Impacts of Drought on Environmental Resources

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Overview

• About COA Watershed Protection Department (WPD)

• Topics:
  – Ecosystem Services
  – Water Quality
  – Aquatic Ecosystems
  – Riparian Health
  – Stormwater Treatment

• Research Needs
About WPD

• **Mission:**
  – Water Quality Protection
  – Erosion Control (stream restoration)
  – Flood Hazard Mitigation

• **Enterprise fund department (drainage utility)**

• **Head count = ~260 FTEs**

• **Budget = ~$60M/year (operating and CIP)**
WPD Mission

• **Water Quality Protection**
  – Pollution Prevention and Reduction
  – Monitoring and Evaluation
  – Regulation (TPDES MS4)
  – Stormwater Treatment
  – Public Education

• **Erosion Control / Stream Restoration**
  – Engineered Solutions
  – Passive/active Riparian Restoration

• **Flood Hazard Mitigation**
  – Floodplain Management
  – Flood Early Warning System
  – Creek and Localized Flood Hazard Mitigation
Ecosystem Services

Drought Diminishes Ecosystem Services:

- Water supply (e.g., improving aquifer recharge)
- Erosion and sediment control
- Air and water pollution prevention and control
- Hazard mitigation (e.g., flooding, wildfire)
- Local and global climate regulation
- Habitat functions
- Food and renewable non-food products
- Social and cultural benefits (e.g., passive/active recreation)
Water Quality

• Water Quality Degrades during Drought – Duh!
  – Reduced assimilative capacity (dilution is the solution)
  – More pronounced impacts from wastewater discharges
  – Accumulation of non-point sources of pollution – loads spike with runoff events
  – Increasing frequency and magnitude of algae blooms

• Indicators:
  – Increased concentrations of chemical constituents
  – Elevated temperatures
  – Lower Dissolved Oxygen
  – Increased phytoplankton blooms
  – Increase algae growth in effluent dominated streams
Water Quality

Concentration of Blue-Green Algae at the COA Ulrich Water Treatment Plant
Impaired creeks during low flow (temp, DO, concentrated nutrients)
Aquatic Ecosystems

• Health of Aquatic Ecosystems Degrades during Drought – Duh!
  – Quality of habitat
  – Extent of habitat

• Indicators:
  – Lower aquatic life indicator scores
  – Population counts of endangered salamanders
  – Size of endangered salamanders
Aquatic Ecosystems

% of Sites Scoring Good or Better vs. Annual Rainfall (in)

- % Sites Good or Better
- Annual Rainfall

Yearly data from 1996 to 2011 showing fluctuations in the percentage of sites scoring good or better and corresponding annual rainfall.
Aquatic Ecosystems

Dissolved Oxygen at Barton Springs
Aquatic Ecosystems

Size of Individual Jollyville Plateau Salamanders Impacted by Drought
Riparian Health

• Stress on water dependent plants

• Erosion risk, due loss of root mass/soil structure

• More dead fuel and drier riparian areas are vulnerable to wildfire

• Open space/niches are vulnerable to invasive, nuisance plant communities

• Loss of bio-diversity and function
Stormwater Treatment

Increased emphasis on the use of “green Infrastructure”, defined as:

- Engineered stormwater management facilities that utilize natural systems – vegetation and soils - to provide infiltration and filtration.

Some types of GI controls are vulnerable to drought:

- Wet Ponds
- Biofiltration
- Rain Gardens
Stormwater Treatment – Wet Ponds

September 2003

August 2011
Stormwater Treatment – Biofiltration

August 2008

August 2011
Stormwater Treatment - Wetponds

August 2009

September 2011
Research Needs

• Drought effects on riparian communities (losses, shifts, etc).

• Improved source tracking methods for identifying low-level chlorinated water or raw wastewater leaks in flowing ambient creek systems.

• Methods for distinguishing nutrient sources (e.g., OSSF, fertilizer, TLAP, animal waste, rain/soil) in ambient water samples.

• Policy issues associated with a “new” hydrologic drought-of-record
  – Re-calculation of water supply yield
  – Adjustment of water rights, contracts?
THE HYDRO-ILLOGICAL CYCLE

1. Drought
2. Awareness
3. Concern
4. Panic
5. Rain
6. Apathy