

Comparing Fall versus Winter Shelterwood Harvests

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OVERVIEW

This project compares two northern hardwood shelterwood harvests in northern Minnesota that were logged the same year but with different variables:

1. Fall harvest versus winter harvest
2. Loamy fine sand versus fine sandy loam

SILVICULTURE OBJECTIVE AND PRETREATMENT STAND DESCRIPTION

The silvicultural objective for the project was to take two northern hardwood stands dominated by sugar maple (*Acer saccharum*) and paper birch (*Betula papyrifera*) and convert them to northern red oak (*Quercus rubra*), American basswood (*Tilia americana*), and paper birch stands through a two-step shelterwood prescription. This strategy was used successfully to regenerate both stands to mid-tolerant and somewhat intolerant species such as oak, basswood, paper birch, and yellow birch (*Betula alleghaniensis*) under a uniform shelterwood system.

Stands 1 and 2 were both 80 years old at the time of the shelterwood seed cut and had a site index of 63 feet for northern red oak. Stand 1 was 28 acres while Stand 2 encompassed 33 acres. The initial basal area of Stand 1 was 103 ft²/acre of which over 50 percent was sugar maple. Northern red oak comprised 16 percent of the stand before the first treatment. Other details of Stand 1 conditions at the time of logging are shown in Table 1.

Stand 2 had an initial basal area of 109 ft²/acre. Approximately 35 percent of the stand's basal area was comprised of sugar maple. Northern red oak made up 20 percent of the stand. Trees were selected for retention during the initial shelterwood seed cut to retain the largest and best quality trees as well as the target species (i.e., oak, birch, and basswood). Other details of Stand 2 conditions at the time of harvest are shown in Table 2.

After the initial harvest, Stand 1 had a residual basal area of 40 ft²/acre. Stand 2 had 42 ft²/acre.

Table 1.—Stand 1 conditions

Stand 1 (loamy fine sand)	
First harvest	Fall 2008
Final harvest	Winter 2016-2017
Logging conditions 2008	Dry, fall harvest
Logging system	Full tree
Acorn crop	Excellent in 2008

Table 2.—Stand 2 conditions

Stand 2 (fine sandy loam)	
First harvest	Winter 2008-2009
Final harvest	Winter 2016-2017
Logging conditions 2008	Snow covered but not frozen
Logging system	Conventional in 2008-2009
Acorn crop	Excellent in 2008

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Regeneration was then released by overstory removal when it reached the desired size and stocking. This occurred in the winter of 2016–2017. The management organization, Aitkin County Land Department, uses a “5-5 rule.” Per this rule, the “top” of the shelterwood or overstory is removed when there are 500 stems/acre of desired species that are at least 5 feet tall. This effectively converted the stands to a more desirable forest type composed of the species reserved from harvest. Retention of snags, den trees, and reserve patches were included to enhance wildlife habitat. Water quality best management practices (BMPs) were also applied to protect water resources potentially impacted by harvest operations.

POST-TREATMENT ASSESSMENT

The post-treatment assessment (Tables 3 and 4) involved sampling the number of stems per acre after the first harvest (Fig. 1). This was done in 2010 and again in 2013. Sugar maple was not counted but was present in large numbers. Sampling was done again in 2017 after the overstory “top” was removed. Sugar maple was sampled at this time along with the number of stems greater than 3 feet in height.

SUMMARY

- Both silvicultural prescriptions were a success.
- Stand 1 had better regeneration because of a combination of fall logging and lighter soils.
- In 2017, northern red oak and paper birch had significant height advantage over sugar maple. The height difference was more pronounced in Stand 1, the loamy fine sand site.
- For unknown reasons, height growth of northern red oak and paper birch were better on Stand 1, loamy fine sand.
- Winter harvest can produce adequate northern red oak and paper birch regeneration given a good acorn and seed crop.
- Shelterwood harvest is an effective method to regenerate northern red oak and paper birch under a variety of scenarios.

Table 3.—Regeneration assessment for Stand 1. Initial harvest was in winter of 2008; soil was fine sandy loam.

Tree genus or species	2010	2013	2017	Stems >3 ft	Avg. height
<i>Acer</i> sp.	Not counted	Not counted	3,437	1,625	2 ft
<i>Quercus rubra</i>	1,100	1,386	2,316	1,800	3-5 ft
<i>Betula</i> spp.	3,600	2,900	4,437	3,250	3-5 ft
<i>Tilia americana</i>	25	22	875	688	2-3 ft
<i>Fraxinus nigra</i>	30	0	0	0	2-3 ft
Total trees	4,755	4,308	11,065	7,363	

Table 4.—Regeneration assessment for Stand 2. Initial harvest was in fall of 2008; soil was loamy fine sand.

Tree genus or species	2010	2013	2017	Stems >3 ft	Avg. height
<i>Acer</i> sp.	Not counted	Not counted	4,636	2,272	2-3 ft
<i>Quercus rubra</i>	860	2,000	772	409	2-3 ft
<i>Betula</i> spp.	640	1,363	3,590	2,227	3-4 ft
<i>Tilia americana</i>	600	180	909	228	2-3 ft
<i>Fraxinus nigra</i>	136	0	590	318	2 ft
Total trees	2,236	3,543	10,497	5,454	



Figure 1.—Regeneration after initial harvest. Courtesy photo by Dennis J. Thompson, used with permission.

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CITATION: Thompson, Dennis J. 2023. **Comparing Fall versus Winter Shelterwood Harvests.** In: Kern, Christel C.; Dickinson, Yvette L., eds. Proceedings of the first biennial Northern Hardwood Conference 2021: Bridging science and management for the future. Gen. Tech. Rep. NRS-P-211. Madison, WI: U.S. Department of Agriculture, Forest Service, Northern Research Station: 124–126. <https://doi.org/10.2737/NRS-GTR-P-211-paper25>.