Ownership Scale Ecosystem Services Evaluation in a New England Suburban Woodland and Wetland

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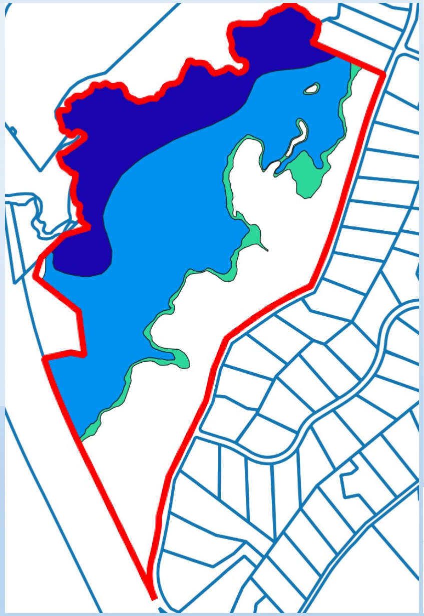
Study Area:

- 120.52 acres located on the south bank of the Ipswich River in Topsfield, Massachusetts
- Bounded by the river to the north, by a highway (Route 95) to the west, and by suburban development to the south and east
- Approximately half of the lot is wetlands
- Two streams from the suburban area uphill
- The land was once in agriculture
- Most of the land is currently under tree growth for fuel wood or timber
- In addition to wood harvested, the area provides hunting of deer as well as the cultural services of an area for horse riding, walking, and wildlife watching



FEMA Designated Flood Zones

- AE: 1% Annual Chance of Flooding, with BFE
- AE: Regulatory Floodway
- X: 0.2% Annual Chance of Flooding

Wetlands Summary:

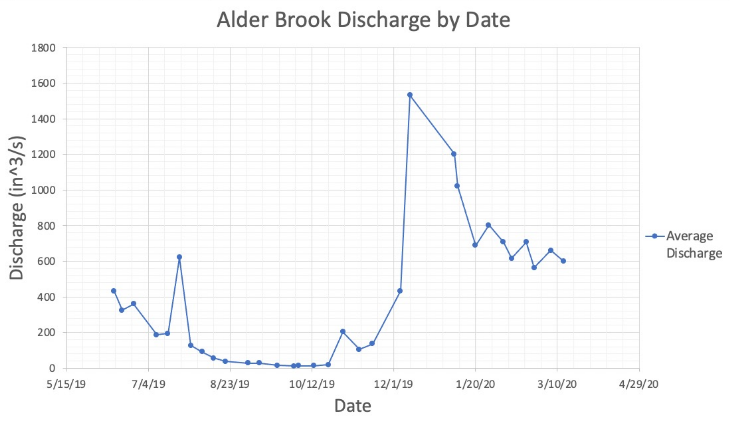
The wetlands in the study area are divided into emergent *Phragmites australis*/persistent, scrub-shrub, and broadleaf deciduous forested palustrine wetlands (Cowardin et al. 1979). These three wetland types are intermingled and are all seasonally flooded. The forested areas are primarily silver maple and green ash, along with red maple. Notably, there was one large weeping willow where Alder Brook flowed into the wetlands from the upland area. The scrub-shrub was dominated by red osier dogwood. These palustrine wetlands extend up to the bank of the Ipswich River and consist of nearly half of the property.

The streams running through the upland portions of the property lose definition as they enter the wetlands and have no clear mouths flowing into the Ipswich River.

The wetlands are a significant part of a larger wetland area between Route 95 and Route 1 extending along approximately 2 miles of river length. Although wetlands do extend on either side of these two roadways as well, they are major chokepoints on the Ipswich River. Additionally, the property's wetlands are just upstream of both the influx of Fish Brook and the bridge over the river on Rowley Bridge Road. On the point between Fish Brook and the Ipswich River are Masconomet Regional High and Middle Schools with their athletic fields extending nearly to the banks of the river and stream. Nearly all the extant wetlands adjacent to the school's boundary with the river are on the study property and not on the school property.

Flood Water Diversion:

Water volume diverted from the Ipswich River into the study area during a 100 year flood was calculated based on LiDAR data. The USGS 2011 digital elevation model (DEM) built from LiDAR ground returns was clipped to the study area. These LiDAR data were collected during Winter-Spring of 2011, with a purpose towards mapping floodplains. While the exact date of data for the study area was not available, the collection was supposed to occur during low to average water height. Thus, the DEM built from ground returns would represent the wetlands surface during low to average water height. By calculating the volume between the wetlands surface and the presumed water surface elevation during a 100 year flood event, the possible volume of water in the study area can be estimated. This volume is 14848939 cubic feet given a 100 year flood water surface elevation of 40.5 feet above sea level. This is approximately 4.2*10^8 (420 million) liters, or about 168 Olympic swimming pools.



Stream discharge was measured for the two streams until the start of the pandemic. The larger, named stream, Alder Brook, continued to flow into the property during the dry summer, but surface water dried out before reaching the wetlands. After March 2020, cross sectional area was measured by the landowner as a proxy until June to complete a full year of measurements.

Wood Resources:

The property is managed for firewood as well as some Christmas trees and timber. Management of the wooded wetlands is minimal, limiting management considerations to less than half of the acreage. The small acreage is thought to present a barrier to entry into carbon sequestration schemes due to costs of analysis and management offsetting the sale of credits. Schemes with one project manager for multiple properties could alleviate some of these costs but lead to conflicts in forest management styles and goals. Possible income from sale of credits is also limited by the property already being under Chapter 61. Because this raises the possible baseline for a carbon sequestration project, the increase in sequestration from enrollment in such a project and, therefore, number of sellable credits, is lowered.

Preliminary Conclusions:

Despite important and diverse ecosystem services provided by the woodlot, obvious and achievable positive monetary motivation to maintain these services is still lacking. More readily apparent are the benefits of development (even as a single developable lot the property would be valued around $1.5 million) and already existing tax breaks. The landowner's choice to conserve the woodlands and wetlands is ultimately driven by aesthetic, ethical, and sentimental reasons rather than monetary. He cites recreation, wildlife, and the historical family significance of the lot as more important benefits than any income it may produce.

Citations:

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