Examination of the Characteristics of a Freshwater Wetland at Brookhaven National Laboratory
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ABSTRACT
Wetland delineation is an important aspect of freshwater resource management, and use and development of wetlands are often subject to government regulation. The purpose of this study was to gain an understanding of the components that characterize a Long Island freshwater wetland. We followed standard protocols to delineate the boundaries of a wetland site at Brookhaven National Laboratory. We set transects, identified floral species in all strata, and cross referenced flora to the New York Department of Environmental Conservation’s list of obligatory and facultative wetland plants. Soil cores confirmed the presence of hydric soils. Physical evidence of water inundation included watershocks and multi-trunked vegetation. Transect locations were marked using GPS and mapped using GIS. Studies of local wetlands by school groups are highly motivating experiences that allow the teacher to blend earth science, biology, environmental science, and technology. Studies of changes in wetland communities over time may suggest natural or human impacts, which could lead to further research.

INTRODUCTION
To the untrained eye wetlands often appear as vast wastelands; however, wetlands play crucial roles in natural freshwater systems. They help control water flow, filter pollutants, and provide habitat and breeding grounds for many types of plants and animals. Early settlers and Native Americans recognized the value of wetlands and fed on the vegetation and animals that were indigenous to these areas. Soil grass was a nutritious feed for grazing animals.[3] Drainage and filling of wetlands to create more usable land began with the industrial revolution and continued through the twentieth century resulting in a loss of 50% of wetlands in the State of New York.[2] Increased awareness of the negative impacts of these changes resulted in efforts to preserve and protect wetlands at the federal, state and local levels. Subsequent to the passage of the Clean Water Act in 1972 the United States Army Corps of Engineers (ACOE) developed guidelines for wetland delineation.[3] The New York Department of Environmental Conservation (DEC) used the ACOE methods to develop its freshwater delineation manual.[4]

Wetlands are transitional areas between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered with shallow water. Other supporting criteria for wetland determination include the presence of hydric plant communities, hydric soils and hydrology; the most important criteria are the plant communities.[2] Plants that thrive in wetlands have adaptations that allow them to survive in saturated soils that are depleted in oxygen. Plant indicator status is based on the probability that a plant will occur in wetlands, as summarized in the table below:[5]

METHODS
This study followed field protocols from the DEC Freshwater Delineation Manual[4]. Pre inspection of the site using local maps and aerial photographs provided an approximate outline. A technician measured the site and established the position of five transects across the width of the study area. Vegetation was examined and described at two meter intervals along each transect. We examined all plant life within 1.5 meters of the transect from the ground surface to the canopy and identified flora, then determined its indicator status[5].

Soil core samples were collected up to 45cm deep where stark differences in flora existed. We examined the samples for texture, moisture, color and content on the Munsel soil color chart,[6] noting the depth of any change in horizon. Hydric soils have an extensive organic layer more than 20 cm thick with a great deal of decomposition and dark color with a low chroma rating. Hydric soils may also exhibit gleying and mottling in the subsoil. Gleyed soil has a grayish appearance; mottled soil shows specks of yellow, orange and brown. These color variations occur because of anaerobic conditions caused by saturation.[4]

Wetlands are generally characterized by the amount of area saturated with water. However, when a study is conducted during the dry season, more specific criteria are needed for wetland classification. Although aerial photographs and past observations indicated that this area normally contains surface water, there was no surface water during the summer of 2006. However, field investigation indicated that the site meets the three basic criteria for wetland classification: hydrophytivc vegetation, hydric soils, and wetland hydrology. We identified facultative wetland species covering more than 50% of the area. Most, lime, chroma, organic rich soils are field indicators of hydric soils. Water marks on trees, water-stained leaf litter, and surface gullies and scours are all signs of past inundation that are indicative of wetland hydrology.

RESULTS
The table below summarizes the vegetation and soil data for the study area.

<table>
<thead>
<tr>
<th>Plant Indicator Status</th>
<th>Symbol</th>
<th>Likelihood of Occurrence</th>
<th>Common Name</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obligate Wetland</td>
<td>DWE</td>
<td>Always in wetlands</td>
<td>Highbush Blueberry</td>
<td>Vaccinium corymbosum</td>
</tr>
<tr>
<td>Facultative Wetland</td>
<td>FACW</td>
<td>Nearly always in wetlands</td>
<td>Woolgrass</td>
<td>Elymus repens</td>
</tr>
<tr>
<td>Facultative Upland</td>
<td>FACU</td>
<td>Equally likely in wetlands or uplands</td>
<td>Black Gum</td>
<td>Nyssa sylvatica</td>
</tr>
<tr>
<td>Obligee Upland</td>
<td>OPL</td>
<td>Almost always in uplands</td>
<td>White Oak</td>
<td>Quercus alba</td>
</tr>
</tbody>
</table>

Woolgrass was often the first grass observed inside the line of highbush blueberry. As we made our way to the interior, highbush blueberry was replaced by woolgrass, indicating the transition from tree zone to grassy meadow. Many shrubs and some trees had multiple trunks. A predominant and attractive grass called weigelia was often the first grass observed inside the line of highbush blueberry. As we walked along the transect to the interior, highbush blueberry was replaced by woolgrass, indicating the transition from tree zone to grassy meadow.

We found consistent placement of facultative wetland (FACW) plants along each of the five transects. Starting at the outside of any particular transect was the tree zone, which was a higher elevation. As we walked along a transect to the interior, highbush blueberry became most prominent. At the transition from tree zone to grassy meadow, many shrubs and some trees had multiple trunks. A predominant and attractive grass called weigelia was often the first grass observed inside the line of highbush blueberry. As we made our way to the interior, highbush blueberry became most prominent.

DISCUSSION
Wetlands are extremely important and environmentally sensitive ecosystems. High school students should be made aware of their innate beauty and their critical role in the overall ecology of an area. This type of study can be easily adapted to a variety of high school science curricula. Earth Science classes can learn basic mapping techniques and use of GPS and GIS. Students can investigate soil characteristics and wetland hydrology. Biology students can learn taxonomy and the use of dichotomous keys by identifying wetland vegetation.

Wetland studies have numerous applications to Environmental Science courses, including studies of soil and water quality and assessment of human impacts on natural systems.

REFERENCES

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