

Silviculture Trial Template

Project Subject/Title: Plunkett Lake Hemlock Conversion

Contact Person: NHAL SF Forester

Abstract: This trial focuses on efforts to encourage old growth stand characteristics in a hemlock, northern hardwood dominated stand. The harvest included single tree and gap selection within a hemlock, northern hardwood, and white pine stand. In FRM surveys conducted following harvest balsam fir was the most abundant species observed with over 2500 stems per acre. Hemlock was the fourth most abundant species with only 449 stems per acre. Continued monitoring of this stand is required to determine if there is further recruitment of hemlock seedlings. Reduction of competing species such as balsam fir and red maple could also be recommended to release hemlock seedlings. Being only 3 years after it was harvested, more time and monitoring will be needed to determine whether this trial was successful in encouraging regeneration of hemlock, and recruitment of old growth stand characteristics such as large down wood and snags.

Trial Location:

County: Iron

Township: 42N Range: 4E Section: 2, 3, 10

GPS Coordinates: Lat: 46.142916 Long: -89.977631

Property Name: Northern Highland State Forest – Plunkett Lake South

Site Map: Figure 2.

Baseline Stand Data: *list pre-trial stand data or attach WisFIRS stand report #113*

- *Cover Type:* Hemlock, Northern Hardwood, White Pine
- *Acres:* 17
- *Habitat Type:* ATM
- *Soil Type:* Springstead sandy loam, Padus sandy loam, Pence sandy loam, Rubicon sand, and Loxley and Dawson soils.
- *Year of Origin:* 2017
- *Total Height:* 56 (post-harvest)
- *Site Index Species and Site Index:* unknown
- *Mean Stand Diameter:* 10 (post-harvest)
- *Total Basal Area per acre:* 180 pre-harvest reduced to about 70 (post-harvest)

- *Other stand conditions:* Average diameter post-harvest 12.25 inches; %crown cover: 70%

Prescription and Methods:

- *Type of prescription:* Cut all aspen and white birch except those with green paint. Within yellow-circled 50ft canopy gaps cut all trees including 1”-5” balsam fir. Retain all hemlock, white pine and red oak.
- *Year initiated:* 2017
- *Establishment methods (timing, equipment, etc.):* natural regeneration
- *Data collection methods:* Post-harvest survey occurred in summer of 2020 and included a 10 BAF variable radius plot, with crown cover estimation and a check for the presence of a duff layer. Three 24ft down woody debris (DWD) transects were conducted at 30, 150, and 270. All downed wood greater than 3” in diameter was recorded along with diameter, length, decay class and species if identifiable. 1/300th acre FRM plots were conducted as well. All trees smaller than 5” in diameter were recorded to species along with height and level of deer browse.

Results:

Downed Woody Debris (DWD)

83 pieces of DWD observed. Average diameter was about 6.4” with a range of 3” to 22”. Average length of DWD was 10.9’ long, with a range of 1’ to 45’. The most common decay class was class 2 which is considered mostly intact, sapwood is starting to decay but can’t be pulled apart by hand, with branches still present. Most common species identified was paper birch. A duff layer was observed in 4 out of 8 plots.

Table 1. Breakdown of down woody debris by decay class.

Decay Class	Pieces in Decay Class	Mean Diameter (Inches)	Max Diameter (Inches)	Mean Length	Max Length (Feet)
1	15	5.60	22	16.60	45
2	36	6.17	16	12.28	30
3	16	6.69	15	8.56	25
4	12	6.92	10	5.58	20
5	4	8.50	14	3.25	5
Overall	83	6.39	22	10.94	45

Regeneration:

In the 3rd year since harvest there was some regeneration occurring within the stand. Eight FRM plots were conducted randomly across the stand to determine seedling regeneration following the harvest. Balsam fir had the greatest number of seedlings following the harvest with over 2500 stems per acre, followed by red maple with over

2000 stems per acre. Red oak was the third most abundant species with 862 stems per acre observed. Only 449 hemlock seedlings were observed in FRM plots and were primarily under 1 foot in height.

There was little deer browse observed within plots only within 3 out of 8 plots. Browse that was observed occurred mostly on broadleaved species such as maples, oaks, birch and aspen. No browse was observed on hemlock seedlings.

Table 2 Stems per acre of species and height classes observed following harvest

Species	<1	1-3ft	3-5ft	>5ft	Total TPA
Balsam Fir	1387	675	412	75	2549
Sugar Maple	187	112	0	37	336
Red Maple	1800	150	75	0	2025
Red Oak	412	375	75	0	862
Hemlock	412	0	37	0	449
Paper Birch	37	75	0	37	149
Quaking Aspen	0	75	112	37	224

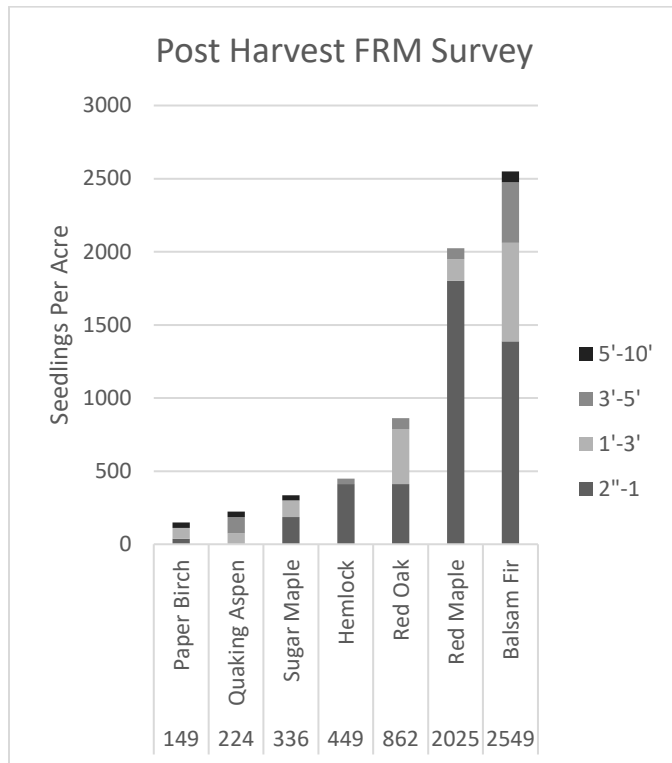


Figure 1. Stacked bar chart of regeneration numbers post-harvest.

Discussion/Recommendations:

These short-term results indicate that while there was some regeneration of hemlock within the site, more monitoring will be required to determine the success of this trial.

Efforts to enhance old-growth characteristics may be successful over time if trees retained are allowed to complete their natural life cycles and become large snags that will eventually create large downed woody debris. Species to focus these efforts on include white pine and hemlock, which were observed as just not in the snag class while conducting overstory plots. At present many of the trees observed in the snag class that are at or just above the desired size of 12 inches in diameter for large retention trees (see table below for breakdown of overstory plots), with none of them at the desired 18 inches in diameter. Some of the still living white pine and hemlock observed in plots may get to the desired size if they are allowed to complete their life cycle. Short lived species such as aspen, balsam fir, and paper birch should be avoided for retention.

Down woody debris was present throughout the site and will continue to accumulate through time. While size now is small on average, over time that should increase as trees are allowed to increase in size and develop into snags creating more down wood. Down woody debris is an important feature of old growth systems, creating nurse logs for seedlings, and enhancing habitat for many species that rely on down wood for shelter and food sources.

Natural regeneration within the stand was dominated by balsam fir and red maple seedlings. There were hemlock observed, however without intervention they may be out competed by the more competitive maple and balsam. Deer browse did not seem to be affecting the hemlock seedlings, however that could change so monitoring should continue to determine if it is impacting regeneration of hemlock. The lack of large down woody debris seems to be a contributing factor to low recruitment of hemlock seedlings.

Recommendations for future management would be to continue monitoring and reduction of competing vegetation such as red maple and balsam fir to release hemlock regeneration. Accruing old-growth characteristic in managed stands takes time and patience. As long as some overstory hemlock are retained on the site to continue providing a seed source and there is large down wood to provide a desirable substrate for germination this stand should eventually develop the desired characteristics.

**WISCONSIN
DEPARTMENT OF NATURAL RESOURCES
TIMBER SALE
TRACT 35-12 PLUNKETT LAKE SOUTH
T42N R4E SECTIONS 2, 3, 10
HARVEST ACRES - 85**

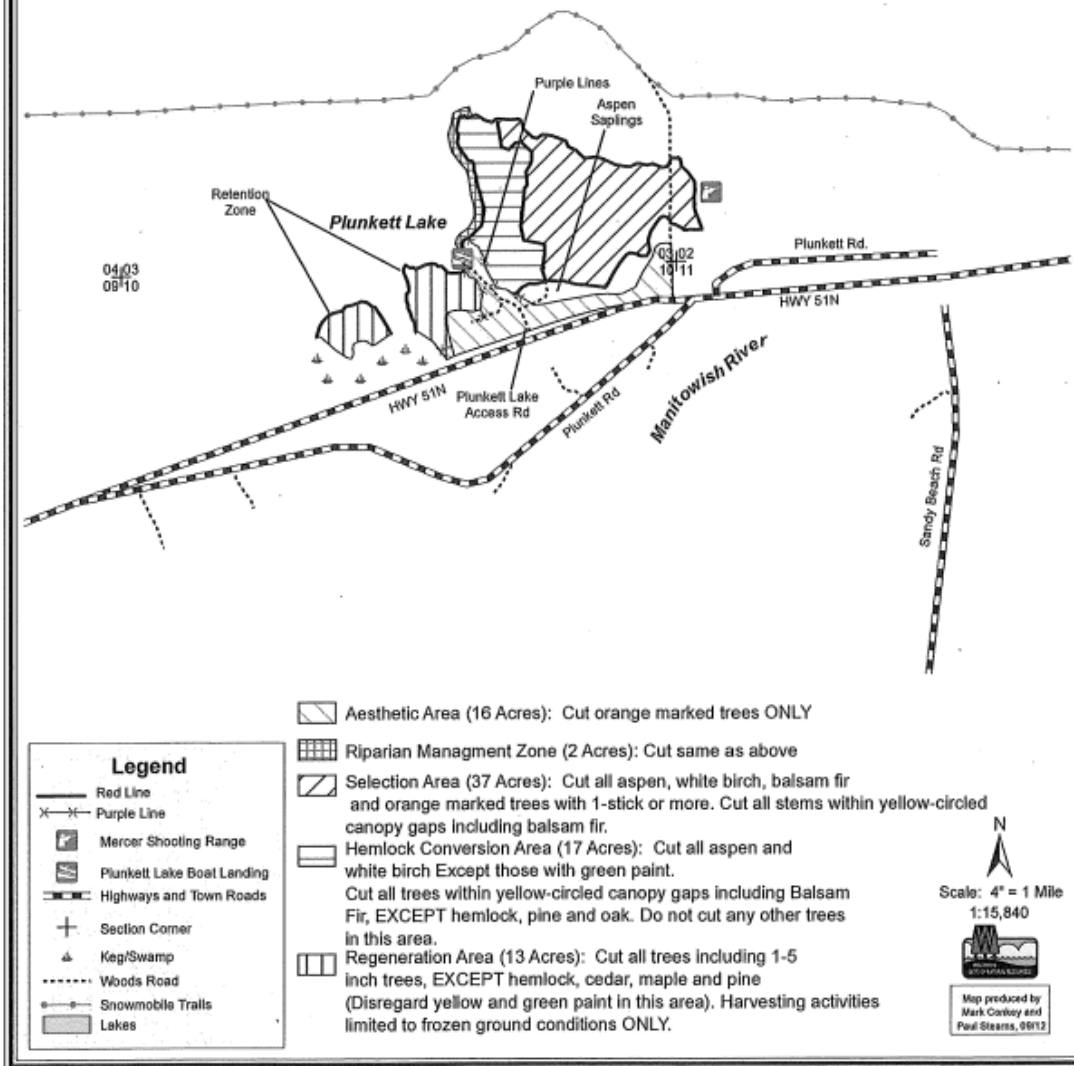


Figure 2. Map of timber sale.



Figure 3. Leaf off aerial imagery of sale area post-harvest.

Table 3. Breakdown of trees observed in variable radius plots by class.

Mortality	Class	Species	Number of Stems (In plots)	Mean Diameter (inches)
Live	Class 1 "Live"	NA	40	11.8
		Trembling Aspen	3	19
		Balsam Fir	5	8.4
		Hemlock	11	11
		Sugar Maple	11	9.45
		Red Maple	4	12.25
		White Pine	3	22.33
		Red Oak	3	10.66
Live	Class 2 "Declining"	NA	3	12
		Trembling Aspen	1	15
		Balsam Fir	1	10
		Red Maple	1	11
Snag	Class 3 "Dead Intact"	NA	1	16
		Trembling Aspen	1	16
Snag	Class 4 "Dead Broken"	NA	10	13.9
		Trembling Aspen	6	17
		Balsam Fir	2	9.5
		Paper Birch	2	9
	Overall	NA	54	12.28