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Water Quality Monitoring in the Gordon Natural Area, East Branch Plum Run
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Abstract
Since late January, 2012, water quality measurements have been made on an essentially continuous basis at a point high in the E. Branch of Plum Run, behind the Sturzebecker Health Sciences Center in West Goshen Township, Chester County, PA. A YSI Model 6600V2-4 Multi-Parameter Water Quality Logger (Yellow Springs Instruments, Owings, MD) was fitted with probes for monitoring chlorophyll-a, dissolved oxygen, turbidity, pH, conductivity, temperature and pressure. The installation included a solar-charged telemetry station which sends measurements every 15 minutes to a dedicated website that is accessible to students and faculty at WCU, as well as other water quality professionals and interested citizens. The station was funded by WCU Technology Fee funds. Results for 2012-2013 have shown that Plum Run is an easily perturbed system. Significant rainfall events have a profound impact on the observed levels of turbidity, stream flow (as indicated by pressure at depth) and specific conductivity. Normal diurnal cycling of temperature, pH and dissolved oxygen levels is also evident. Because the telemetry station for this system is charged by a small solar panel, the charted battery charge can also be used as an indirect measure of incoming solar intensity. On days with reduced sunlight, water temperature values are correspondingly depressed and, reflecting the reduced levels of CO2 uptake during reduced photosynthetic activity, pH levels are also diminished. Chlorophyll-a results are so far unclear. This system provides a unique opportunity for students in many disciplines to observe the interaction of biological, geological and human influence in water quality of a small watershed. Environmental Health students have gained valuable experience in the calibration and maintenance of field equipment used for real-time observations. Students across the institution have had access to real-time, local water quality data. The E. Branch of Plum Run as it flows through the Gordon Woods provides an ideal field setting for such studies because it is close at hand, socially and ecologically important to the geographic area, and located within a partially-protected watershed. Continuous monitoring of the water quality in this system will be invaluable in characterizing the effectiveness of forest and watershed conservation practices.

Equipment
- In-Stream Installation by WCU Facilities
- YSI Model 6600V2-4, Multi-Parameter Water Quality Logger with sensors for:
  - Chlorophyll-a
  - Conductivity
  - Dissolved oxygen
  - Temperature
  - Turbidity
  - Pressure
  - pH
- Solar-Charged Econet Data Telemetry Unit
- Dedicated Data Storage and Sharing Website

Monitoring Data – 2013

Images from top left, clockwise:
- WCU Facilities placing trench for underground wiring near the Plum Run
- WCU Environmental Health Students with the YSI 6600V2 water quality data sonde in the lab for calibration
- WCU Environmental Health Students deploying the data sonde in Plum Run, Gordon Natural Area
- WCU Environmental Health Students pointing out the solar panel and telemetry units for data logging
- YSI 6600V2 Data Sonde on the lab bench, WCU Environmental Health Laboratory

Graphical Output
- All measurements taken to date (February 2012 – April 2014) are available online in table format or customizable graphs; images above (clockwise from upper left) include depth above the probe, temperature, specific conductivity and turbidity, for all dates in 2013.
- Images below show battery charge status from solar panel (an indirect indicator of solar intensity), left, and a comparison of Plum Run – Brandywine Creek pH values, right.

Summary
- Plum Run in the Gordon Woods provides a unique opportunity for students in many disciplines to observe biological, geological and human influences in water quality of a small watershed.
- Environmental Health students have gained valuable experience in the calibration and maintenance of field equipment.
- Students across the institution have access to real-time, local water quality data.
- This is an ideal field setting because it is close at hand, socially and ecologically important to the geographic area, and located within a partially-protected watershed.
- Continuous monitoring of the water quality in this system will be invaluable in characterizing the effectiveness of forest and watershed conservation practices.