The Appleton Wetland;
Its Decline, Cause and Recommended Action

Appendix L: Tree Ring Coring

Report prepared by

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Tree Coring – Appleton Wetland – January 13, 2014

At a Mississippi Valley Field Naturalists (MVFN) review meeting on the work of the Appleton Wetland Research Group, it was suggested that tree ring coring might be a useful technique for determining the dates at which the wetland trees started being stressed and actually died. Following up this suggestion, Jim Bendell loaned us an eight inch tree ring corer as a means of doing some initial testing. After a bit of polishing and sharpening, a test on a backyard tree indicated that the corer was ready to go.

Figure L-1 The refurbished tree ring corer

On January 13, 2014, Al Seaman and Neil Carleton did an exploratory proof of concept test of tree ring coring in the Appleton Wetland. The details follow.

The site chosen was accessed overland via the new subdivision on the northeast side of Appleton. At the end of that road snow shoes were used to access the north side of the wetland near to the previously established waypoint 315 (N 45° 11.302´ W076° 07.730´) from the November 6, 2013 wetland exploration (Appendix K). A Google Earth image follows of this location with WP315 marked.

Figure L-2 Google Earth image of location

Cores were taken from two healthy trees located on the northern margin of the wetland above the current summer high water levels. Further cores were taken from trees lower down in the wetland where stressed and dead trees predominate. Two samples were collected from stressed trees, and two from dead trees.

The weather conditions were good – overcast and slightly above freezing with very low winds. It was not raining or snowing, although light rain did start just as we got back to the car. The time of the exploration was approximately 2:30 to 5:00 PM.

At each sampling point a GPS reading was taken to record the location of the sample, and the recorded GPS data also included the time. The GPS position was measured with a Garmin eTrex Vista HCx unit, WAAS enabled, and averaged over 1.5 to 2 minutes. The GPS unit typically indicated a probable accuracy of 3 metres or less. In the data below for each sample, both the GPS coordinates and the time are noted. In addition, the time of each picture is recorded in the auxiliary data in the image file. That time has been manually transcribed to the file name for each image – i.e. the photo *NeilC-151030-Wetland-e.jpg* was taken at a time of 15:10:30.

Figure L-3 Photo NeilC-150955-Wetland-e.jpg
Shows the interior of the wetland with many stressed and dead trees in the background

Specific sampling details:

Core 1:

At WP318 - N45° 11.319´ W076° 07.733´ – GPS Time 15:12
Tree diameter – 12.75 in. Healthy looking crown. Good 4.5 inch core collected.

Figure L-4 Photo NeilC-151030-Wetland-e.jpg
Shows the tree clump at first sample point

Figure L-5 Photo NeilC-151043-Wetland-e.jpg
Shows the tree crowns above

Figure L-6 Photo NeilC-152416-Wetland-e.jpg
Shows the interior bowl of the clump where the original ancestor tree grew

Core 2 and 3:

At WP319 - N45° 11.312´ W076° 07.724´ – GPS Time 15:43
Two trees in the same clump sampled.
Tree 2 diameter – 11.8 in. Healthy looking crown. 3 inch core collected.
(short core due to a hollow spot in tree)
Tree 3 diameter – 13 in. Healthy looking crown. Good 4.5 inch core collected.

Figure L-7 Photo NeilC-153810-Wetland-e.jpg
Extracting the core

Core 4 and 5:

At WP320 - N45° 11.300´ W076° 07.728´ – GPS Time 15:55
Two trees in the same clump sampled.
Tree 4 diameter – 10.5 in. Dead tree. 3.5 inch core collected (inner portion too soft to sample).
Tree 5 diameter – 10.5 in. Tree alive but stressed. 2 inch core collected (interior too soft).

Core 6:

At WP321 - N45° 11.294´ W076° 07.731´ – GPS Time 16:25
Tree diameter – 13 in. Tree alive but stressed. 3 inch core collected (interior too soft).

Figure L-8 Photo NeilC-161522-Wetland-e.jpg
Shows the stressed crown of tree 6

Core 7:

At WP322 - N45° 11.292´ W076° 07.726´ – GPS Time 16:35
Tree diameter – 13.5 in. Dead tree. 4.5 inch core collected.

Results

At the time and place of extracting the core from each tree, it was pushed into a plastic drinking straw for protection while transporting it in the field and back to home. It was then placed in a freezer to prevent any degradation of the sample until it was possible to mount it permanently.

A few days later, after preparing grooved backing boards, the cores were pushed out of the drinking straws and glued to the groove in a backing board. In each case, as closely as could be determined from a visual inspection, the core was oriented in the groove so that the natural grain of the wood was vertical. The backing board was identified with the core number marked on the board at the bark end of the core. The cores were held in place with masking tape until the glue dried. After drying the glue, the sample was sanded with a coarse grit to leave a flat on the top side, and then progressively finer grades of emery paper used to give as smooth a surface as possible. The sample cores are shown in the image below.

Figure L-9 The seven cores as mounted (Al-Img-0620e.jpg)

The above image does not have sufficient resolution to see the ring structure in the samples, but they do provide some indication of the sample quality. It is evident from the samples that healthy trees (cores 1 and 3) produce useful cores, but that the stressed trees (cores 5 and 6) produce marginal to poor samples, and the dead trees (Cores 4 and 7) yield very poor samples due to the early stages of decay. It is interesting that although the two healthy tree samples (1 and 3) came from similar trees only a short distance apart, the ring detail is only roughly similar. There is certainly no detailed year-to-year correlation between the two samples. There is also a very wide variation in ring width in individual samples as viewed with at least a 10X magnifier. The widest rings approach a quarter of an inch, while the smallest are a few hundredths of an inch wide.

Subsequently, on January 23, 2014, we had a visit to Brian Anderson, Advisory Services Coordinator at the Mississippi Valley Conservation Authority (MVCA) for a discussion of tree ring coring in general, and comments on our results. His comments include:

- Silver maple, red maple, and possibly Freeman's maple, are growing at the Appleton wetland. The size, shape, and bark of silver and red maples are quite similar. A comparison of leaves would be necessary to tell them apart. The lesser known hybrid, Freeman's maple, is a cross between silver and red maples.
- Silver and red maple are particularly susceptible to ice damage. If the water level is high, up around the root collar, and it freezes hard, the tree is effectively girdled when the bark cells are killed at that level.
- The multiple trunks we saw on January 13, 2014 at the Appleton Wetland, are typical of a silver and red maple forest. When the tree dies, a bunch of shoots can come up around the stump and eventually yield a ring of mature trunks.
- A short corer, like the one we tested on January 13, 2014 at the Appleton Wetland, is used for plantation pines to assess the last 8-10 years of growth after thinning. To determine the age of selected maples at the Appleton Wetland, and look at their complete growth history, a longer corer will take a sample to the center of the trees. Brian has loaned us his 16" corer from home. It will be fine to use on the soft maples of the Appleton Wetland, but not for hardwoods.
- As a volunteer effort, 25 trees is a reasonable sampling. Take samples on the same compass sides of the trunks. Collect cores from healthy trees in the uphill areas as well as dying trees closer to the river. Important information to record for each tree is;
  - location so it can be found again (mark the tree),
  - diameter at chest height, and
  - crown description.

  Take some cross section or cookie samples with a chain saw. These are valuable, and the dying trees are not going to survive anyway.
- The mounted samples from our January 13, 2014 testing were examined by Brian and he expressed that they were in line with his expectations. Some rings were close together, indicating years of slow growth, and others were wider apart, reflecting better growing conditions. One year's growth is a light ring + a dark ring. Staining a core sample, to better see the growth rings, could be done with diluted water based paint or an ink, and even an oil. Experiment first for best results on a few test samples.

Conclusion

A general conclusion is that tree coring will give an immediate confirmation that a tree is healthy, but if it has been stressed for some years or is dead, it is unlikely to provide any data that would indicate when the stress started or when death resulted. This initial test was very limited, and that conclusion may be premature.

There is merit in collecting a further set of around 25 samples as per Brian Anderson's recommendation, with careful observance of his suggested sampling protocol. He also loaned us a sixteen inch core sampler – this will enable taking longer cores, and the longer handles will certainly provide more leverage making the job a bit easier. This work will continue as time, weather and opportunities permit.