How Land Use Affects Water Quality in Urban Environments: A NRES Case Study of Little Kitten Creek, Manhattan, Kansas

Lisa Henderson, Casey Mahoney, Connor McClelland & Amber Myers

The test results showed that the water quality in the urban area was, in fact, different than the natural site. There were some variations in what we expected to find within the Little Kitten watershed. Instead of a huge difference, we discovered the indicators in those three test sites were comparable.

We concluded through this study that urban development does affect surface water quality. We suggest conducting surface water tests throughout the year, testing more often and using more test kits and volunteers (citizen scientists), there would be a very different set of data. More comprehensive analysis through lab tests rather than field kits could be more accurate, as there were some questions about the quality of the samples obtained and instrument errors.

**Introduction**

Citizen science is the use of non-expert citizens in the collection of data for scientific analysis. Citizen science is gaining popularity in the scientific community and can be used to provide large data sets. In our experiment, we took water quality samples using a Hach Test Kit which would be feasible for use by non-expert citizens. We measured common water quality indicators that we used to assess the effectiveness of a watershed for filtering runoff.

The primary purpose of our study is to determine the impacts of land use and land cover on the quality of surface waters. This is an important relationship to establish because of our societal dependence on surface waters for drinking, recreation, household use and irrigation. By establishing relationships between land use, land cover and water quality, we can develop recommendations for watershed management to better protect our surface waters from pollution.

**Limitations**

Time constraints: Throughout our sampling time period of 6 weeks we concluded that the samples were not sufficient in showing changes in water quality over time. With a sampling period over a year, the data might show more variability.

Precipitation: During our sampling period there was little rainfall and the lack of precipitation added to our doubts of sufficient water sampling to show true water quality of an area. Also due to the lack of rainfall the test sites did not have a lot of water movement and in the Vanesta watershed there was only a small area of sitting water to test from.

The time of year was also a limitation because there was a large amount of leaves and other debris in the water which could affect the water samples. We also experienced some water freezing which could change the water properties and in turn alter our samples.

Some additional limitations included lack of test kits to work with, only a few amount of participants and a limited number of test sites.

**Methods & Results**

Five samples were collected from each Little Kitten Creek test point, and two from Kings Creek, over a six week period from the end of October to beginning of December. The HACH R/S Surface Water Test Kit was used to test samples on site. Air temperature, water temperature, pH, electrical conductivity (EC), dissolved oxygen (DO), nitrogen (N), phosphorus (P), and turbidity. The average of each result was computed. Averages of P, N and DO were compared between each subwatershed and Kings Creek.

For the purposes of our study, the citizen scientists that participated during the Fall of 2014 were all college students and members of our research group, with the exception of one set of tests which was assisted by a fourth grade student.

No significant differences were observed between the tests for pH and N Levels. In addition, in comparison of the P, N and DO levels in the subwatersheds no significant difference was observed between the vanesta, anderson and kimball subwatersheds. When compared to the control site at King’s Creek, the control showed significantly lower levels for the P, EC, and DO measurements. Levels of development in each individual watershed were also compared to the water quality indicators to determine if there were any significant correlations between water quality indicators and increasingly developed land. The only significant interaction observed was between percent developed land in a watershed and EC