

THE OLD-GROWTH FORESTS OF BRONTE CREEK PROVINCIAL PARK: AN URBAN LANDSCAPE THREATENED BY INVASIVE SPECIES

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SUMMARY

Bronte Creek Provincial Park was visited as part of AFER's *Eastern Hemlock Project*. This is one of a series of rapid surveys of old-growth hemlock forests undertaken in anticipation of the arrival of hemlock woolly adelgid (HWA), an invasive species that has killed thousands of hectares of hemlock forests in the eastern U.S. It is established in 43 counties of New York State (New York State Department of Environmental Conservation 2018) and has been detected in Canada in a few southern Ontario locations.

Four hemlock trees along Bronte Creek's ravine trail were cored and the stand of mature oak-maple-beech forest between the ravine trail and the logging trail was visually evaluated. The maximum ring count from the four hemlock tree cores was 216 years, with an estimated age of 240 years. Evidence from the tree cores and old-age characteristics of the trees suggest that the hemlocks adjacent to and on the ravine slope are commonly 150-240+ years old. Size is a poor indicator of age for these hemlocks, as the largest of the four trees cored was likely the youngest, and the oldest was the smallest at 35.3 cm diameter. More reliable indicators of age include low trunk taper, deflections in the trunk, and large upper branches.

Bronte Creek is an ideal location for conducting HWA surveys and raising public awareness. Hemlock branches are sometimes within reach along the Ravine Trail, Trillium Trail and Half-moon Trail and should be checked annually for HWA and public monitoring should be encouraged December-July. Trees along Bronte Creek and adjacent wetlands should also be prioritized for HWA monitoring because they may support higher populations of migrating and resident birds, which are the primary vector of HWA (Costa & Onken 2006). Additional information about monitoring for HWA can be found at <http://www.ancientforest.org/monitoring-for-hwa-how-and-when/>. The Canadian Food Inspection Agency (CFIA) makes HWA trail signs available and these could be posted on the Ravine Trail (contact Erin Bullas-Appleton Erin.Bullas-Appleton@inspection.gc.ca)

It is clear that the oak-maple-beech forest has been affected by human disturbances (including logging) in the past, however, it still contains many hardwood trees with old-age characteristics as well as old-growth stand characteristics including large trees, logs and snags. Larson et al. (1999) aged a 62 cm sugar maple in this forest at 216 years, which puts the current stand age at 234 years. The most striking impact since Larson's 1999 study has been the decline and death of a majority of the mature beech trees due to beech bark disease. A ring count of one beech log that was cut near the Ravine Trail revealed 198 annual growth rings, and it is likely that many of the mature beech in this forest were of similar age.

A rapid survey for beech bark disease-resistant trees found what appeared to be two large healthy trees, which the Park should monitor and potentially use as a source of seed or other propagation material for eventual restoration of the beech component of this forest. Other resistant trees may occur in this forest, and a more thorough inventory is warranted.

INTRODUCTION

Bronte Creek Provincial Park was visited on Friday November 3, 2017, as part of the *Eastern Hemlock Project*. This is one of a series of rapid surveys of old-growth hemlock forests, undertaken with the following goals:

1. use maps and field data to identify and characterize high-value (old growth) hemlock forests in anticipation of the arrival of HWA,
2. collect field data to confirm visual characteristics of old age in hemlock trees.
3. raise the public profile of hemlock as an old-growth and foundation species that is currently under threat.

The old-growth forests of Bronte Creek are comprised of a hemlock-mixed forest growing on a steep ravine slope and a mature oak-maple-beech forest growing adjacent to and west of the ravine. The latter forest was confirmed by Larson et al. (1999) as an old-growth forest and significant woodland. Our survey focused on the hemlock-mixed forest on the ravine slopes, which is less well-documented.

RESULTS AND DISCUSSION

THE BRONTE CREEK RAVINE HEMLOCKS

Hemlocks with one of more old-age characteristics were selected for coring (at breast height – 4.5 ft.). All of the trees selected occurred either immediately adjacent to or on the ravine slope itself. The maximum ring count from the four tree cores was 216 years. Vasiliauskas (1995) determined that hemlock trees take an average of 24 years to reach breast height in Algonquin Park. Using this age estimation for the first 4.5 ft., an estimate of 240 years was obtained.

Two of the cores had heart rot, one of which (tree 3) had very tight rings in a short section of core. A simple extrapolation of the ring count would make it the oldest tree cored, but any estimate from such a short section of core would be unreliable. The only other tree with a solid center (tree 4) was estimated to be 190 years old.

Figure 1. Bronte Creek Core 1

Eastern Hemlock

Lat: 43.41354

Long: -79.756113

Ring count: 216

Core: full (bark to pith)

Estimated age: 240

DBH: 35.3 cm

Height: 15.6 m

Height of first branch: 5.9 m

The base of the hemlock is about 5 meters over the crest of the ravine. A large red oak (estimated 150 years old) is suppressing it. There is a dense hemlock stand on the ravine slope in this area, many of which have old-age characteristics, as does a sugar maple further downslope.

Old-age characteristics of the tree include low trunk taper, major deflections in the upper trunk, and large / twisting branches. It has a lean of about 20°.

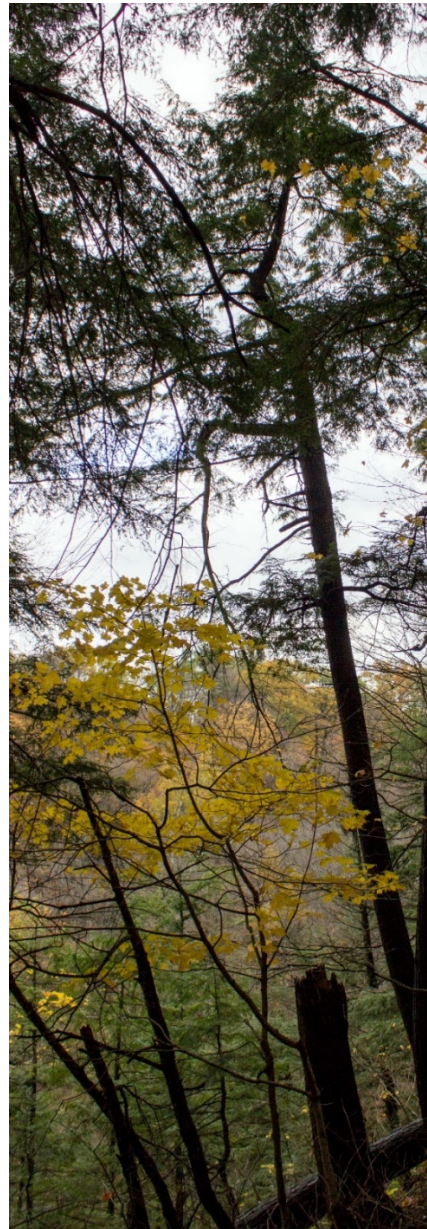


Figure 2. Bronte Creek Core 2

Eastern Hemlock

Lat: 43.413557

Long: -79.756079

Ring count: 109

Core: partial (23.3 cm)

Est. age: ~188 (rough)

DBH: 64.2 cm

Height: 20 m

1st branch: 7 m

This tree is in the same area as Core 1 – a hemlock-dominated slope forest with many old trees.

Old-age characteristics of this tree are not pronounced but include low-moderate trunk taper, and some large branches. The tree has a broad curve in the trunk and is leaning at 35°.

188 years is a rough estimate obtained using the growth rate of the inner 20 rings to complete the missing section of core (Rozas 2004), plus a correction for height of coring.



Figure 3. Bronte Creek Core 3

Eastern Hemlock

Lat: 43.41295

Long: -79.760634

Ring count: 51

Core: partial (4.2 cm)

Estimated age: uncertain, likely old

DBH: 45.5

Height: 17.7 m

Height of first branch: 5 m

This hemlock is growing on the flat within a few meters of the edge of the ravine, near the Ravine Trail. It is growing beside a large red oak, which at some point lost its top. The incomplete core from this hemlock shows much larger growth rings over the past nine years than in the preceding 42 rings, suggesting it was released from shade, possibly by the red oak being topped or the death of some large beech trees in the area. There is also a large leaning white oak nearby. This location would have been quite impressive when the large beech trees were still standing.

Old-age characteristics include trunk sinuosity, with minor deflections lower on the trunk and major ones higher on the trunk, low trunk taper, and large and twisting branches.

Old-growth stand characteristics include large trees, old trees, large logs (mostly recent, decay class 1-2) beech, cut for trail safety).

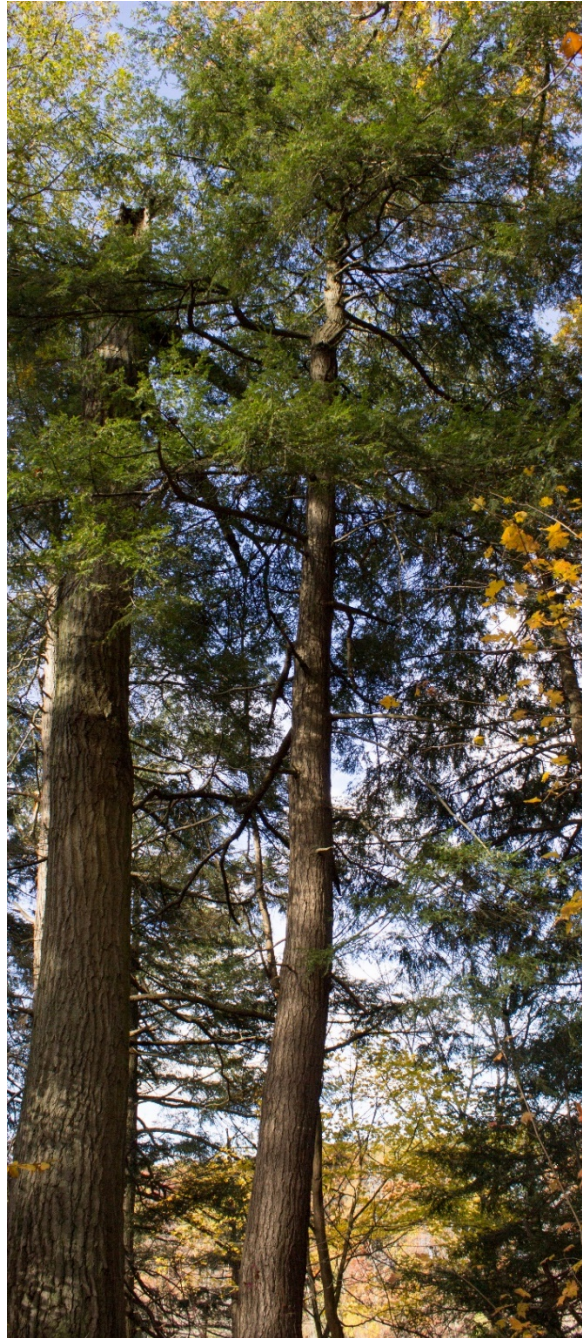


Figure 4. Bronte Creek Core 4

Eastern Hemlock

Lat: 43.41331

Long: -79.757523

Ring count: 159

Core: Full / missed center

Estimated age: 190

DBH: 47 cm

Height: 17.1 m

Height of first branch: 11 m

The tree is growing on the steep ravine slope, would have been impossible to core except the base of the tree creates a small platform behind it. Hemlocks with old-age characteristics are quite abundant here.

The tree appears to have lost its top and replaced it with several major branches, giving it an unusual growth form for hemlock, resembling that of a hardwood tree. The tree has relatively low taper of the trunk, a major deflection and large / twisting branches, although some or all of these features may have been artefacts originating from the split-trunk growth form.



OAK-MAPLE-BEECH FOREST

The oak-maple-beech forest was evaluated by Larson et al. (1999) and found to be mature for the region, including a 62 cm sugar maple that was 216 years old (234 years old today). This was consistent with our survey of the area, which found many sugar maples, as well as some beech and oak, with old-age characteristics including bark balding, trunk sinuosity, and celery-stalk growth form. Beech trees were over 200 years old, as revealed by a 198-year ring count of a beech log cut near the Ravine Trail. The forest has many old-growth characteristics despite signs of stand disturbance including selective historical logging - however pit and mound topography is minimal, the oldest age classes of trees are lacking, and there are few logs and snags in late stages of decay. This is typical of urban old-growth forests, which have always had some history of human use.

Considering the long history of human use in Bronte Creek, dating back at least to the 1820's and including sawmills, a brick kiln, farming and orchards (Entwistle 2017), it's amazing that some trees remain that seem to predate these human uses. The oldest trees now would have been very young at the time, and likely not worth harvesting – but it suggests that the land may not have been completely cleared during settlement.

Invasive understory plants are common, especially garlic mustard. Larson et al. (1999) noted that garlic mustard occurred along the trails in 1999, but now it is abundant throughout much of the stand. Emerald ash borer is killing ash trees and beech bark disease has already killed many of the beech trees. However, two potentially resistant beech trees were found, although one of these has a strange wound part way up the trunk that may be of concern. Hopefully the Park will further evaluate these trees and monitor them to determine resistance.

RESISTANT BEECH TREES

Figure 5. American Beech 1

Smooth bark, no sign of scale, many infested and dead trees in area

Lat: 43.412609

Long: -79.757392

DBH: 58 cm

Inaturalist id:

<https://www.inaturalist.org/observations/8666733>

Notes: This is a beautiful tree, but there is some damage at a small branch well up the trunk that is oozing, should be more carefully inspected and monitored. Other than this it seems healthy and putatively resistant to beech bark disease.



Figure 6. American Beech 2

Relatively smooth bark, some blemishes / roughness, but no obvious cankers or signs of scale, many heavily infested and dead trees in the area.

Lat: 43.411808

Long: -79.757002

Inaturalist id:

<https://www.inaturalist.org/observations/8668287>

Notes: This tree should be further inspected and monitored but appears healthy and may be resistant to beech bark disease.



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