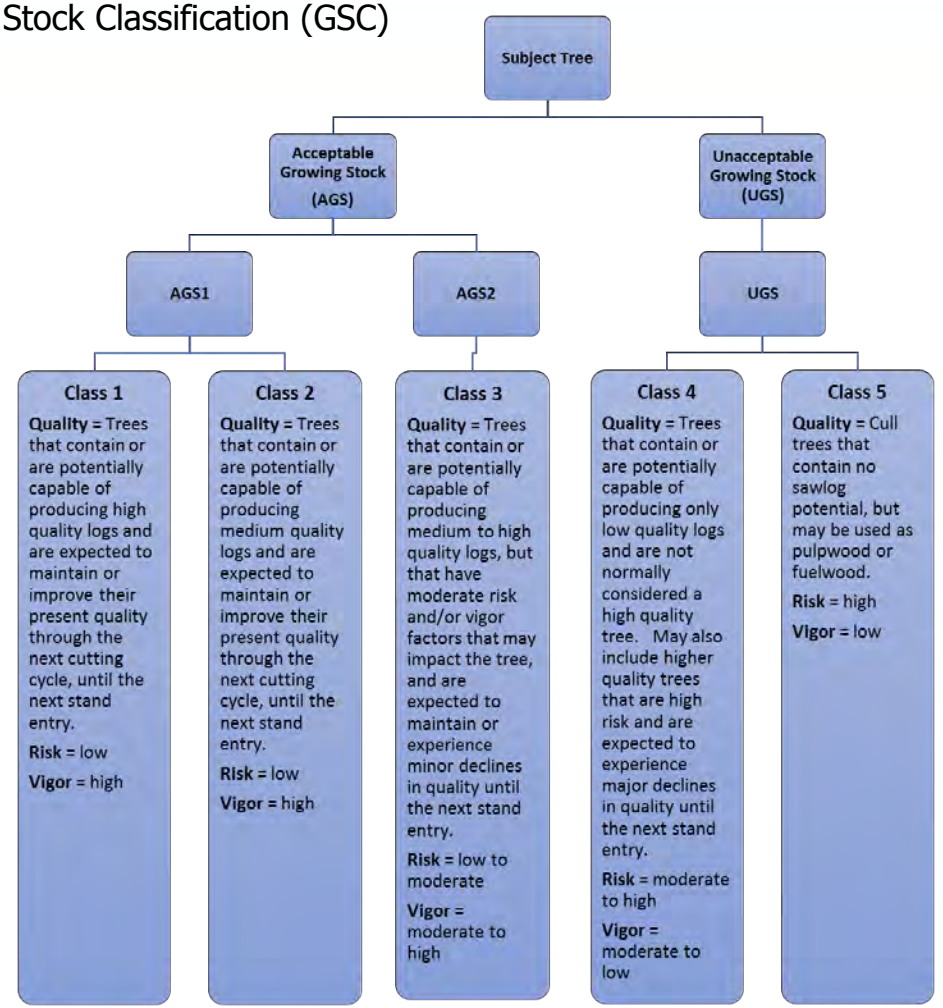
WDNR Growing stock classification is designed to help foresters assess and rate individual trees based on their quality, risk and vigor characteristics.

Interrelated systems allow the forester to flexibly choose from two, three, or five tree class systems depending upon stand assessment needs.

WDNR GSC, can be used to:
- Inform stand level assessments of growing stock quality.
- Guide the selection of cut/leave trees in coordination with a harvest prescription.

Note: WDNR GSC is not a prescription for what to remove and what to retain.

It replaces the concept of a crop tree.



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2. Revision: Common Priorities for Removal and Retention

If stand management objectives include the promotion of stand and tree vigor and the production of high quality sawtimber products, then the selection of trees to remove and retain could apply the following sequence for removal and retention to achieve the desired residual stand composition and structure.

Common Priorities for Removal and Retention (see definitions)

1. Remove trees with high risk of mortality, failure, or loss of quality and/or value
2. Release acceptable growing stock (AGS) trees
3. Remove trees with low crown vigor
4. Remove trees with poor stem form and quality
5. Remove less desirable tree species
6. Remove trees to improve spacing

….. The recommended sequence for removal & retention is not a silvicultural prescription but rather a marking guide element designed to aid in implementing a prescription. Foresters will need to review the application of removal and retention priorities with each practice to ensure proper application.

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2. Revision: Common Priorities for Removal and Retention

Definitions

Risk: the probability or potential that a tree will die, suffer structural failure (*physical risk*), decrease in quality and/or economic value (*quality risk*) due to internal degradation within a specified period or cutting cycle, or have a lower rate of economic return than that targeted by a landowner (*economic risk*).

Table 24.6 can be used to evaluate potential physical and value risk to individual trees based on common indicators of defect or poor health. Factors that determine a landowner's desired economic return and economic risk may include net present value (NPV), internal rate of return (IRR), rate of value growth (RVG), etc. If utilized, these factors should be defined in the Rx to clarify economic risk marking criteria. Levels of risk tolerance may vary between landowners based on landownership goals and risk perception. Identification of excessive risk within a substantial portion of a stand is a well-founded reason to assess and prescribe new stand management practices.

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3. Addition: General Criteria for Assessing Success

If appropriate stand-level inventory data is available or can be collected, success in achieving "sound forestry" and prescription goals can be determined by comparing prescription targets with cut vs. leave / post-harvest information. For intermediate thinning and generally accepted natural regeneration methods, general criteria for measuring success specific to each practice have been established. Marked stand evaluation out of chapter – now a partner resource.

Example

1.Intermediate Thinning

a. <u>Thinning from below (low thinning)</u>

i. The percent of AGS basal area increases

ii. The average merchantable stand diameter increases. Note, this can also be documented with a d/D score <1.

d/D = QMD of trees removed / QMD of pre-harvested stand

i. Residual BA within acceptable limits of variation above or below the **prescribed** target

ii. Other potential criteria

- Range of stand basal area variance is smaller or larger based on harvest prescription
- The proportion of suppressed and intermediate trees decreases

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4. Addition: Marking Guide Templates and Example Marking Priority Tool

Marking Guidelines Template

Property:		Comp #		Stand #		Acres	

Prescription :

Fill in the blank, with suggestions from below

Treatment:

(Thinnning (comm, pre-comm), single tree selection (with gaps, groups, patch), shelterwood, seed tree)

Goal density:

(Basal Area/Crown cover/Trees per acre, etc)

Retain:

AGS/Crop trees/seed trees:

(crown release, number per acre, characteristics of trees)

Wildlife trees:

(number per acre of cavity/den, mast producer)

Desirable species:

(oak, BY)

Understocked size classes:

(less strict on quality?)

Remove:

Risk trees:

(mortality risk, financially mature)

UGS:

(remove low quality to release AGS, improve spacing)

Undesirable species:

(discriminate against ash)

Overstocked size classes:

(more strict on quality)

Designated species to cut:

(Cut all A, fir, BW etc.)

Special considerations:

(Historic sites, snags, nest trees, RMZ, ephemerals, legacy trees, etc)

Gap, group, patch:

(Size and number per acre)

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Chapter 40

Northern Hardwoods

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NH Ad-hoc Team Members

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Tom Norman	PCA
Duran Bjorklund	Washburn County
Matt Schultz	Ashland County
Pat Zimmer	WDNR
Andy Tuttle	Consultant
Brad Hutnik	WDNR
Tom Piikkila	WDNR
Greg Edge	WDNR
Ron Eckstein	wildlife society
Dean Bowe	Lincoln County
Mike Lietz	WDNR (retired)

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Major Changes

- Clarify Single Tree Selection
- Clarify Conversion from Even age to Uneven age
- Growing Stock Status (new tool)
- Stand Assessment Checklist (new tool)
- NH Decision Model (new section)
- Sedge and Ironwood treatment (new section)
- Clarify management options in Degraded Hardwood stands

- WFPS (both chap 24 & 40 linked together)
- Order of Removal
- Rotation Age
- Economics
- Crop tree definition and assessment
- NH Marking guide examples

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Flexibility and Alternatives

- Addresses range of basal areas and maximum diameter
- Research by Arbogast, Edrmann, Tubbs, Strong, Niese, Leak, Kern and others referenced throughout chapter
- Compares alternatives in stand density and structure as it relates to stem quality and growth
- Alternative methods – Group/Patch Selection and Irregular Shelterwood

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Northern Hardwood Decision Model

Poor Quality Sites (40-32)

Or

Degraded Stands (40-30)

Stand/Site Condition
- **Seed bearing age**
- **<40 AGS/ac.**
- **FHT**
- **Site index <55**
- **Poor Tree Quality**
- **Poor Stand Condition**
- **Deer browse**
- **Sedge/Ironwood**

Even-age Management Objective

Uneven-age Management Objective

Inadequate regen/limited seed source

<2,000 stems/ac.

- Artificial regen
- Convert to another cover type
- Other rehabilitation techniques

Inadequate regen
< 2,000 stems/ac.
<4ft. Tall
<70% stocked plots

2 Step Shelterwood

(40-21)

Adequate Regen
2,000 -5,000 stems/acre,
2-4 ft. tall
70% stocked plots

Overstory removal

(40-22)

See Degraded section for alternatives

(40-30)

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Northern Hardwood Decision Model

Stand/Site Condition
- **> 40 AGS/ac.**
- **Site index >55**
- **FHT medium to good**
- **Good to excellent tree quality and stand condition**

Good to High Quality Stands

- Seedling/Sapling
  - Crop tree release (40-24)
- Pole and saw timber
  - **Even-age Management Objective**
    - Less than rotation age
      - **EA Thin (40-21)**
    - At rotation age (80-120 yrs)
      - Inadequate regen <2,000/ac <4ft tall <70%stocked plots
        - **2 Step Shelterwood (40-21)**
      - 2,000 -5,000 stems/acre, 2-4 ft. tall 70% milacre stocking
        - **Overstory Removal (40-22)**
  - **Uneven-age Management Objective**
    - Even-age or 2-age stand
      - **Even-age to Uneven-age Conversion process (40-23)**
    - Uneven-age stand (2 or more size class)
      - **Single Tree Selection (40-25)**

      Or

      Group or Patch Selection (40-28 & 29)

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Landowner Objectives

Recognized Landowner objectives throughout chapter:

"Landowner goals and management objectives should be identified in a sustainable forest management framework, with consideration to the local and regional landscape. Prior to the development and implementation of silvicultural prescriptions, landowner goals and objectives need to be clearly defined and management units (stands) must be accurately assessed."

-Recognized a variety of silviculture alternatives to address Landowner Objectives

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Marking guide examples

TIMBER SALE MARKING GUIDE

WDNR Draft 05_01_2017

District	Property	Code	County
ND			

Sale Name	Sale Number	Tract Number
Example		

Site Considerations

EXISTING STAND CONDITION - BA & TREES / ACRE BY SPECIES AND DBH (WDNR NED-3 data, measured 05/18/16)

	5" – 11"		12" – 15"		16" – 22"		>22"		Total	
	BA	Trees	BA	Trees	BA	Trees	BA	Trees	BA	Trees
Sugar Maple - ACSA	32.0	75.5	22.0	25.0	22.0	13.4	2.0	0.7	78.0	114.5
Red Maple- ACRU	4.0	8.4	8.0	9.5	5.0	3.0	0.0	0.0	17.0	20.9
Basswood - TIAM	1.0	1.8	1.0	0.9	7.0	4.8	1.0	0.3	10.0	7.7
Red Oak - QURU	0.0	0.0	0.0	0.0	3.0	1.5	4.0	1.1	7.0	2.6
Yellow Birch - BEAL	0.0	0.0	2.0	2.6	2.0	1.2	0.0	0.0	4.0	3.7
Paper Birch - BEPA	0.0	0.0	2.0	2.2	1.0	0.6	0.0	0.0	3.0	2.8
Aspen - POGR4	1.0	1.8	0.0	0.0	0.0	0.0	1.0	0.3	2.0	2.1
Balsam Fir - ABBA	2.0	10.2	0.0	0.0	0.0	0.0	0.0	0.0	2.0	10.2
White Pine - PIST	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.4	1.0	0.4
Total	40.0	97.7	35.0	40.2	40.0	24.2	9.0	2.8	**124.0**	**164.8**

Stand 12 is a mixed northern hardwood stand located north of Indian Road, northeast of the Beaver Creek. The stand is likely an even-aged or two aged stand. While all size classes are represented, age class diversity is largely absent. The overstory is dominated by sugar and red maple. The maple is of poor quality, with most stems exhibiting forks, seams, bumps or cankers. Mid-tolerant species like basswood and yellow birch are also present. Scattered red oak can also be found. The oak is of exceptional quality. Large, super-canopy white pines are in the eastern portion of the stand, along the intermittent stream and banks. Although the growing stock quality is poor, the stand does have a good diameter distribution and proportion of sawtimber. The stated management objective is for uneven-aged management through single tree selection.

The soils in the stand consist of Wabeno/Goodman silt loam throughout the majority of the interior, with some Padus sandy loam around the edges. Mudlake silt loam is found in the stream valley. There are some slopes that may approach 30% along the intermittent stream (see prescription map). Despite the rich soil and AOCa/ATD habitat types, the overall quality of the growing stock is poor and the relative growth potential is average (SI 60 ACSA3). Perhaps some of the growing stock quality is a result of distant management practices. Management records state that the stand was cut in 1977 and 1997, but there was a conspicuous lack of stumps observed in the field. Stand density averages 124 ft^2 / acre of basal area with an average stand diameter of 11.7". Basal areas throughout the stand are consistent, ranging from a low of 90ft^2 to a high of 160ft^2. The current inventory did not have any snags fall within the sample plots, but some snags were noted in the stand. The understory is open in the south and north ends of the stand, while the remainder contains a dense understory of balsam fir 10 to 20 feet tall. Some sugar maple saplings, 10 to 30 feet tall, can be found, especially in the more open areas.

An intermittent stream, not displayed on available maps, was discovered in the north and east portion of the stand during the field inspection. The stream channel was GPS'd and is displayed on the prescription map. A field inspection for cultural resources was also conducted, with the results discussed below

Short Term Silvicultural Objectives

- Utilize uneven-aged conversion harvests (gap establishment and thinning) to reduce stocking, initiate new age classes, and improve growth, quality, and health while moving the stand toward desired diameter distribution over future entries.
- Create gaps to recruit and release established regeneration and to create additional age (size) classes, and to promote the establishment and development of mid-tolerant tree species.
- Provide timber products to local operators

Desired Future Condition

- To encourage and maintain an uneven-aged northern hardwood stand with high structural class diversity. A long-lived conifer component of white pine is to be protected and maintained within the stand.
- To have trees in the stand growing at an optimum rate and which are resilient to insect and disease attacks.

Marking Instructions

Treatment Method:	Target Residual Density:	Estimated Treatment Acres:
Single-Tree Selection	80 ft^2/acre	39

Species / Marking Priority

- Designate all merchantable ironwood, white birch, balsam fir and aspen for harvest.
- Harvest to an average 80 ft^2 residual BA in trees greater than 5" DBH, Recognizing 4 size classes (*G59*)
  - Remove 15 ft^2 in the 5"-11" (approx. 1 of every 4 trees)
  - Remove 15 ft^2 in the 12"–15" class (approx. 1 of every 2 trees)
  - Remove 5 ft^2 in the 16"–22" size class (approx. 1 of 5 trees)
  - Remove any high-risk trees in the 22+" size class

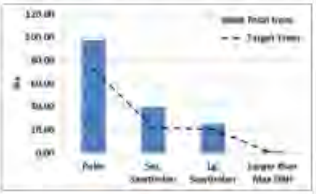
Leave tree Priority

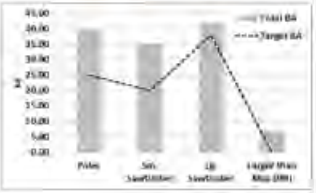
- To foster diversity and resiliency, favor yellow birch, northern red oak, and basswood over sugar maple for retention.
- Reserve all white pine.
- Reserve all snags and live den trees, up to 10 per acre unless they present a safety concern

Canopy Gaps

- Through marking the stand to size class targets, create no more than four 25 to 40-foot canopy gaps per acre. Removal of 1-2 large trees or groups of smaller trees will accomplish this target.
- Establish 1 canopy gap approximately 60-feet in diameter every 2 acres (*G57*).
- Locate gaps in areas where regeneration is abundant, stem quality is poor, or where potential mid-tolerant seed trees occur (i.e. red oak).
- In all gaps, cut poor quality stems larger than 1" DBH (*G58*).

Size Class	Desired TPA	Existing TPA	Excess TPA	Trees to Mark
5"-11"	73	98	25	1 of 4
12"-15"	22	40	18	1 of 2
16"-22"	21	26	4	1 of 5
22"+	0	2	2	H. Risk





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Degraded stands and Poor Quality Sites

Table 40.12. Acceptable Growing Stock (AGS) guidelines for defining degraded stands

Basal Area (sqft/ac)AGS	AGS Trees per acre	Condition	Recommendation
Greater than 50sqft AGS	>50 AGS	Not degraded	Apply generally accepted silviculture methods
30-50sqft/ac AGS	40-50 AGS	Degraded	Rehabilitate or regenerate
Less than 30sqft/ac AGS	< 40 AGS	Severely Degraded	Regenerate

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EA to UA Conversion Process

Even-aged to Uneven-aged Process

Most northern hardwood stands in Wisconsin are even-aged and not regulated. They lack stand structure in several size classes especially the seedling/sapling class due to a number of factors including closed canopy conditions, past stand management, and other regeneration limiting factors. Erdmann (1986) states that only 2% of understory trees in even-aged stands have the potential of becoming grade-1. Stands that are even-aged or two -aged, pole to saw log sized stands may be converted to uneven-aged management (i.e. single tree selection) by combining intermediate thinning and canopy gap installation.

This application can: establish or release regeneration, encourage tree species diversity, improve stand quality, and develop stand structure over time subsequent entries.

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Sedge/Ironwood section

Table 40.13. Sedge Control Method Comparison

Treatment	Overall Effectiveness (WDNR 2002)	Summer Application	Fall Application	>2 year control	Stand Application	Group / Patch	Shelterwood	Woody Control Needed
herbicide Foliar	81%	R	PR	R	R	R	R	PR
Foliar Herbicide & Scarification	60 %	R	PR	PR	PR	R	R	R
Scarification	30%	R	R	N	N	R	PR	R

R = Recommended
P = Provisionally recommended (See sedge & ironwood management for more detail)
N= Not Recommended

Ashland cty Sedge treatments: before/after

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Changes to the Silviculture Handbook

- Decision made that the publication will no longer be a ‘Handbook’ as defined in manual code
- Based on the survey conducted in 2018:
  - Reorganize the cover type chapters
  - Rework the forward and introduction to better define the uses of the publication
  - Add ‘quick guides’ for cover type chapters and to collate resources such as the stocking charts

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Questions?