

## Comparison of State Biomass Harvest & Wildlife Tree Guidelines

Compiled by R. Bryan 8/20/08; revised 1/5/09

Category	Wisconsin Sept 2008 Draft	Minnesota Voluntary Site Level Guidelines 2007	Pennsylvania 2008	Maine Maine Forest Biodiversity Project(MFBP) & Maine Forest Service Forest Sustainability Standards (MFS- FSS) Draft
<b>Standing Trees</b>				
<b>Snags</b>	<ul style="list-style-type: none"> <li>Retain <math>\geq 3</math>, preferably large (<math>&gt;12"</math> DBH, preferably <math>&gt;18"</math>) in all harvests. Retain as many as possible. If necessary to cut for safety reasons, retain on site as coarse woody debris.</li> </ul>	<ul style="list-style-type: none"> <li>Retain all possible, with safety exception.</li> </ul>	<ul style="list-style-type: none"> <li>1-5 trees/ac (p. 19); leave all possible (p. 38z); no size specified.</li> </ul>	<p>MFBP:</p> <ul style="list-style-type: none"> <li>Uneven-aged management: <math>\geq 4</math> cavity trees or snags /ac, with 3 <math>&gt;14"</math> and 1 <math>&gt;24"</math>.</li> </ul> <p>MFS-FSS</p> <ul style="list-style-type: none"> <li>Statewide goal 3 dead trees and snags/ac <math>\geq 15"</math> + 1/ac. <math>\geq 21"</math>.</li> </ul>
<b>Cavity Trees</b>	<ul style="list-style-type: none"> <li><math>\geq 3</math>/ac <math>&gt;12"</math>, preferably <math>&gt;18"</math>, in even age intermediate treatments and uneven-aged management. See also Reserve Trees below.</li> </ul>	<ul style="list-style-type: none"> <li>Included under guidelines for Reserve Trees" below (called "Leave Trees" in the MN Voluntary Site-Level Guidelines)</li> </ul>	<ul style="list-style-type: none"> <li>Average 5/acre (p. 19), "protect" (p. 36); no size specified.</li> </ul>	<p>MFBP:</p> <ul style="list-style-type: none"> <li>Uneven-aged management: <math>\geq 4</math> cavity trees or snags /ac, with 3 <math>&gt;14"</math> and 1 <math>&gt;24"</math>. In areas lacking cavity trees leave live trees in these diameters likely to lead to cavity formation.</li> <li>All harvests: Retain as many live cavity trees as possible.</li> </ul> <p>MFS-FSS</p> <ul style="list-style-type: none"> <li>Not included as a separate category by MFS(see <i>Recruitment Trees</i> below)</li> </ul>
<b>Mast Trees</b>	<ul style="list-style-type: none"> <li><math>\geq 3</math>/ac <math>&gt;12"</math>, preferably <math>&gt;18"</math>, in even age intermediate treatments and uneven-aged management. See also "Reserve Trees" below.</li> </ul>	<ul style="list-style-type: none"> <li>Manage for oak and other mast trees, maintain beech with bear use.</li> </ul>	<ul style="list-style-type: none"> <li>Protect food producing shrubs and vines</li> </ul>	<p>MFBP:</p> <ul style="list-style-type: none"> <li>Retain/promote oak and healthy beech, and large mast-producing beech regardless of condition.</li> <li>Retain apple, black cherry, a component of raspberry and pin cherry, and a diverse and productive herb layer.</li> </ul> <p>MFS-FSS</p> <ul style="list-style-type: none"> <li>Not included as separate category</li> </ul>
<b>Recruitment Trees</b>	<ul style="list-style-type: none"> <li>Consider <math>\geq 3</math> trees/ac to develop into large, old trees, in even age intermediate treatments and uneven-aged management.</li> </ul>	<ul style="list-style-type: none"> <li>Included under guidelines for Reserve Trees" below (called "Leave Trees" in the MN Voluntary Site-Level Guidelines)</li> </ul>	<ul style="list-style-type: none"> <li>Not mentioned</li> </ul>	<p>MFBP:</p> <ul style="list-style-type: none"> <li>All harvests: Retain as many large unmerchantable trees as possible.</li> </ul> <p>MFS-FSS</p> <ul style="list-style-type: none"> <li>Statewide goal 3 rough and rotten trees/ac <math>\geq 15'</math> + 1/ac. <math>\geq 21"</math></li> </ul>
<b>Reserve Trees (individuals and/or patches) in even-aged regeneration harvests</b>	<ul style="list-style-type: none"> <li>Retain 5-15% of even-aged harvest area "rotation harvests" in reserve trees and patches. Include large vigorous trees, mast trees, and cavity trees (see guidelines above). Use a mix of individuals and patches – most benefit in patches 0.1-2 acres.</li> </ul>	<ul style="list-style-type: none"> <li>Option 1 - Patches (preferred): Leave <math>\geq 5\%</math> of clearcut area in patches (preferred); do not reduce basal area below 80 ft<sup>2</sup>/ac in trees <math>\geq 6"</math> DBH, and do not harvest biomass within reserve patches.</li> <li>Option 2 – Scattered individuals: Leave 6-12 dispersed individuals/acre on average-sized clearcuts, with <math>\geq 15</math> trees per acre on the largest (top 20% of</li> </ul>	<ul style="list-style-type: none"> <li>Reduce biomass available for removal by 5-20% from inventory data to retain 10-20 square feet over entire treatment area for biodiversity.</li> <li>Avoid biomass harvest within clumps left for biodiversity purposes (no guidelines on amount or size of clumps).</li> </ul>	<p>MFBP:</p> <ul style="list-style-type: none"> <li>Uneven-aged management: Consider designating 3-5% of stocking as potential cavity trees and future snags.</li> <li>Even-aged management: For every 10 acres, leave <math>\geq 5\%</math> of area in uncut patches <math>\geq 0.25</math> ac. in size.</li> </ul> <p>MFS-FSS</p> <ul style="list-style-type: none"> <li>Indicator 5.6: Degree to which forest management is consonant with natural</li> </ul>

		<p>clearcuts).</p> <ul style="list-style-type: none"> <li>Identify patches and leave trees prior to initial seed tree or shelterwood cut.</li> <li>Leave trees should be at least 6" DBH, with about 50% &gt;12" DBH, and at least 1-2 trees per patch or per acre &gt;18" DBH.</li> </ul>		<p>forest dynamics.</p> <ul style="list-style-type: none"> <li>Benchmark 5.3.1. At least 25% of forest area in two storied or multi storied/mosaic stands sawtimber size and at least 15% in high basal area sawtimber.</li> </ul>
<b>Other Retention</b>	<ul style="list-style-type: none"> <li>Species and size diversity is beneficial.</li> <li>Designate by marking or writing which trees to retain.</li> <li>If Fine Woody Material is harvested, consider 10-15% reserve tree/patch retention to compensate for increased impacts of biomass removals.</li> <li>Salvage harvests: retain ≥5% of salvage area in un-salvaged patches 1-20 acres in size.</li> </ul>	<ul style="list-style-type: none"> <li>Retain conifers &gt;4" in mixed stands.</li> <li>Allow some trees to reach 200-300 years old.</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>	<p>MFBP:</p> <ul style="list-style-type: none"> <li>Maintain softwood inclusions in hardwood forests.</li> </ul> <p>MFS-FSS</p> <ul style="list-style-type: none"> <li>None</li> </ul>
<b>Coarse Woody Debris and Fine Woody Material</b>				
<b>Coarse Woody Debris (CWD)</b>	<ul style="list-style-type: none"> <li>CWD is ≥4" DIB small end</li> <li>Retain and limit disturbance to existing CWD.</li> </ul>	<ul style="list-style-type: none"> <li>CWD is ≥6" diameter</li> <li>Avoid damage.</li> <li>Retain stumps and uprooted stumps.</li> <li>leave snags that must be felled.</li> <li>Create 2-5 bark-on logs/ac &gt;12" if fewer exist.</li> <li>Create 4 logs/ac in RMZs (overall site average still ≥2/ac).</li> <li>Mixed hardwood and conifer.</li> </ul>	<ul style="list-style-type: none"> <li>CWD is &gt;6" diameter small end</li> <li>Leave snags cut for safety where they fall.</li> <li>Leave 2-5 non merchantable logs/ac.; cull trees can be felled and left to meet this goal (p. 19)</li> <li>Retain 15-30% of harvestable biomass as CWD (p. 36).</li> </ul>	<p>MFBP:</p> <ul style="list-style-type: none"> <li>Avoid damaging existing downed woody material (DWM), especially large hollow logs and stumps.</li> <li>Leave DWM on site when possible.</li> <li>Leave or haul back several downed logs of decay class 1&amp;2, &gt;12" diameter and &gt;6ft. Retain as many as possible in classes 3, 4&amp;5.</li> <li>Leave snags that must be felled on site.</li> </ul> <p>MFS-FSS</p> <ul style="list-style-type: none"> <li>Statewide goal 3 downed logs/ac ≥15' + 1/ac. ≥21".</li> </ul>
<b>Fine Woody Material (FWM)</b>	<ul style="list-style-type: none"> <li>FWM is &lt;4" DIB large end</li> <li>Retain ≥4 tons/ac well distributed, including volume in retention patches.</li> <li>Typical Wisconsin forest has 8-12T/ac FW.</li> </ul>	<ul style="list-style-type: none"> <li>FWM is &lt;6" diameter</li> <li>Retain and scatter tops and limbs from 20% of trees harvested and all FWM from incidental breakage. Haul back if using whole tree harvesting.</li> <li>Leave 20% of small trees and brush.</li> </ul>	<ul style="list-style-type: none"> <li>Limit whole tree harvests. If whole tree harvesting, retain slash on 10% of site (p. 19).</li> <li>Retain slash on areas treated with conventional harvests .</li> </ul>	<p>MFBP:</p> <ul style="list-style-type: none"> <li>Not included as a separate category (would be included under <i>Soils</i>, below)</li> </ul> <p>MFS-FSS</p> <ul style="list-style-type: none"> <li>Not included as a separate category (would be included under <i>Soils</i>, below)</li> </ul>
<b>Soils</b>				
<b>General</b>	<ul style="list-style-type: none"> <li>Do not remove litter layer, stumps, and/or root systems.</li> <li>≤3% of harvest area in permanent roads and landings.</li> <li>≤15% of harvest area in roads, landings, and skid trails.</li> <li>(see also FWM guideline)</li> </ul>	<ul style="list-style-type: none"> <li>Retain stumps and uprooted stumps</li> <li>(see also FWM guideline)</li> </ul>	<ul style="list-style-type: none"> <li>Do not remove forest floor, litter layer, or root systems.</li> <li>Keep landing and road network to a minimum.</li> <li>Use applicable soil and water BMPs</li> <li>(see also FWM guideline)</li> </ul>	<p>MFBP:</p> <ul style="list-style-type: none"> <li>Avoid whole tree removal, particularly on low fertility sites (see below).</li> <li>≤15% of harvest area in roads, landings, and skid trails.</li> <li>When possible, conduct whole tree harvests of hardwoods during leaf-off season to retain nutrients.</li> <li>Limit short-rotation harvests as much as possible unless replacement of nutrients and organic matter is considered.</li> <li>When possible, delimb trees and return slash to woods.</li> </ul> <p>MFS-FSS</p> <ul style="list-style-type: none"> <li>Indicator 1.1: Harvested area with soil disturbance (removal of organic matter, exposure of mineral soil, soil erosion,</li> </ul>

				<p>compaction, destruction of soil horizons, or alteration of internal soil hydrology) that alters soil physical properties and degrades soil productivity.</p> <ul style="list-style-type: none"> <li>Indicator 1.2: Harvested area with significant change in soil chemistry that degrades soil productivity.</li> </ul>
<b>Sandy and/or Shallow-to Bedrock Soils</b>	<ul style="list-style-type: none"> <li>Do not harvest FWM on soils with &lt;20" to bedrock.</li> <li>Do not harvest FWM on nutrient-poor soils (list of series to be developed).</li> </ul>	<ul style="list-style-type: none"> <li>Avoid biomass harvest of deciduous species.</li> <li>For other harvests of deciduous species, <ul style="list-style-type: none"> <li>Retain/redistribute slash. If soil not frozen, leaving slash along trail may cause less damage than off-trail distribution.</li> <li>Avoid short rotation or extend rotation age.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Not mentioned</li> </ul>	<p>MFBP:</p> <ul style="list-style-type: none"> <li>Avoid whole tree removal, particularly on low fertility sites (i.e., shallow to bedrock soils, coarse sands, wetlands, and areas with high water tables) unless replacement of nutrients and organic matter is considered.</li> </ul>
<b>Organic Soils</b>	<ul style="list-style-type: none"> <li>Do not harvest FWM on "dysic Histosols" (≥18" organic layer, nutrient poor, with low PH).</li> </ul>	<ul style="list-style-type: none"> <li>Avoid biomass harvest on organic soils with &gt;24 organic layer. Retain and redistribute slash.</li> </ul>	<ul style="list-style-type: none"> <li>Not mentioned</li> </ul>	
<b>Erosion-prone Sites</b>	<ul style="list-style-type: none"> <li>Do not harvest FWM on erosion-prone sites.</li> </ul>	<ul style="list-style-type: none"> <li>Not mentioned</li> </ul>	<ul style="list-style-type: none"> <li>Not mentioned</li> </ul>	<ul style="list-style-type: none"> <li>Not mentioned by MFBP or MFS-FSS</li> </ul>
<b>Special Management Areas</b>				
<b>Riparian Management Zones (RMZ)</b>	<ul style="list-style-type: none"> <li>Do not harvest FWM within 35' of non-navigable streams and 100' of wetlands.</li> </ul>	<ul style="list-style-type: none"> <li>Avoid biomass harvest in RMZs.</li> </ul>	<ul style="list-style-type: none"> <li>Retain dead and down material.</li> </ul>	<p>MFBP:</p> <ul style="list-style-type: none"> <li>Use single-tree and group selection cuts to maintain 65-70% crown closure.</li> <li>Consider an inner no-cut zone.</li> <li>Retain snags, cavity trees, large trees, and downed logs as much as possible.</li> </ul> <p>MFS-FSS</p> <ul style="list-style-type: none"> <li>Indicator 2.4: Percent of mapped, perennial first and larger order stream kilometers with acceptable levels of large woody material and snags within riparian zone.</li> </ul>
<b>Rare, Threatened, and Endangered Species (R,T&amp;E)</b>	<ul style="list-style-type: none"> <li>Do not harvest FWM where Federal or State T or E species are known, except to improve habitat per guidelines.</li> <li><b>Under consideration:</b> <i>If Special Concern or Species of Greatest Conservation Need are present, determine if harvest of FWM is consistent with maintaining the species and habitat.</i></li> </ul>	<ul style="list-style-type: none"> <li>Avoid biomass harvest on sites with T or E species.</li> </ul>	<ul style="list-style-type: none"> <li>Beware of presence of R,T,&amp;E species habitat and unique features and take steps to protect them. (p. 27).</li> <li>Know their habitat requirements and avoid disturbing or enhance habitats.</li> </ul>	<p>MFBP:</p> <ul style="list-style-type: none"> <li>No recommendations specific to biomass harvesting.</li> </ul>
<b>R,T&amp;E Natural Communities</b>	<ul style="list-style-type: none"> <li>Do not harvest FWM on State Element occurrences identified by WI Natural Heritage Inventory.</li> <li><b>Under consideration:</b> <i>On sites with exceptional community composition or structure, determine if harvest of FWM will be consistent with maintaining the type.</i></li> </ul>	<ul style="list-style-type: none"> <li>Avoid biomass harvest in rare natural plant communities.</li> </ul>	<ul style="list-style-type: none"> <li>Not mentioned</li> </ul>	<p>MFBP:</p> <ul style="list-style-type: none"> <li>No recommendations specific to biomass harvesting.</li> </ul>

Notes: The Wisconsin, Minnesota, and Pennsylvania biomass harvest guidelines also include recommendations that cover non-biomass timber harvests as well (e.g., retention of snags, cavity trees, etc.). The MFBP and MFS guidelines were not designed specifically for biomass harvesting; elements included here are those most applicable to biomass harvests. All guidelines assume that state soil and water BMPs are being used.

## References:

Elliot, CA (ed). 1999. Biodiversity in the Forests of Maine, Guidelines for Land Management. University of Maine Cooperative Extension Bulletin #7147. University of Maine, Orono, ME. [http://www.maine.gov/doc/mfs/pubs/pdf/biodiversity\\_forests\\_me.pdf](http://www.maine.gov/doc/mfs/pubs/pdf/biodiversity_forests_me.pdf) (accessed 1-5-09)

Maine Forest Service. 2005 Biennial Report on the State of the Forest and Progress Report on Forest Sustainability Standards. [http://www.maine.gov/doc/mfs/pubs/pdf/2005sof\\_full\\_rpt.pdf](http://www.maine.gov/doc/mfs/pubs/pdf/2005sof_full_rpt.pdf)

Minnesota Forest Resources Council. 2005-2007. Sustaining Minnesota Forest Resources: Voluntary Site-Level Guidelines for Landowners, Loggers, and Resource Managers. MFRC, St. Paul, MN. <http://www.frc.state.mn.us/FMgdline/Guidebook.html> (accessed 1-5-09)

Pennsylvania Department of Conservation and Natural Resources. 2008. Guidance on Harvesting Biomass for Energy in Pennsylvania. [http://www.dcnr.state.pa.us/PA\\_Biomass\\_guidance\\_final.pdf](http://www.dcnr.state.pa.us/PA_Biomass_guidance_final.pdf) (accessed 1-5-09)

Wisconsin Council on Forestry. 4th Draft - Wisconsin's Forestland Woody Biomass Harvesting Guidelines. <http://council.wisconsinforestry.org/biomass/> (accessed 1-5-09).

Wisconsin Department of Natural Resources, Division of Forestry. 2003. Wisconsin Forest Management Guidelines. PUB-FR-226 2003. WIDNR, Madison. <http://dnr.wi.gov/forestry/Publications/Guidelines/> (accessed 1-5-09).