Anderson Watershed Water Quality Analysis

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Research Question

How does the management of Colbert Hills Golf Course affect the surrounding; watershed, and waterways, when compared to suburban and native areas?

Hypothesis

- The management of Colbert Hills Golf Course does not affect the surrounding watershed with as much pollution as compared to the urban developed area.

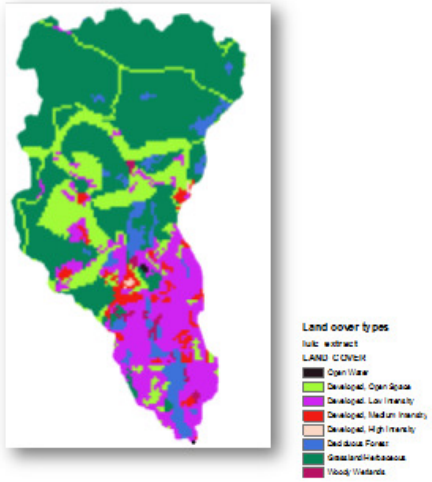
Project Overview

The water quality of the Anderson Watershed in Manhattan, KS was tested and studied. This area is comprised of urban area with the Colbert Hills golf course near the top of the watershed. The main point of this study was to find whether or not the golf course has negative ecological effects on the watershed. The variables compared Throughout the watershed included; pH, nitrate, phosphate, and dissolved oxygen levels, and electrical conductivity. Statistical Analyses were don't to determine which variables were effected by the land use differences, as well as look at temporal changes throughout the growing season.

Literature Review Information

- Pollution due to excreta and chemical waste harms the lives of living things
- Recognizing point source pollution is simple because the data from runoff areas is directly related to the source. To recognize nonpoint source pollution, inferences must be done based on data (Hayakawa, A. M. et. al., 2006).
- Grab sampling is simple method that determines polluted areas. This method incorporates the assessment of samples from random areas at random times (Harmel, et. al., 2010).

Study Area



Materials

Materials	Quantity
Permachem Dissolved Oxygen 1 Reagent	1 packet per D.O. sample
Permachem Dissolved Oxygen 2 Reagent	1 packet per D.O. sample
Permachem Dissolved Oxygen 3 "Powder Pillow"	1 packet per D.O. sample
NitraVer 5 Nitrate Reagent	1 packet per nitrate sample
PhosVer 3 Phosphate Reagent	1 packet per phosphate sample
pH Meter & Electric Conductivity Meter	1 pH Meter & 1 E.C. Meter
Turbidimeter	1

Procedure

Step 1

Sample Sights Determined

Areas at key points in water shed

Random sampling throughout the semester

Step 2

HATCH Kits

·Used to determine water quality

·Measured pH, Temperature, Electrical Conductivity, Nitrate, Phosphate, Turbidity, and Dissolved Oxygen

Step 3

Use of GIS

Data entered using GIS software

Allowed on site data collection using GIS applications on mobile devices

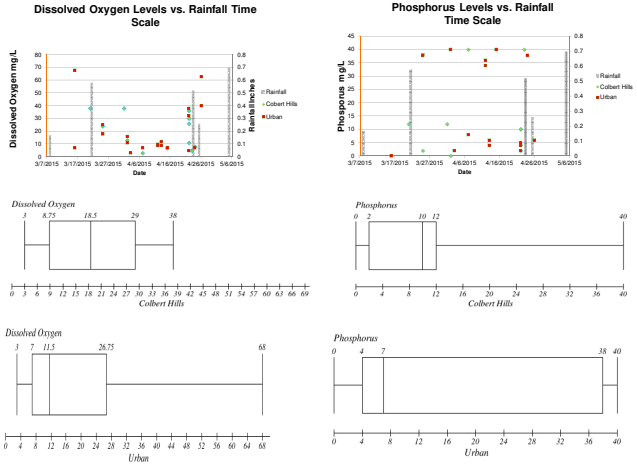
Step 4

Statistical Analysis

Used Microsoft Excel to run analysis on data

Allowed for initial conclusions to come from the data

Results



Results

The graphs shown representa time scale of collected samples. Each graph displays the date range as to which a data point was collected and identifies the data point as representing Colbert Hills or Urban Development. Rainfall events that accumulated more than .1 inches of total rainfall were marked on the graph displaying the total rainfall for the specified date. Levels of DO appear to decrease after the rainfall event on the 21st of April, then increase directly before the rainfall event on the 24th of April and continue to increase after the rainfall event on the 25th. The observed lack of correlation between rainfall and DO levels suggests that rainfall did not significantly impact the fluctuations in measured DO levels. There appears to be a broad distribution of phosphorus levels for both spatial ranges. This distribution of phosphorus levels does not correlate with rainfall events, which suggests that rainfall did not impact the measured variation in measured phosphorus levels.

Statistical Analysis

A two-tailed independent T-test, at a 95% confidence level, was conducted to determine the significance of the observed differences in the data collected. Within the study area, no significant difference was observed between any variables between Colbert Hills and urban development. Additional analysis was conducted to determine if the entire watershed was significantly different than controlled natural areas. Analysis determined that there was no significant difference between the control and the entire watershed.

	Colbert Hills vs. Urban Development		Natural Area vs. Anderson Watershed	
	Calcualted T-value	Critical T-value	Calcualted T-value	Critical T-value
DO	0.007	2.048	0.004	2.042
pH	0.233	2.048	0.856	2.042
Nitrate	0.157	2.048	0.074	2.042
Phosphorus	0.057	2.048	0.018	2.042
EC	0.001	2.048	0.003	2.042

Conclusion and Discussion

- The Colbert Hills Golf Course has minimal effect on the surrounding watershed, streams, ponds, and waterways
- Urban had a larger effect on the watershed
- This supports our hypothesis
- There was a lack of rain over the time that this study was done. This likely affected the results of the study by decreasing available sample areas and altering the data from those areas. Eighty percent of nutrient loading in an area occurs during precipitation events that occur ten percent of the year (Banner, et. al., 2009).
- This study could be improved by regularly taking samples throughout a full year and obtaining more control samples from areas like the Konza Prairie.

Works Cited

- Banner, E. B., K., Stahl, A. J., & Dodds, W. K. (2009). Stream Discharge and Riparian Land Use Influence In-Stream Concentrations and Loads of Phosphorus from Central Plains Watersheds. Environmental Management, 44(3), 552-65. doi:http://dx.doi.org/10.1007/s00267-009-9332-6
- Harmel, R.D., R.M. Slade, Jr., and R.L. Haney. 2010. Impact of sampling techniques on measured storm water quality data for small streams. American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America (39): 1734-42.
- Hayakawa, A. M. Shimizu, K. P. Woli, K. Kuramochi, and R. Hatano. 2006. Evaluating Stream Water Quality through Land Use Analysis in Two Grassland Catchments: Impact of Wetlands on Stream Nitrogen Concentration. J. Environ. Qual. 35:617-627 (2006), doi: 10.2134/jeq2005.0343.\