URBAN HIGH SCHOOLERS AS CITIZEN SCIENTISTS: A COLLABORATIVE PARTNERSHIP WITH UNIVERSITY NATURAL RESOURCE EDUCATORS

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Introduction

- University undergraduate natural resource degree programs in the U.S. are at risk (Nyland, 2008; Sharick & Frisk, 2008)
  - Dwindling enrollment numbers
  - Limited student diversity

- Urban high school student knowledge and interest in natural resource careers is low (Hager et al., 2007)
Introduction

- High school curriculum limitations...
  - Interaction with natural resource professionals
  - Exposure to outdoor, natural resource-related experiences tied to performance standards
  - Travel funds for field excursions
  - Teacher self-efficacy with natural resource topics
The EscapE Program

- Environmental stewardship and career awareness program for Education
  - Funded by Environmental Protection Agency and National Fish & Wildlife Foundation
  - Created a partnership between urban high school students, their teachers, university professors, and national wildlife refuge personnel
The EscapE Program

- **Goal:** To increase urban student knowledge of natural resource careers by providing opportunities to work with natural resource professionals at Mason Neck National Wildlife Refuge (20 mi. outside of Wash. DC)

- Refuge personnel expressed need for data on...
  - Vegetative composition of refuge forests
  - Past land-use practices at the refuge
The EscapE Program

- Authentic (real-world) learning for students
  - A day in the life of a natural resource professional
  - A point of contact for questions and advice
  - A team-oriented project involving data collection, analysis, and interpretation
    - Tree species composition and size
    - Tree rings (dendrochronology)
    - Soils
Student Scientists: Pre-trip

- Teacher training
  - Meet and greet with refuge personnel and faculty
  - Site visit (locate established plots)
  - Equipment use
  - Website
Student Scientists: Pre-trip
Student Scientists: Pre-trip
Student Scientists: Pre-trip

Soils

For general information on soils, visit the Soil Science Education House Page.

You will be visiting and sampling soils of the Mattaponi series, except for Veg plots 18 and 19, which are on the very similar Mattaponi series.

Soils at the refuge have been heavily impacted by human activity. While there, you will have opportunity to sample one of these soils. One area was a woodland, and was (we think) not farmed. Our area was farmland that was somewhat recently abandoned... guess what is growing there now. The third area has not been farmed for a very long time. How might these cultural practices influence the soil? Which site do you think is the most enriched?

While at the Refuge, you will be augering the soil to reconstruct a soil profile. Do you expect large color changes between soil horizons?

Historical Ecology

Mason Neck has been inhabited for a very long time, first by the Potomac Tribe, later by the family of George Mason. Throughout the 18th, 19th, and early 20th centuries, the land was farmed and harvested for pine and hardwood timber. The 1960s brought the threat of subdivision and development to the peninsula. Citizen groups achieved the establishment of the Wildlife Refuge in 1968.
Student Scientists: At the refuge

- Measuring the plots for sampling
Student Scientists: At the refuge

- Data collection
  - Tree species and size
  - Tree rings
  - Soils
Student Scientists: Post-trip data entry

Basal Area: Foresters often use the term “basal area” to talk about how much wood is on a forested site. If you tell Ranger Nick that your site has 14 square meters of basal area per hectare, he would look at you funny. However, if you do the quick math in your head (multiply by 0.105504) and tell Nick you have 140 square feet per acre, he would picture a very sparse site with few trees. If you tell him you have 220 square feet per acre (57 square meters per hectare), he would picture a dark and dense stand.

Basal area is not tough to picture. Imagine cutting down every tree on one acre of ground at DBH (0.4 feet above the ground). Then imagine you have above the stumps in a half-ounce. The total area is sound that you can see when looking down in the basal area. Commonly, only about 0.1% of the ground area is actually occupied by trees (120 square feet / 43560 square feet in an acre), or in SI units, 10 square meters per 10,000 square meters in a hectare. Shocking!

If the trees on this log truck came from one acre, the total area of the trees would be the basal area per acre. How high would the stumps have to be for this to be true?

Making a Scientific Poster: A scientific poster is a common method of presenting experimental results. A paper is very different from a scientific paper.
Student Scientists: Post-trip data entry
Student Impact: Data Collection

- Online questionnaire (post-then-pre design)
  - Life skill development
  - Science career knowledge
- “Pen pals” with university faculty
  1. Faculty emailed questions
  2. Student teams responded
  3. Faculty offered feedback and follow-up questions
### Student Impact: Findings

<table>
<thead>
<tr>
<th>Construct (5 items/construct)</th>
<th>Internal Consistency (α)</th>
<th>Significant Change?</th>
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<tbody>
<tr>
<td>Problem-solving skills</td>
<td>0.89</td>
<td>No (p = 0.45)</td>
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<tr>
<td>Self-efficacy skills</td>
<td>0.91</td>
<td>Yes (p = 0.04)</td>
</tr>
<tr>
<td>Team work skills</td>
<td>0.92</td>
<td>No (p = 0.43)</td>
</tr>
<tr>
<td>Communication skills</td>
<td>0.89</td>
<td>Yes (p = 0.007)</td>
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</tbody>
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n = 54 students

**Science career knowledge** (5 items, α = 0.87): Moderately to highly influenced
### Student Impact: Findings

- Domain (theme) analysis of student pen pal responses

<table>
<thead>
<tr>
<th>Question</th>
<th>Dominant Domain</th>
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<tbody>
<tr>
<td>What surprised you the most?</td>
<td>“Tree species diversity”</td>
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<tr>
<td>How did things go in your plot?</td>
<td>“Surprised by leadership”</td>
</tr>
<tr>
<td>Recommendations for refuge?</td>
<td>“Double check measurements”</td>
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</table>
Recommendations

- “The teacher training was invaluable!”
- Be on-site and available to teachers
- Develop an answer key within plots (trees tagged)
- Provide pre-trip, on-site, and post-trip instructions
- Fall data collection is ideal (given testing schedule)
The Student Scientists