USING EXTERNAL CHARACTERISTICS TO IDENTIFY OLD GROWTH HARDWOOD TREES

Tree Coring Project Conducted at Mark. S. Burnham Provincial Park for Ontario Parks
March 31, 2013

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Introduction

A recent publication (Pedersen 2010) listed a number of external characteristics exhibited by hardwood trees that indicated they were old (>250 years). Typical characteristics include:

- Smooth or balding bark, where the typical bark patterning along the lowest section of the trunk has sloughed off, due to the extreme age of the tree.

- Low stem taper. Over long periods of time, the upper portion of the trunk grows radially such that it is almost the same diameter as the base of the trunk.

- High stem sinuosity. Sinuosity refers to bending in a tree trunk, which is a result of a tree growing towards light in a partly shaded environment (phototropism). The tree will have grown toward more than one light source due to changes in canopy gaps over centuries of growth, creating a crooked stem.

- Large, thick and gnarled branches. Such branches indicate that the tree has experienced numerous disturbance events over its long life, and numerous adjacent canopy gaps which have led to the large size of the branches.

- Broken tree crowns. Damaged tree crowns, with a 'celery' top appearance (a stout stem with few leaves), result in a canopy with few branches and consequently small crown volume, leading to slow growth over time. They are damaged by lightning or other disturbance events which have occurred over a long period of time.

While any single character does not necessarily indicate that a tree is old, a combination of the above indicators provides strong evidence.

Sugar Maple from Burnham Woods **showing old growth features,** including balding lower trunk, low stem taper, and damaged tree crown.

Note that very large trunk diameter is not included as a characteristic of old trees. Old trees typically have diameters that are near the average of trees at a site. Larger diameter trees often have larger crowns, and likely larger root systems, which gives them a competitive advantage and leads to faster growth rates (Pederson 2010).

Mark S. Burnham Provincial Park, located on the southeastern outskirts of the City of Peterborough, has often been cited as an example of "old growth forest" (Henry and Quinby 2010).Numerous trees in the park have many of the external features described above, including balding bark, low stem taper, and broken crowns (see photo). In 2012, eleven trees exhibiting all three of these characters were cored by NHIC staff members using an increment borer. Due to the large trunk diameters, a long 18" long borer was used to ensure it could reach the centre of the trunk. Once extracted, cores were inserted into labelled large diameter straws to prevent breakage.

Methodology

Tree cores were glued to pieces of wood, then sanded prior to counting the annual growth rings using a stereoscopic microscope (Stokes and Smiley, 1968). Note that all determined tree ages are minimum estimates. No extrapolations have been made for the number of missing rings due to missed tree centres or the number of years to reach coring height as they were taken at breast height (162 cm or 5 feet 4 inches).

Additional information collected included the tree species, tree height, GPS co-ordinates, and diameter at breast height. A sequence of photos covering the whole tree was also taken, and these were photo-stitched to create an image of the entire tree.

Assistance in the field was provided by Meaghan Robson, NHIC summer student, and Sam Brinker, NHIC Project Botanist. Map showing locations of cored trees created by Bonnie Henson, NHIC Project Ecologist.

Results

The trees that were cored are identified in Table 1, along with their species, diameter at breast height (162 cm/5' 4") and number of rings counted.The oldest tree recorded was a Sugar Maple (*Acer saccharum*), aged at 330 years. This would mean it began growing sometime before 1682! Additionally, a number of Sugar Maples were determined to be over 2 centuries old (235, 218, 211 and 208 years of age).

Tree #	Species Common Name	Species Scientific Name	DBH (cm)	Minimum Age
1	Sugar Maple	Acer saccharum	71.5	128
2	Sugar Maple	Acer saccharum	70	218
3*	Sugar Maple	Acer saccharum	52.5	211
4	Eastern Hemlock	Tsuga canadensis	78.8	126
5	Sugar Maple	Acer saccharum	67.3	235
6	Sugar Maple	Acer saccharum	72.3	330
7	Sugar Maple	Acer saccharum	60	208
8	White Ash	Fraxinus americana	73.5	118
9**	Sugar Maple	Acer saccharum	79.75	105
10	Fagus grandifolia	American Beech	54	151
11	Sugar Maple	Acer saccharum	77.7	72

Table 1. Results of the tree coring study from Mark S. Burnham Provincial Park. Abbreviation: *, a 2.5 cm piece of core with compressed rings was inadvertently dropped and not found during the extraction; **, hollow centre.

In all cases where trees were very old, portions of the cores exhibited extremely tight growth rings; in some cases 5mm of core represented 10 years of growth. All cores were incomplete, since the cores did not reach the exact center. Also, in some cases the whole core was not successfully extracted, with some of the older centre portions crumbling and falling out of the extraction tube in the process of being retrieved.

Locations of sampled trees are shown in Figure 1 (following page).

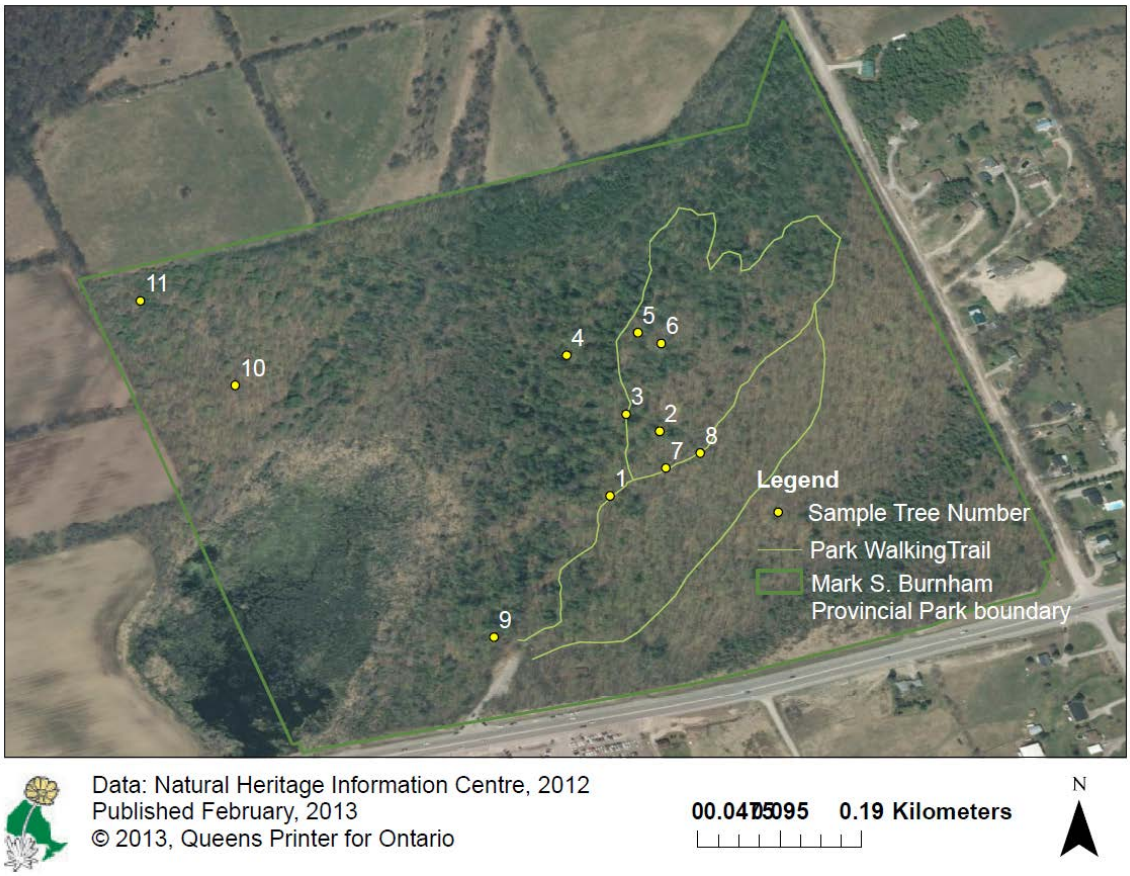

Figure 1. Location of trees cored in Mark S. Burnham Provincial Park.

Discussion

The discovery of a Sugar Maple which is 330+ years old indicates that it is possible to identify old trees based on their external characteristics. Four other trees were cored that were in excess of 200+ years, so almost 50% of trees examined were quite old.

Previously, a dead Eastern Hemlock from Mark S. Burnham Provincial Park had been cored, with 439 rings counted, making it the oldest Eastern Hemlock ever recorded from Ontario. This tree was only 53 cm in diameter (Henry and Quinby 2010). These authors also indicate that the eastern portion of the woods have previously been logged.

There are a number of other types of evidence which are indicative of old forests, including the presence of many large logs in different stages of decay, no evidence of logging, and pit and mound shapes on the forest floor (Tyrrell and Crow 1994; Runkle 1996; White and White 1996).

Save for the eastern portion of the park, there is no evidence of logging in most of the park, as indicated by the presence of cut stumps or old logging tote roads. Within the park, there is an abundance of downed trees in various states of decay (Figures 2, 3).

Figure 2. Extensive areas of downed trees and woody debris, in the vicinity of Tree #7.

Figure 3. An almost fully decomposed log from northwest Mark S. Burnham PP.

Also, pit and mound topography (mounds are created by tree roots pulling up the soil when a tree falls, the adjacent depression from where the soil has been removed creating the pit) is strikingly evident throughout the park, often in association with abundant downed logs and woody debris (Figure 4).

Figure 4. Pit and mound topography in Mark S. Burnham PP., with somewhat recently created mound on the right side of photo. Woody debris abundant. Northwest section of park.

These structural characteristics, in combination with documented extremely old Sugar Maple and Eastern Hemlock trees provide clear evidence that the park clearly supports an example of old growth hardwood and mixed hardwood-hemlock forest. Its occurrence within an urban setting is thus made even more remarkable.

References

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