# Tree Composition Along a Riparian Corridor in an Audubon Cooperative Golf Course Sanctuary

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## Background and Objectives

The conservation organization Audubon International manages a cooperative sanctuary program for golf courses, which is designed to help golf courses protect their environment through educational opportunities and a certification program. One of the goals of this program is to enhance valuable natural areas and wildlife habitats that golf courses provide. As part of the certification process, course managers must assess environmental resources and develop an overall environmental plan for the property.

In this study, we examined tree species composition and abundance along a riparian corridor within the Amherst Country Club in (Amherst, NH). The golf course is a certified cooperative Audubon sanctuary and the riparian vegetation along a river that bisects the course represents the largest natural area on the property. The objectives of this study were to:

1. document riparian tree species richness and diversity
2. rank each species according to its relative importance to the community

## Methods

Field Sampling

- Site: Amherst Country Club, Amherst, NH (N42° 49.6765', W071° 36.5054')
- Dates: October 3 and 10, 2010
- Method: sampled 173 trees with point-centered quarter method using 50m transect and sampling 10m, 20m , 30m, 40m , and 50m marks

Data Analysis (calculations from Barbour *et al.* 1999)

- *Cover* was expressed as total basal stem area at breast height, which is a commonly used correlate for canopy cover
- *Density* was calculated as number of individuals per hectare (10,000 square meters)
- *Frequency* was calculated as the proportion of sampling points in which a species was encountered
- *Dominance* is a measure of species total cover within a community and is calculated as the product of relative density and mean basal area
- *Importance* refers to the relative contribution of a species to the community and is calculated as the average of relative density, cover, and frequency

## Results and Conclusions

- Total species richness at our site was 16 with a diversity of: natural log of Shannon-Weiner = 7.5; Inverse Simpson's = 4.5 (scale = 0-16; E. Smith, unpub. data)
- Tree cover equaled 40 m²/ha and density equaled 234 trees/ha (table 1), which is slightly higher than 196/ha reported for mature temperate deciduous forests (Mendoza-Ponce and Galicia 2010)
- *Acer saccharinum* was the most dominant, important, and common tree (tables 2 and 3); the species' favored habitat of stream-banks that flood periodically is very similar to our sampling sites (Grimm 2002)
- Although dominance and importance values were largely consistent, there were some differences. For example, *Ulmus americana* ranked as more important than dominant due to the fact that its density and frequency were larger than other species who may have had a greater basal area. Note that frequency is often independent of density.

## References

• Barbour, M. G., J.H. Burk, W.D. Pitts, F.S. Gilliam, and M.W.Schwartz. 1999. *Terrestrial Plant Ecology*. Benjamin Cummings Publishing. New York.
• Grimm, W.C. 2002. *The Illustrated Book of Trees*. Stackpole Books. Mechanicsburg, PA.
• Mendoza-Ponce, A and L. Galicia. 2010. Above and belowground biomass and carbon pools in highland temperate forest landscape in Central Mexico. *Forestry.* 83:497-506.

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**Table 1**. Absolute cover, density and frequency.

| Species | Cover (m² / ha) | Density (trees / ha) | Frequency (% samples) |
|---|---|---|---|
| *Acer saccharinum* | 15.8 | 99 | 42.2 |
| *Pinus strobus* | 7.9 | 31 | 13.3 |
| *Quercus rubra* | 4.4 | 24 | 1.2 |
| *Prunus serotina* | 3.3 | 12 | 6.9 |
| *Platinus ocidentalis* | 1.9 | 16 | 5.2 |
| *Acer rubrum* | 1.5 | 11 | 2.9 |
| *Tsuga canadensis* | 1.3 | 7 | 0.6 |
| *Acer saccharum* | 1.2 | 1 | 1.2 |
| *Ulmus americana* | 1.1 | 11 | 1.2 |
| *Catalpa speciosa* | 0.6 | 3 | 0.6 |
| *Carya ovada* | 0.4 | 5 | 0.6 |
| *Fraxinus americana* | 0.3 | 3 | 4.6 |
| *Betula alleghaniensis* | 0.3 | 5 | 2.3 |
| *Acer platanoides* | 0.1 | 1 | 4.6 |
| *Tilia americana* | 0.1 | 3 | 2.3 |
| *Carpinus caroliniana* | 0.1 | 1 | 10.4 |
| Total | 40.2 | 234 | 100 |

**Table 2**. Ranked dominance values for each tree species.

| Species | Relative Density | Mean Basal Area (m²) | Dominance value | Dominance Rank |
|---|---|---|---|---|
| *Acer saccharinum* | 0.42 | 0.16 | 0.068 | 1 |
| *Pinus strobus* | 0.13 | 0.25 | 0.034 | 2 |
| *Quercus rubra* | 0.10 | 0.18 | 0.019 | 3 |
| *Prunus serotina* | 0.05 | 0.27 | 0.014 | 4 |
| *Platinus ocidentalis* | 0.07 | 0.12 | 0.008 | 5 |
| *Acer rubrum* | 0.05 | 0.14 | 0.006 | 6 |
| *Tsuga canadensis* | 0.03 | 0.19 | 0.005 | 7 |
| *Acer saccharum* | 0.01 | 0.87 | 0.005 | 8 |
| *Ulmus americana* | 0.05 | 0.10 | 0.005 | 9 |
| *Catalpa speciosa* | 0.01 | 0.22 | 0.003 | 10 |
| *Carya ovada* | 0.02 | 0.08 | 0.002 | 11 |
| *Fraxinus americana* | 0.01 | 0.12 | 0.001 | 12 |
| *Betula alleghaniensis* | 0.02 | 0.05 | 0.001 | 13 |
| *Acer platanoides* | 0.01 | 0.07 | 0.000 | 14 |
| *Tilia americana* | 0.01 | 0.03 | 0.000 | 15 |
| *Carpinus caroliniana* | 0.01 | 0.05 | 0.000 | 16 |

**Table 3**. Ranked importance values (IV) for each tree species.

| Species | Relative Density | Relative Cover | Relative Frequency | IV | IV Rank |
|---|---|---|---|---|---|
| *Acer saccharinum* | 0.42 | 0.39 | 0.42 | 0.41 | 1 |
| *Pinus strobus* | 0.13 | 0.20 | 0.13 | 0.15 | 2 |
| *Quercus rubra* | 0.10 | 0.11 | 0.10 | 0.11 | 3 |
| *Prunus serotina* | 0.05 | 0.08 | 0.05 | 0.06 | 4 |
| *Platinus ocidentalis* | 0.07 | 0.05 | 0.07 | 0.06 | 5 |
| *Acer rubrum* | 0.05 | 0.04 | 0.05 | 0.04 | 6 |
| *Ulmus americana* | 0.05 | 0.03 | 0.05 | 0.04 | 7 |
| *Tsuga canadensis* | 0.03 | 0.03 | 0.03 | 0.03 | 8 |
| *Carya ovada* | 0.02 | 0.01 | 0.02 | 0.02 | 9 |
| *Betula alleghaniensis* | 0.02 | 0.01 | 0.02 | 0.02 | 10 |
| *Acer saccharum* | 0.01 | 0.03 | 0.01 | 0.01 | 11 |
| *Catalpa speciosa* | 0.01 | 0.01 | 0.01 | 0.01 | 12 |
| *Fraxinus americana* | 0.01 | 0.01 | 0.01 | 0.01 | 13 |
| *Tilia americana* | 0.01 | 0.00 | 0.01 | 0.01 | 14 |
| *Acer platanoides* | 0.01 | 0.00 | 0.01 | 0.00 | 15 |
| *Carpinus caroliniana* | 0.01 | 0.00 | 0.01 | 0.00 | 16 |