Overstory removal and natural conversion to white pine

Project Subject/Title: Overstory Removal of Red Pine to Release White Pine Regeneration

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Abstract: The objective for this treatment is an even-aged, overstory removal of red pine in order to release white pine advance regeneration (natural conversion). Prior to the harvest the understory was well stocked with white pine advance regeneration. The post-harvest objective is to release a minimum of 700 evenly distributed, undamaged white pine seedlings per acre that are at least 2-4 feet in height. Long-term objectives include even-aged management for white pine sawtimber through periodic intermediate treatments, including release, thinning and pruning.

Trial Location:

County: Waushara_____

Township: NE Corner of Property; Township: 20N, Range: 09E, Section: 20_

GPS Coordinates: Lat: 44°11'44.5" **Long:** -89°27'59"

PropertyName: Private_____

Site Map: (see below)

Baseline Stand Data:

- *Cover Type - Red Pine with high density of white pine (advance)*
- *Total: 29 ac*
- *Habitat Type*
- *Soil: Plainfield Sand*
- *Year of origin: 1939*
- *Stand 1: 136 sq. ft/ac; stand 2: 120 sq ft/ac*

Prescription and Methods:

- *Type of prescription -Overstory removal*
- *Year initiated – Spring 2011*
- *Establishment methods (timing, equipment, etc.)* **-**mechanical processor and forwarder.

In 2010, the management plan was amended to the following based on the landowner's request:

In stands 1 and 2 – conduct an overstory removal regeneration harvest to be completed in 2010. The overstory removal will harvest all overstory red and white pine (minus reserve trees) in order

to release desirable advance regeneration of white pine seedlings that are well stocked and well established in the understory. Well stocked is defined as over 700 evenly distributed vigorous seedlings per acre remaining following the removal. Well established is defined as seedlings at least 2-4 feet in height. The minimum stocking of 700 trees per acre (ideally is 900 trees per acre) will promote correcting of tip weevil damage and ensure an adequate number of crop trees at rotation. If the stands do not reach desirable stocking by the fourth year after the harvest (2014), site prep and planting will be completed by 2016. In addition, leaving 5-15% of the crown cover from living trees that are greater than 5 inches in diameter as reserve trees is retained for tree species diversity, wildlife, habitat, aesthetics, and water/soil quality.

Results:

After the harvesting, a regeneration survey was completed in late summer of 2011, using 1/100th acre plots on a three chain by three chain grid within the harvesting area. Every seedling/sapling with in an 11.78 foot radius was either counted as acceptable or unacceptable. Unacceptable seedlings/saplings had one or more of the following criteria: leaning more than 15%, broken top or forked and one fork dead/broken, dead from sun scald. Seedlings/sapling heights and ages were also estimated by sampling the first tree north of plot center. (see Figures 1 and 2))

Average Seedlings per Acre:	162400 seedlings and saplings 33 plots with data 4921 seedlings and saplings per acre
	149200 seedlings 33 plots with data 4521 seedlings per acre
	13200 saplings 33 plots with data 400 saplings per acre
Stocking per Acre per Species:	147600 white pine seedlings and saplings 33 plots with data 4473 white pine seedlings and saplings per acre
	4500 black oak seedlings and saplings 33 plots with data 145 black oak seedlings and saplings per acre
	400 red pine seedlings and saplings 33 plots with data 12 red pine seedlings and saplings per acre
	100 jack pine seedlings and saplings 33 plots with data 3 jack pine seedlings and saplings per acre
Average Height of First White Pine North per Plot:	10’ 2”
Average Age of First White Pine North per Plot:	21 years
Average Slash Depth per Plot:	1.5” in regeneration rows 7.4” in slash rows

Figure 1. Results for the regeneration survey completed in the late summer of 2011. Seedlings and saplings are considered to have a DBH of 0-5 inches. There were 47 plots taken with 33 providing data.

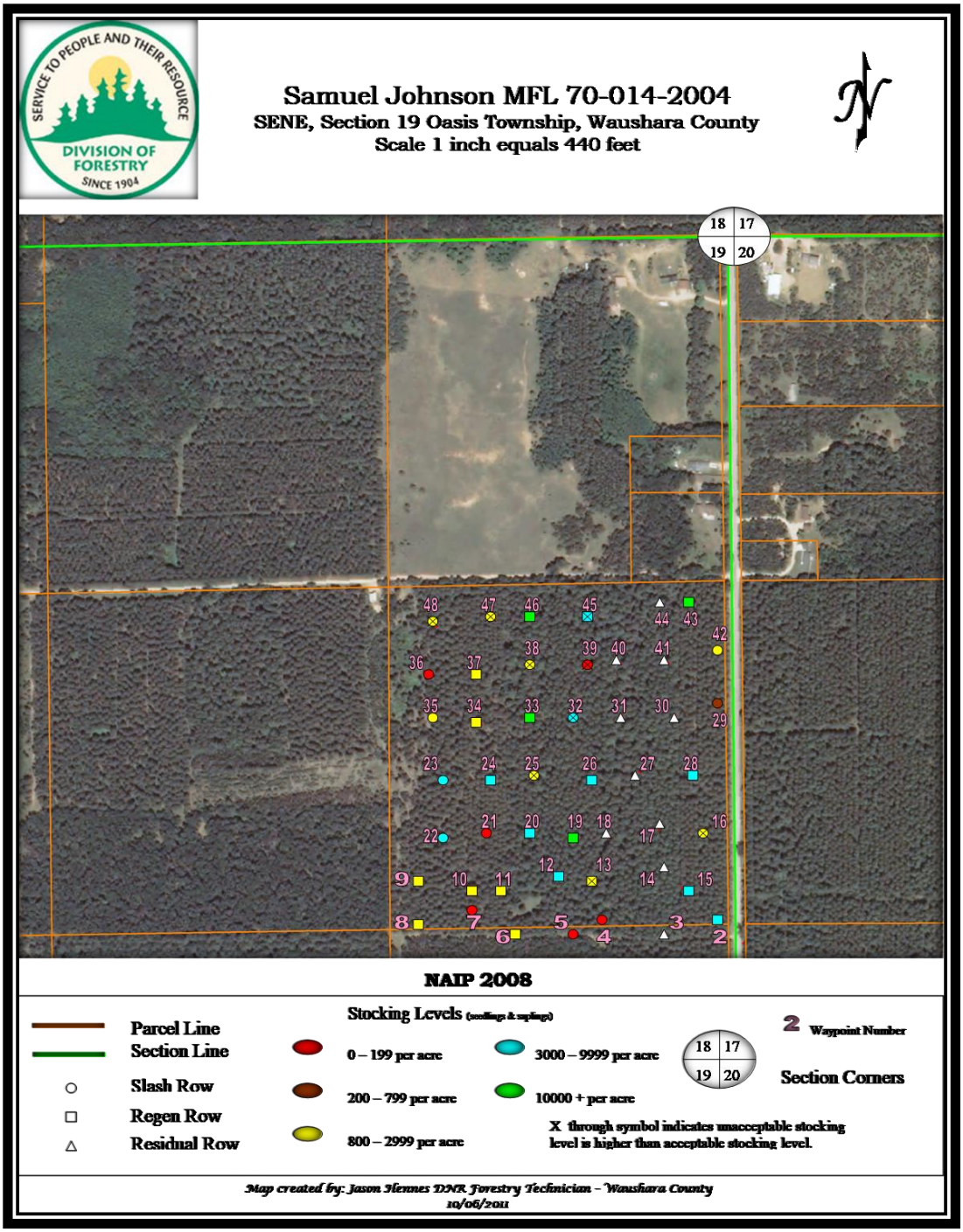

Figure 2. A map of the property with stocking levels post-harvest in late summer 2011.

In December of 2015, a follow-up regeneration survey was conducted to remeasure density and height growth response. Again, 1/100th acre plots were used, but this time on a 6 chain by 6 chain grid. Plots were purposely not located within skid lanes, so the resulting trees per acre were skewed greater than the 2011 survey.

Table 1. Results for the survey completed in 2015.

Plot #	**GPS Coordinates**	**1st PW North "Height"**	**Spp**	**Seedling/Sapling count**	**Per Acre**
Plot 1	44.194882-89.466515	20' 8"	PW	87	8,700
Plot 2	44.194968-89.468761	1' 7"	PW	138	13,800
Plot 3	44.195223-89.470168	5' 3"	PW	124	12,400
Plot 4	44.194098-89.470030	11' 0"	PW	123	12,300
Plot 5	44.194040-89.468776	15' 6"	PW	185	18,500
Plot 6	44.193550-89.468970	8' 8"	PW	240	24,000
Plot 7	44.194060-89.466722	12' 7"	PW PR O. Black	33 1 3	3,300 100 300
Plot 8	44.192541-89.466818	5' 1"	PW O. Black	228 2	22,800 100
Plot 9	44.192709-89.468974	12' 3"	PW	196	19,600
Plot 10	44.192674-89.470352	6' 2"	PW PR	6 4	600 400

Discussion/Recommendations:

A noticeable result of the overstory removal in Stands 1 and 2 is the amount of advance regeneration destroyed through harvesting and skidding operations. The timber processor attempted to harvest two rows on either side of the machine, resulting in a skid lane every 5th row (or approximately 40-45'), however due to variable row widths and stocking within the plantation the area impacted by harvesting operations was greater than expected. In addition, there was some windstorm damage to the residual white pine overstory (reserve trees) and a subsequent salvage harvest in the winter of 2011 that may have resulted in more damage to the white pine regeneration.

An adjacent plantation was thinned at the same time by the same operator with significantly less harvest damage to the advance regeneration, but this stand was reported to have more consistent row widths and larger white pine advance regeneration. One option to mitigate damage in future overstory removal treatments is to further restrict access to limited width, pre-designated skid trails. Timing of the harvest also appears to be important as the regeneration was reported to be more brittle due to cold temperatures. At the stand level, white pine regeneration easily met the prescription target of 700 trees per acre, however, when comparing the height estimates between the 2011 regeneration survey (average height = 10' 2") and 2015 regeneration survey (average height = 9'11"), it appears that the white pine advance regeneration has responded little in terms of height growth after 4 growing seasons. The data for height measurement were limited, so these numbers should be interpreted cautiously. Overall the white pine seedlings/saplings still appeared healthy in 2015, so more time may be needed to see a substantial height growth response.

Photographs

Figure 3. Slash trail on the property post-treatment in December 2015.

Figure 4: A picture of the property post-treatment in December 2015.

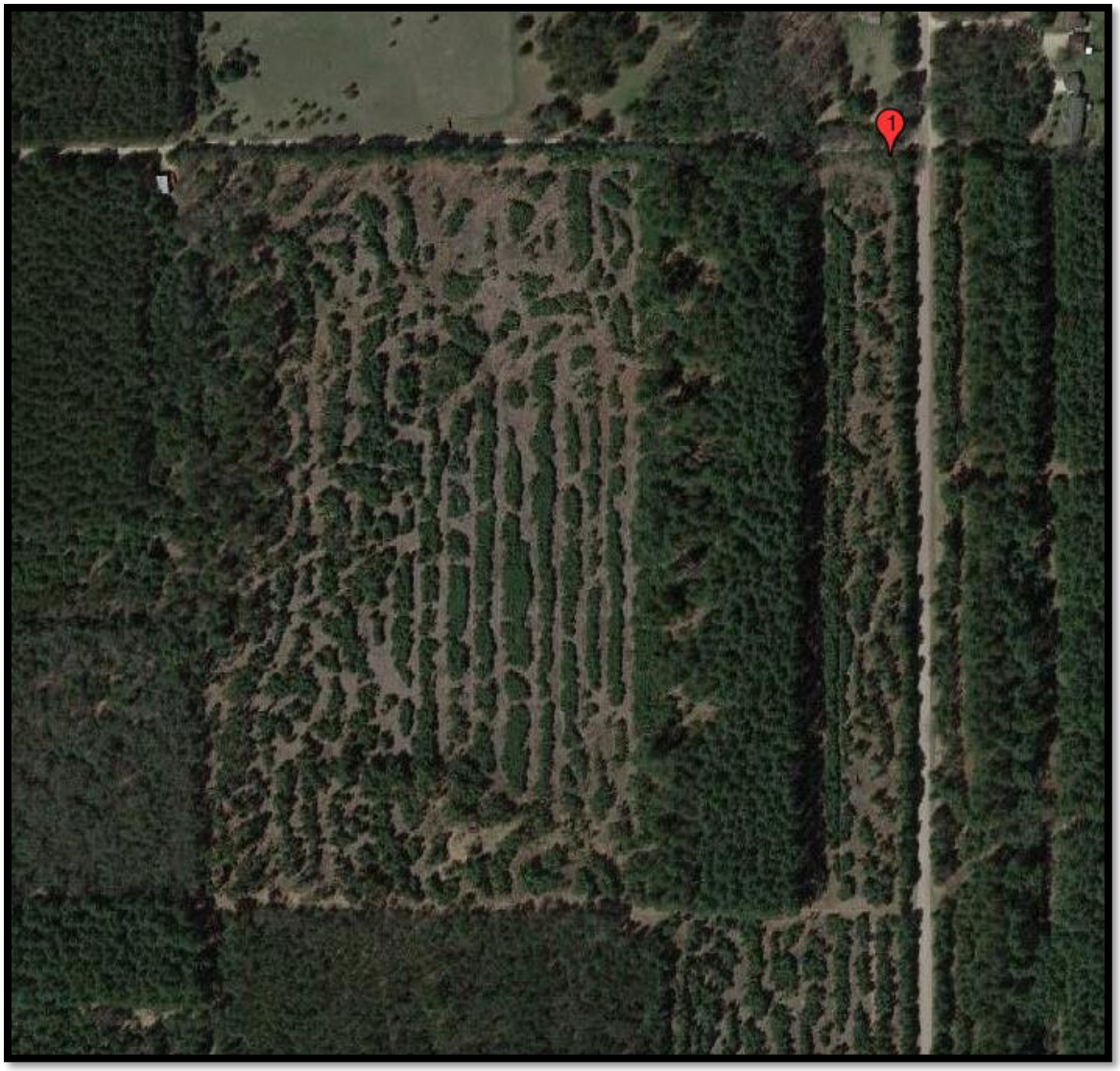

Figure 5: Current aerial imagery of the stands showing damage to regeneration caused by harvesting and skidding operations. Photo curtesy of Google Maps and obtained in December 2017.