Valuing the Urban Hydroscape: Perceptions and Importance of Urban Water

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Cities, like Blacksburg, frequently have degraded surface water quality. Poor water quality limits the ecosystem services provided to the residents and downstream users. Improving urban water quality requires understanding the socio-ecology of urban hydroscapes and designing effective management practices that include outreach and awareness programs.

An important step in this process is to understand the relationship between residents and water features and quality in cities. Through a community survey and GIS mapping/modeling, this effort seeks to identify the values and uses that town members associate with different areas of Stroubles Creek (e.g. recreational waters, ecological diversity, etc.) in order to learn how and why residents value different hydroscape features, as well as community educational/outreach needs to ensure the support future watershed remediation efforts.

Objectives

- Locate and identify hydroscape features of low and high value to watershed residents.
- Determine why each feature is perceived as important using a tested values typology.
- Determine willingness to pay in order to maintain or increase values.
- Measure the level of contact residents have with hydroscape features.
- Measure people's perception of water quality in the community.

Methodology

1. **Mapping Blacksburg's Hydroscape**
   We identified and mapped all of the streams and ponds in the Upper Stoubles Creek watersheds using the National Hydrography Dataset, Town of Blacksburg GIS, and aerial imagery. We initially identified 26 water features in Upper Stroubles watershed. Six more were added by residents during the survey process.
2. **Community Survey**
   - A representative random sample population of 100 was obtained based on percentage of overall Blacksburg population per census blocks. Demographics were recorded to gauge representativeness (Figure 1a-1f).
   - We used a face-to-face survey method. Respondents were asked to identify 3 (from most to least important) water features they valued in the watershed and three reasons they valued them.
3. **Data Analysis**
   - To measure the value we both summed and averaged ranking given by residents: 1st = 3 points, 2nd = 2 points, and 3rd = 1 point.
   - We mapped the summed value for each water feature to examine the spatial distribution.
   - We regressed the measured value with the area of the ponds.

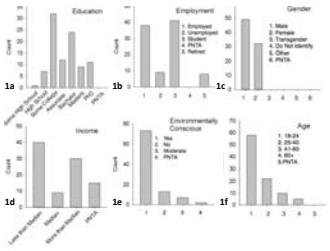


Figure 1a: The demographic profile is of an educated subgroup. **Figure 1b:** Our subsample largely consisted of a student population. **Figure 1c:** More respondents were male than female, but this does not affect the validity of our results. **Figure 1d:** Seeing as the population is comprised of students for the most part, income levels are typically low. **Figure 1e:** A majority of respondents identified themselves as being environmentally conscious. **Figure 1f:** Our subsample was relatively youthful, the most significant age range being 18-24.

Results

1. Certain features, such as the Duck Pond, were found to be much more highly valued (Figure 2).
2. We observed a *significant relationship* between the pond area and it's aggregate value. This relationship was best described by an *exponential (or semi-log) model*, which *accounted for 71% of the variation* in pond value (Figure 3).
3. In general, respondents identify a feature as important due to its Aesthetic, Environmental, and Recreation Value (Figure 4).
4. Respondents most frequently reported walking, running, biking, or driving by identified features. Fewer people reported fishing and swimming. Fewer respondents reported interacting with Stroubles, and many had no contact.
5. Overall, Blacksburg residents perceive the water quality as moderately good.
6. Individuals, local government, and Virginia Tech are perceived as the most responsible agents in maintaining and improving water quality of the hydroscape features.
7. 54% of respondents would be willing to pay an additional $100 each year to improve or maintain the Blacksburg water features which they identified as important (Figure 5a). Using an allocation method devised by Sherrouse, et. al (2010), we found respondents would "spend" the most money on Environmental, Aesthetic, and Life-Sustaining Value (in descending order). This finding is in contrast to Result 3 (Figure 5b).
8. 70% of Blacksburg residents identified themselves as environmentally conscious.

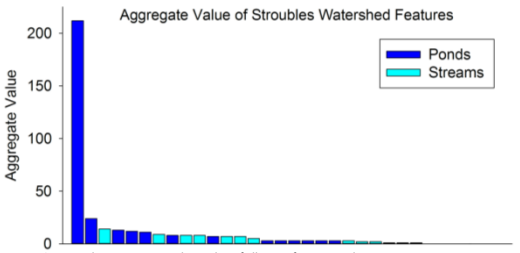


Figure 2: The aggregate resident value of all water features in the Upper Stroubles Creek watershed. The asymmetry indicates most residents value a single large feature in the watershed.

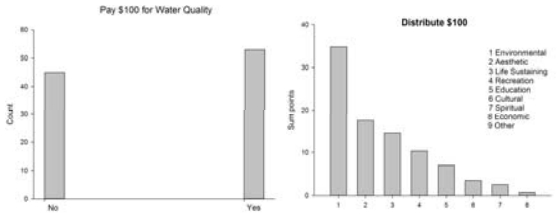


Figure 5a: A slight majority of respondents indicated willingness to pay an additional annual water quality fee.
Figure 5b: Residents most frequently allocated this money to Environmental, Aesthetic, and Life-Sustaining Value.

Conclusions

- The relationship between size and value we observed in this study helps explain why broader hydrographic patterns emerge (Steele and Heffernan 2014).
- The Town of Blacksburg should continue to pursue improvement measures in accordance with the EPA's Recreational Water Quality Criteria issued under the Clean Water Act, considering residents have direct contact with Stroubles Creek.
- Following the principles of conservation biology, Blacksburg's watershed could benefit from utilizing the Duck Pond as a "flagship watermark" in conservation efforts.
- Community members recognize the importance of water quality and are interested in awareness campaigns and ways to get involved in improvement projects.

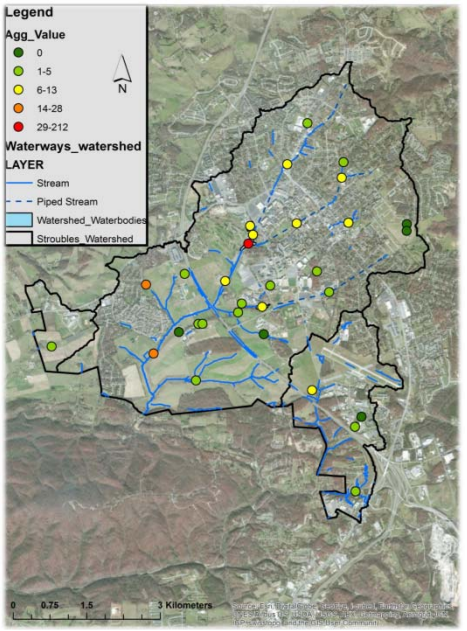


Figure 3: Hotspot Map of Stroubles watershed features. Color of points indicated the aggregate resident value of each water feature.

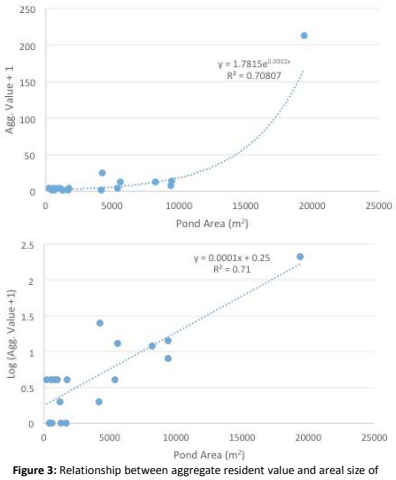
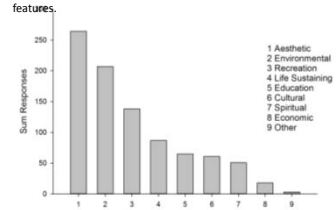


Figure 3: Relationship between aggregate resident value and areal size of ponds in Stoubles Creek Watershed. More value is assigned to larger water features.



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