Baseline Monitoring Case Study of a High Gradient Urbanized Stream: Boone Creek, Boone, NC

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Boone Creek (a.k.a. “Kraut Creek”) is...
- A trout stream (NCDWQ: WS-IV, Tr)
- Headwaters to the New River (American Heritage River) (NCDWQ: NEW01 C12NW2)
- A remediation candidate
  - An impacted, “urban” stream
  - A high-gradient stream
  - Compromised roadway / structure integrity
- Convenient resource for...
  - Research
  - Instruction
  - Outreach

Climate Data - Daily Averages

Boone, NC
- Elevation: 1016m (3333ft)
- Headwaters to:
  - New River
  - Watauga River
- Home to:
  - (1-A Championship Division)

Baseline Data Obtained
(May, 2006 to present)

15-minute time series of...

- Asynchronous autosamples
- TSS
- Monthly grab samples
  - metals
  - alkalinity
- Quarterly
  - bed sediment characterization
Hydrographic Response

Temperature rises 10\(^\circ\) - 12\(^\circ\)F up-to-downstream (summer months only)

Temperature ranges 40\(^\circ\) - 72\(^\circ\)F

Runoff from hot surfaces heats stream suddenly

Snow event
Runoff from hot surfaces
Chloride pulses
Construction activity

High Temperature Variability

Runoff from hot surfaces heats stream suddenly

Snow event
Runoff from hot surfaces
Chloride pulses
Construction activity

Snowmelt
Rain event
Snow event
Snow event
Rain event
Snow event
Snowmelt
Demolition of Broome-Kirk began the 1st week in May, 2006.
Part of the debris fell into Kraut Creek on May 11, 2006.
Spikes in conductivity and pH could represent the injection of Calcium Hydroxide and Calcium Chloride (concrete).
Turbidity increased and DO decreased due to disturbance.

Before sed. pond
Ave NTU = 50

While dam was clogging
Ave NTU = 100

After dam clogged
Ave NTU = ~10

These values are considered low.
**Metals Results**

- Over the past year, iron and manganese were usually below the LOD (and Action Level)
- At the weir (waterfall), ~1 ppm iron detected
- Episodic events send iron levels well above action levels.

![Graph showing metals results over time]

**Causal relationships?**

- Temp., D.O., NTU
  - Runoff from impervious surfaces
  - Direct outfall pipes (>70)
  - Poor riparian zones
  - No retention / local storage
  - No wetlands / few pools
- Temperature:
  - Steam Plant "dumps" boiling water directly into the stream
- Sediment:
  - Disturbance: e.g. construction, people walking through stream
- Salinity:
  - Road salts

**Comparison of riparian buffers.**

*Photos: Chris Thaxton*

**Comparison of stream banks**

*Photos: Chris Thaxton*
Going forward…

- **Active collaborations:**
  - New ASU Center for Water Resources
  - Kraut Creek Committee / Town of Boone
  - National Committee for the New River
  - NC Cooperative Extension

- **Feasibility & prioritization**
  - Locate & eliminate outfall pipes and gullies
  - More & larger riparian buffers
  - More retention and wetlands
  - Morphology-based remediation
  - “Daylight” the stream: contiguous ecosystem

- **Other practices that would help**
  - Green-roofs, rainfall harvesting, pervious pavement, bioretention ponds, etc

http://pimlico.phys.appstate.edu/krautcreek/