Water Quality Index analysis of headwaters leading into Penns Creek
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Introduction:

A detailed Water Quality Index (WQI) was performed on water samples collected from five headwater sites that each lead into Penn’s Creek, a tributary of the Susquehanna River. The five streams are Henstep, Coral Run, Lick, Green Gap, and Little Weikert, all of which are located in the Valley and Ridge Province. The focus of this study includes an assessment of water quality of each individual stream and their similarities and differences. Maintaining good water quality is vital in keeping both aquatic life and other life that depends on the water way healthy.1 Questions asked previous to the collection of this data include: how the geomorphology and the vegetation cover play a role in these similarities and differences. The parameters in which the samples were analyzed include both physical and chemical properties, each individually vital in testing the quality of the waterway. The physical assessment included temperature, conductivity, pH, and total dissolved solids (TDS). The availability of oxygen is highly dependent on the temperature of the water. Conductivity is helpful in discovering the presence of many factors in the water such as salts, minerals, or any contaminants that may be in the water.2 The chemical properties observed were oxidation-reduction potential (ORP), dissolved oxygen (DO), biological oxygen demand (BOD), chemical oxygen demand (COD), concentrations of anions including chloride, nitrate, and phosphate, and concentrations of cations including calcium, potassium, sodium and magnesium. The anion sulfate and the cation ammonium were also monitored, however, due to the purity of the water, there was no evidence of these parameters being present. Dissolved oxygen is necessary in maintaining aquatic life and is very helpful in determining river health. The pH of the water affects both chemical and biological processes in the river and must be at a certain level depending on the traits of the river to support both quality and biological diversity of the water.2 Shown below (Figure 1) is a map of each headwater leading into Penns Creek.

Methods

Monitoring of the headwaters for physical properties was done using a YSI 556 multiparameter. Grab samples from each site were also analyzed for anions and cations using an ICS instrument. BOD was measured using a Hach HQ440d Benchtop and COD was monitored using a spectrophotometer for further analyses (Figure 2).

Results and Discussion

- While this study is still at its early stage, few result point can be point out:
  - Physical and chemical data from all streams were found to be similar in most cases with the exception of Green Gap.
  - Na, Mg, Ca and K values were found high at Green Gap, causing the conductivity to rise as well
  - It is not known why Ca and Mg were high in GG but they can be caused by inclusions of small formations of limestone with the bedrock or from the gravelly road around GG sub watershed
  - The increase of these cations buffered the pH to higher values by comparison to the other headwater streams.
  - The COD is also high in GG which can be attributed to the chemicals leaching from the limestone or gravel
  - Further research will be conducted to study the similarities and differences among all 5 streams.

References


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