Greenwood Lake Conservation Reserve White Pine Status 2019

Report of tree survey performed in September 2019

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Summary: Tree inventory performed in two white pine dominated blocks at Greenwood Lake Conservation reserve revealed that mature (200 to 300 year-old) white pines still dominate the site and are detected in 40% of sample plots. Unfortunately, recruitment of young white pine trees and saplings is minimal. In the absence of fire and other disturbances. Competition for light from mid-understory species – balsam fir, red maple and paper birch - will likely supress ongoing re-establishment of white pine. This will likely cause a gradual change in the character of the site and loss of the primary protected "conservation value" at this location. Our data establish a baseline for future monitoring of the white pine status at the reserve.

Introduction and Purpose:

The principal value protected in the reserve are the mature "old growth" white pines (*Pinus strobus* L.) as described in OMNRF documents "Approved SCI Examination Report with endorsement [3126], 1998" and accompanying "Statement of Conservation Interest – Greenwood Lake SCI[3128], 2000". The goal of this study was to establish a baseline evaluation of the condition of the forest as it exists now, in 2019. We were unable to locate historical quantitative data and are continuing efforts to secure such data. This study is expected to allow future evaluation of the apparently deteriorating state of this extensive protected white

pine stand and to provide information toward potential efforts to maintain the white pine dominated character of this magnificent forest.

Methods:

Two polygons (A=98.5ha and B=10.6ha, from the enhanced Forest Resource Inventory (eFRI, https://www.ontario.ca/page/forest-resources-inventory accessed March 2020) were identified as representing the two major sites dominated by white pine. Circular sampling plots (100m^2, radius 5.64m) were established, and are shown in pdf files GWLCR_blockA and B (see end of document). Specific GPS co-ordinates of each stake marking the center of the plot are in Table 2, at the end of the document). If the sampling plot fell in the proximity of a trail, its center was shifted as to be invisible from the trail. At each location, crews of two evaluated vegetation type (Field Guide to the Forest Ecosystem Classification for Northwestern Ontario https://cfs.nrcan.gc.ca/publications?id=22144), % shrub cover and each tree within the plot was evaluated for its position in the canopy and its diameter measured at breast height. One plot in each polygon (A48 and B4) was not quantified and will be evaluated in more detail at a size of 400m^2..

Results and Discussion

Analysis based on tree basal area:

Table 1. Tree basal area (BA) per hectare in two polygons sampled

Species and canopy level	Polygon A* Basal area (m^2/ha)	Polygon B Basal area (m^2/ha)
White pine level 1	24.53	31.47
White pine level 2	0.33	
White pine level 3	0.05	
White spruce level 1	0.54	
White spruce level 2	1.26	
White spruce level 3	0.04	
Balsam fir level 2	2.10	5.93
Balsam fir level 3	1.01	1.01
Black spruce level 2	0.82	
Black spruce level 3	0.10	
White cedar level 2	0.51	
Red maple level 2	2.57	3.81
Red maple level 3	0.35	0.02
White birch level 2	3.55	2.70
White birch level 3	0.39	0.36
Yellow birch level 2	0.20	
Yellow birch level 3	0.02	
Trembling aspen level 2	0.83	0.30
TOTAL BA/ha level 1	25.07	31.47
TOTAL BA/ha level 2	12.18	12.73
TOTAL BA/ha level 3	1.98	1.39
TOTAL BA/ha in polygon	39.23	45.59

*Area of polygon A was 98.5ha and polygon B 10.6ha. Sixty-three plots in polygon A and five plots of 100m^2 each in polygon B were sampled, for sampling intensity of 0.63% and 0.47% in polygons A and B, respectively.

Evergreens: Basal area per hectare of trees in the three canopy levels is presented in Table 1. White pine, the main objective of the study, dominated both polygons and formed the highest canopy level (level 1) considered, and contributed basal area (BA) of 24.53 and 31.47 m^2/ha in polygon A and B, respectively. A few white pines in canopy levels 2 and 3 in polygon A translated into BA of 0.33 and 0.05 m^2/ha, respectively. No young white pines were observed in polygon B, suggesting minimal recruitment of young white pine into these mature segments of the reserve. Similarly, white spruce, the only other large tree reaching canopy level 1, is lacking as a sapling (canopy level 3) and a few intermediate size trees in polygon A resulted in BA of 1.26 m^2/ha. White cedar and black spruce were highly localized in wet areas of polygon A (see below). Only a few intermediate size cedar trees contributed 0.51 m^2/ha BA (level 2, polygon A) and black spruce trees contributed BA of 0.82 + 0.10 m^2/ha in this polygon. None were measured in polygon B. Red pine, although present in the reserve, was not identified in any of the sample plots.

Hardwoods: Red maple and white birch are the two main deciduous species with the potential to supress white pine recruitment due to shading (https://www.fs.fed.us/database/feis/plants/tree/pinstr/all.html). Both polygons had significant concentrations of saplings and intermediate size trees (Table 1). Trembling aspen was also present to a small degree in both polygons, while yellow birch was quite noticeable and measured in polygon A at both canopy levels (Table 1). Prevalence of hardwoods in the lower canopy suggests that a gradual shift will take place in the future from white pine dominated forest to a deciduous forest. In order to maintain the present character of the conservation reserve some intervention may be needed to release the growth of existing white pine, possibly combined with limited white pine planting. Casual observations suggest that white pines are regenerating along (or in the middle of) trails and roads, as well as along lake shores, where more light is available.

Analysis of spatial distribution of trees:

White and red pine: The main object of the study, white pine, was detected in 25 of the 63 plots (40%) sampled in polygon A and in 2 of the 5 plots (40%) in polygon B. The mature white pine trees represented most of the upper canopy (level 1), with only two large white spruce deemed to reach that height.

Regenerating white pine reaching canopy level 2 was detected in only 2 plots and young seedlings in canopy level 3 were found in only three of the total 68 plots sampled.

On a more quantitative level, extrapolating from the sample plots in Polygon A (98.5ha), this area contained about 5233 dominant trees (canopy level 1, average diameter 73.8$\pm$ 17.1cm), 308 subdominant trees (canopy level 2), and 770 seedlings (canopy level 3). In polygon B (10.6ha), there were no (or very few) seedlings or sub-dominant white pine, and the plot data extrapolated to about 883 dominant white pine in the entire polygon. These trees were on average 61.4$\pm$17.5cm DBH. This polygon is characterised by a partially burned area (in 1991) and much competition from white birch (see below). The largest white pine tree (in plot A25) measured 110cm DBH.

Red pine, although present in the reserve, was not detected in any of the sampling plots. This translates into a very few individual trees in the entire sampled area. As we extend the sampling to other parts of the reserve, particularly lake shores, this species will be more likely encountered and quantified.

Competing trees:

Our data suggest that several focal areas of developing competing tree vegetation are present throughout the reserve. These sites tend to be richer in either birch, red maple or balsam fir. All these species have reached the upper canopy (level 2), near the crowns of the white pine.

Mature (canopy level 2) **balsam fir** was the most abundant, with about 9234 individuals in polygon A and 1943 trees in Polygon B. These trees were on average 17.7$\pm$5.1cm DBH. There were 24009 balsam fir saplings in Polygon A and 1767 saplings in Polygon B (7$\pm$3cm DBH). These highly resinous and flammable trees represent the highest threat to the white pine, should fire occur in the future.

Deciduous **red maple** and **white birch** both will likely close the canopy above any white pine seedlings which manage to establish in the understory. It remains to be seen if the few white pine saplings will continue to grow under the deciduous canopy. Both deciduous species were randomly present throughout the study area, but a focal area of more red maple seedlings appeared to be in the East section of Polygon A (Plots A45, 46, 52). Similarly, white birch was particularly abundant in the NW section of Polygon A (A37, 39, 40). Surprisingly, our sampling missed the above-mentioned burn area in Polygon B dominated by white birch (pers. observation). Only 353 birch trees at each canopy level were quantified in the entire B polygon, Plot B4 was not measured because it fell on a steep slope. This site should be moved further West, even West of the orange trail and center of the old burn.

In Polygon A, there are about 970 large birch trees (Canopy level 2, 20.9$\pm$8 cm DBH) and 4617 small saplings (Canopy level 3, 8.0$\pm$3.3 cm). Similar sized trees were present in Polygon B. Red maple in Polygon A was estimated at 5387 individuals at canopy level 2 and 4309 individuals at level 3. Corresponding numbers in Polygon B were 707 and 353 trees, respectively.

Yellow birch quantities were included with white birch. This species is a minor component and contributed only 6.5% of the white birch value.

Spruces are also present, but in relatively low numbers: a few already mentioned large **white spruce** individuals were present, extrapolating to a total of 1693 and 616 individuals (canopy level 2 and 3, respectively) in Polygon A. **Black spruce** was estimated at 2309 and 2155 trees (canopy level 2 and 3, respectively). No spruce at all was detected in Polygon B sample plots, suggesting only a few individuals are likely present in this area.

GWLCR_blockA.pdf   GWLCR_blockB.pdf

Table 2. Coordinates of sample plots (NAD83).

Name	Zone	Easting	Northing
56-2004-04(2009)	15	665849	5362537
A1	15	666322	5362105
A10	15	665562	5362296
A11	15	665680	5362308
A12	15	665808	5362308

A13	15	665923	5362333
A14	15	666055	5362330
A15	15	666168	5362344
A16	15	666299	5362360
A17	15	666426	5362358
A18	15	666548	5362373
A19	15	666681	5362389
A2	15	665695	5362175
A20	15	665667	5362431
A21	15	665798	5362435
A22	15	665919	5362457
A23	15	666047	5362459
A24	15	666170	5362464
A25	15	666296	5362480
A26	15	666423	5362482
A27	15	666555	5362482
A28	15	666665	5362504
A3	15	665825	5362195
A30	15	666034	5362583
A31	15	666158	5362593
A32	15	666283	5362603
A33	15	666414	5362618
A34	15	666523	5362624
A35	15	666652	5362639
A36	15	666772	5362641
A37	15	665650	5362679
A38	15	665775	5362688
A39	15	665899	5362698
A4	15	665940	5362202
A40	15	666024	5362708
A41	15	666148	5362718
A42	15	666265	5362717
A43	15	666394	5362741
A44	15	666519	5362752
A45	15	666639	5362753
A46	15	666769	5362764
A47	15	666887	5362770
A48	15	666134	5362848
A49	15	666264	5362853
A5	15	666058	5362202
A50	15	666386	5362861
A51	15	666508	5362874
A52	15	666631	5362887

A53	15	666759	5362899
A54	15	666128	5362964
A55	15	666251	5362976
A56	15	666377	5362987
A57	15	666499	5363009
A58	15	666620	5363010
A59	15	666749	5363017
A6	15	666193	5362213
A60	15	665999	5363077
A61	15	666375	5363110
A62	15	666617	5363133
A63	15	666361	5363237
A7	15	666314	5362232
A8	15	666440	5362241
A9	15	666571	5362241
B1	15	666575	5362115
B2	15	666695	5362134
B3	15	666820	5362144
B5	15	666686	5362259
B6	15	666810	5362268

Additional references:

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