The New WVU Institute of Water Security and Science (IWSS): Purposes and Directions

WV Mine Drainage Task Force Symposium

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In the Beginning: There were Mountains

- WVU Mountains of Excellence Initiative
  - Identified to infuse curiosity, scientific advancement and strengthen WV economy
  - Major investment by WVU
    1. Addressing health disparities in Appalachia
    2. Improving STEM education and scientific literacy
    3. Utilizing shale gas responsibly
    4. Promoting stewardship of water resources
    5. Achieving international leadership in radio astronomy

The Institute of Water Security and Science

Why IWSS: Society is Increasingly Complex

A need for new approaches and greater commitment:

- Land-use and related natural resource issues are not localized problems.
- Developed areas and surrounding natural systems are often impacted by upstream development but also impact downstream areas.

Why IWSS: Society is Increasingly Complex

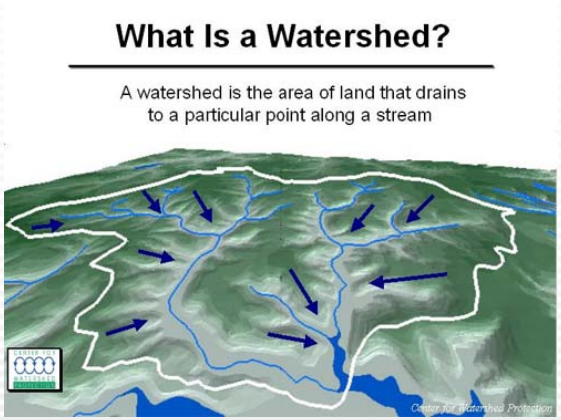
- Rural communities often have significant impacts on their surrounding natural systems due to a smaller tax base and fewer financial resources relative to larger metropolitan areas
  - Example: Insufficient or aging waste water treatment facilities in small rural communities.

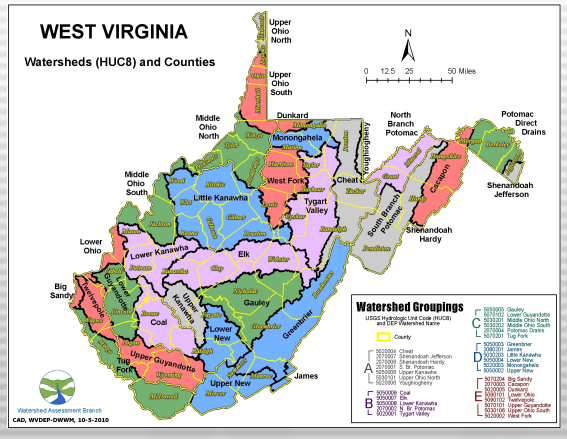
Why IWSS: Society is Increasingly Complex

- We must identify long-term and nagging questions/challenges
  - Reduce uncertainty in policy outcomes
  - Provide a foundation for designing and conducting priority research and management activities
- This requires substantial energy, considerable intellectual capital, and serious long-term commitment.

IWSS Vision

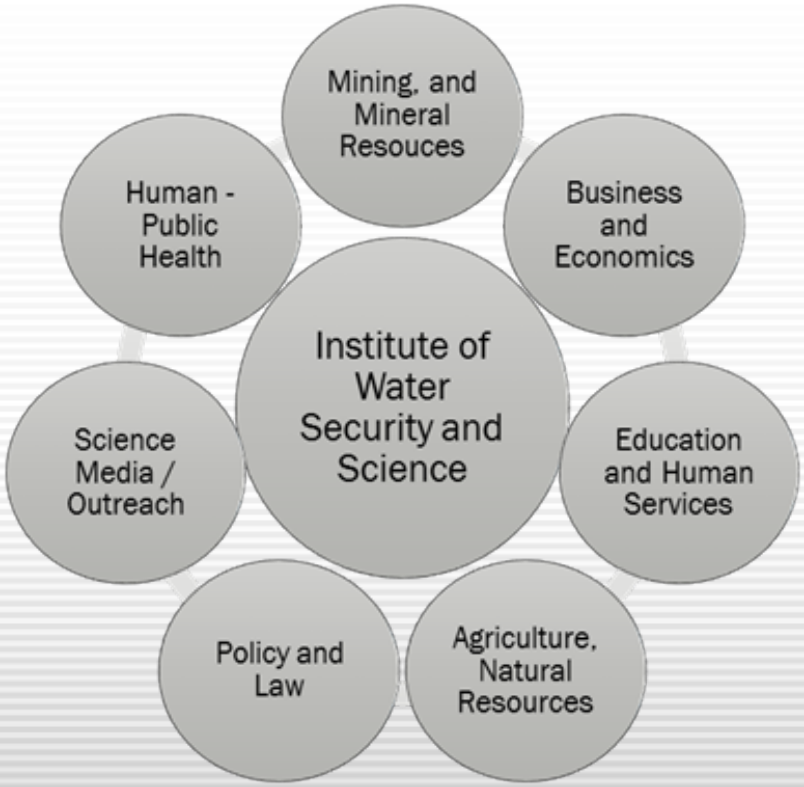
- Provide *services* across aquatic and terrestrial gradients
- Recognize that management actions and policy decisions are most effective at definable scales.
  - Example: the *watershed* scale
  - Using existing classification schemes (e.g., HUCs)





IWSS Vision

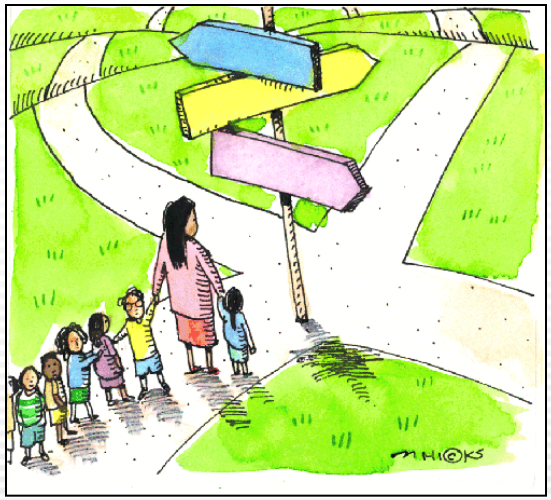
- Integrate and organize expertise
  - Identify missing expertise
- Encourage long-term studies with interim results
  - Adaptive research, extension and management
- Facilitate integrated, multi-disciplinary collaborations

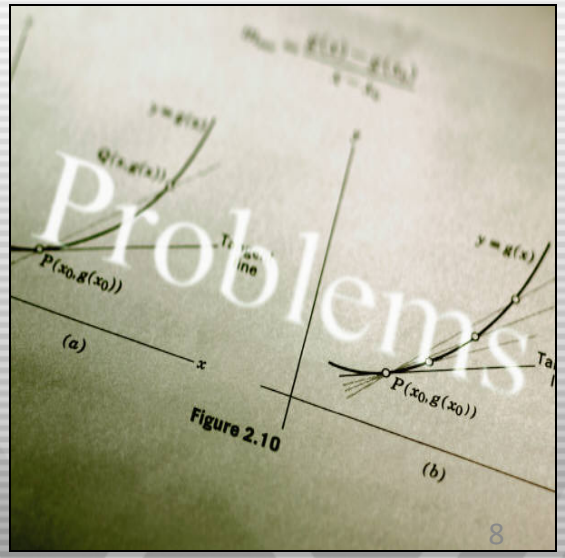


Current and future areas of engagement (not an exhaustive list) in the WVU IWSS.

IWSS Vision

- Sustaining water resources isn't just about research, teaching and extension: it's about the kind of knowledge generated and how it's used.
- It's the way we conceive of water resource systems, approach problems, and include the people that are a part of the systems of interest.





What is the IWSS?

At a time when human demands of and for fresh water have never been greater:

I. A clearinghouse for research, education and extension expertise.
II. A conduit to link water resource stewardship, land-use-practices and people
III. A catalyst to improve human health and water resource sustainability

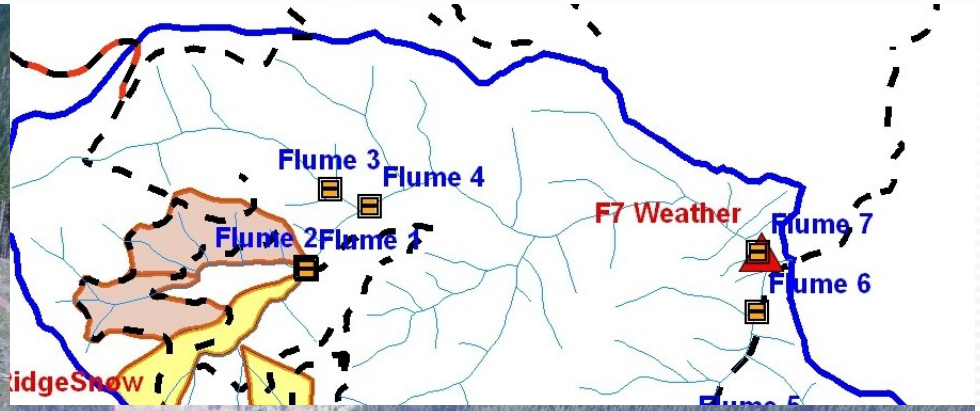
Near-Term Agenda of the IWSS

- Organize a water resources community
  - Meetings, listen and learn, hold organizational meetings, short symposia
- Initiate Website, E-News, Information
  - Who does what, where, how?
  - How to find help / collaboration?
- Engage proposal efforts
  - Pursue meaningful research, teaching, outreach
- Provide support for proposal efforts
  - Facilitate, organize and process.
- Begin to build a presence and engage with industry, state and Federal agencies, national labs, institutions and other entities.

Examples of Early Activities in the IWSS

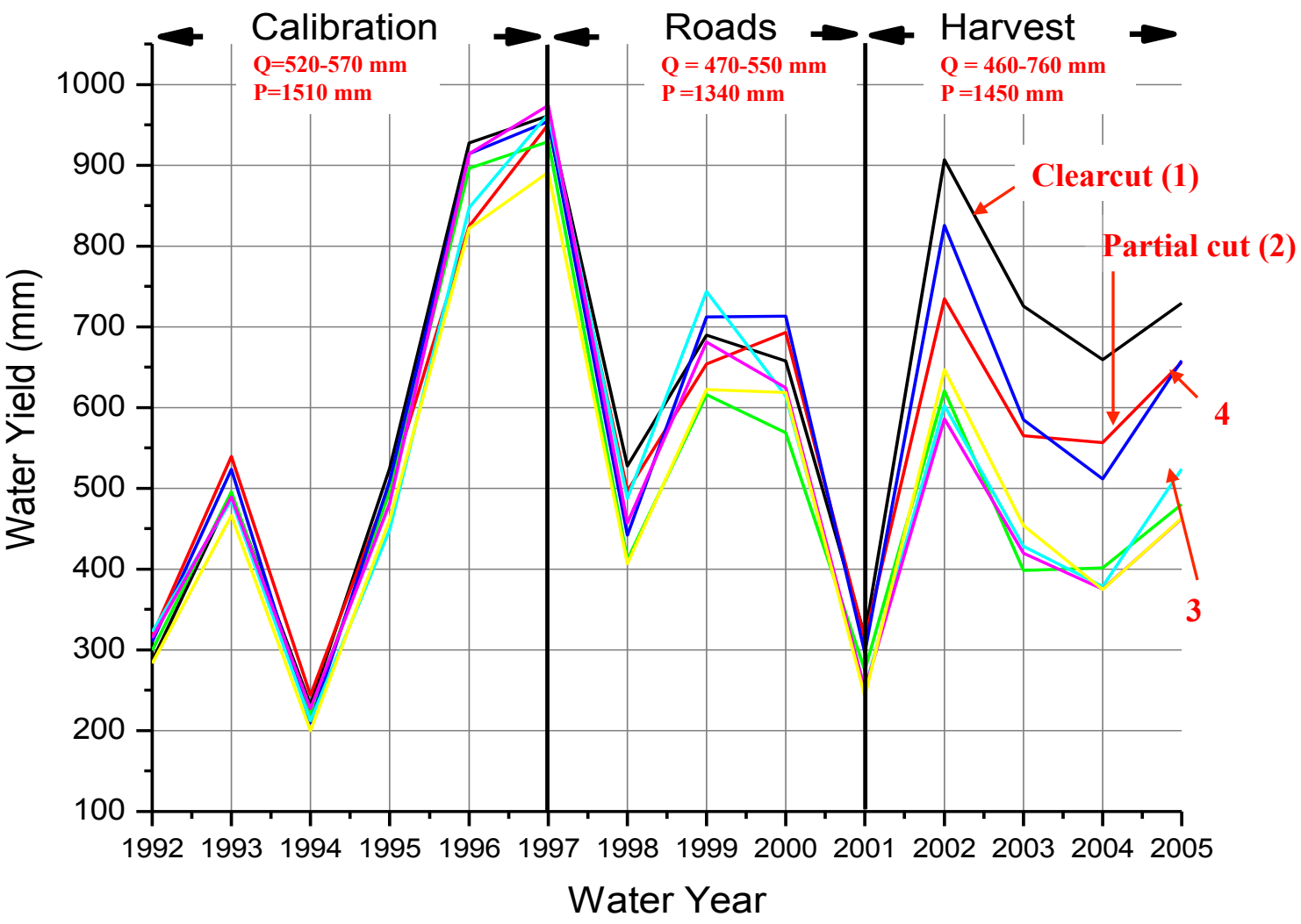
- EPSCoR TII
  - Center for Sustainable Rural Development
- EPA Environmental Education Grant
  - Collaboration for West Virginia's Environmental Future (CWVEF)
- Robert Wood Johnson Foundation
  - Impact of Policies Governing Wastewater on Health in West Virginia
- EPA Integrating Human Health and Well-Being with Ecosystem Services
  - Watershed level investigation: Intersection of management and human health
- EPSCoR NSF: Experimental Program to Stimulate Competitive Research
  - West Run Experimental Watershed
    - Leverages EPSCoR NSF capacity building
  - Collaborative Adaptive Management (CAM) program
  - Experimental watershed study approach

Mica Creek Experimental Watershed: Idaho, USA

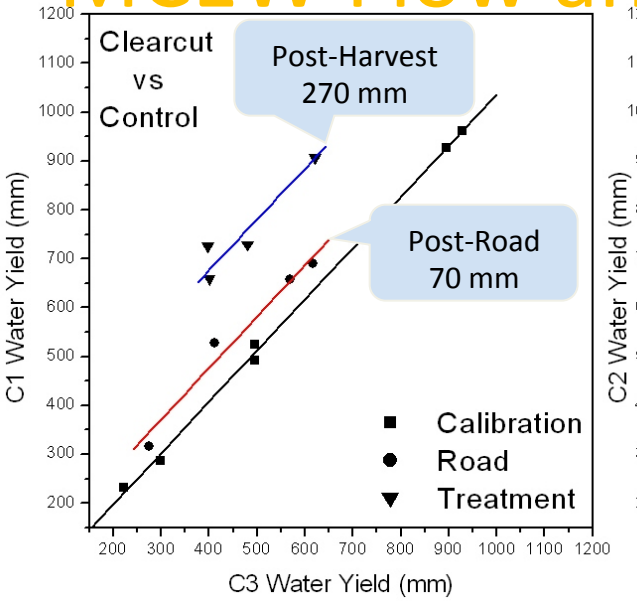


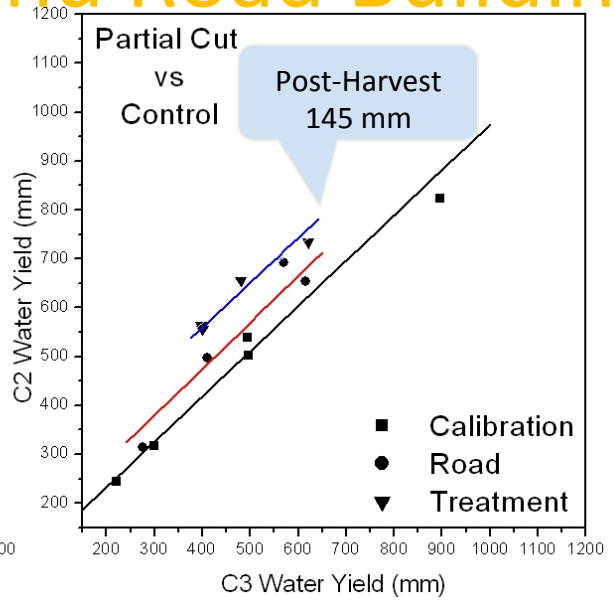
- 4 years post-ro
- 4 years post-ha
  - 50% clearcuts
  - 50/50 partial cu

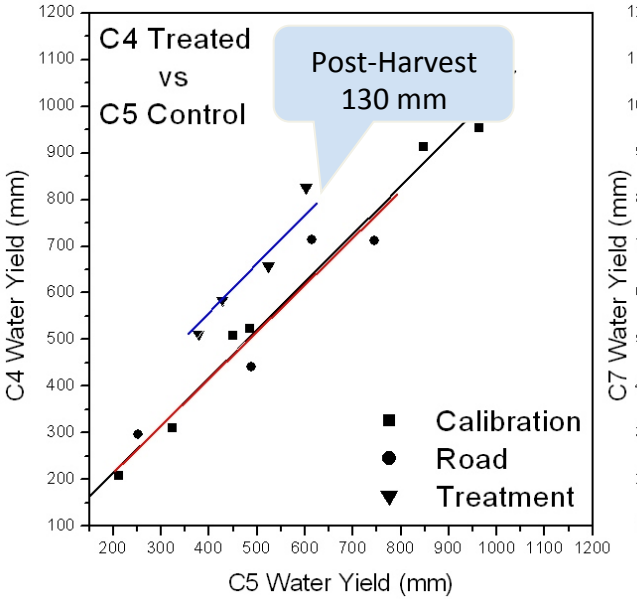
MCEW Annual Water Yield (mm)

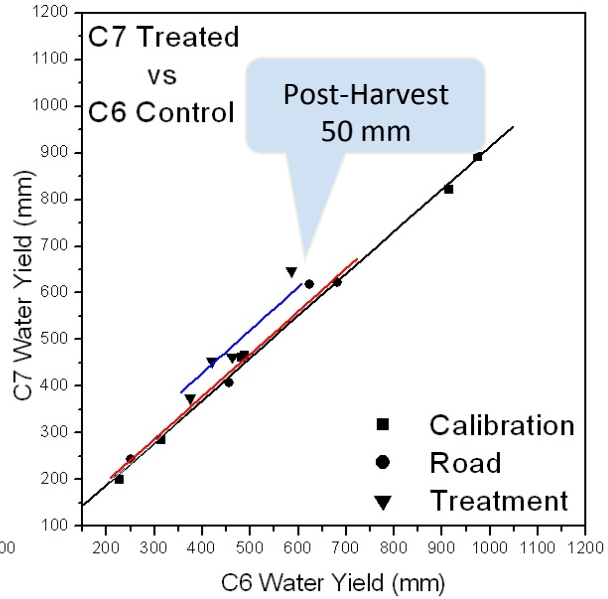


MCEW Flow and Road Building





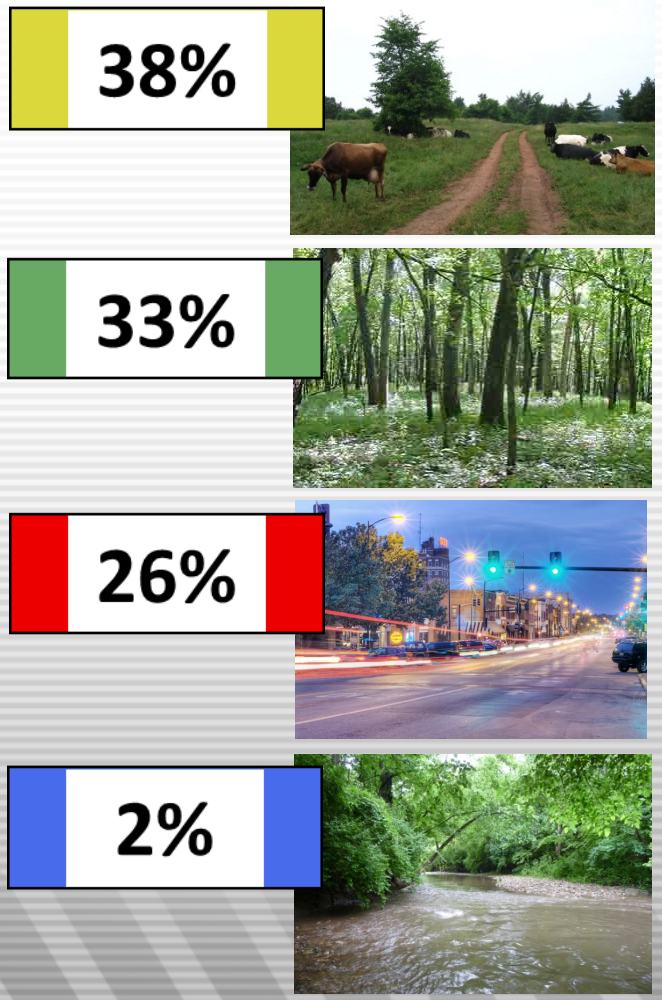




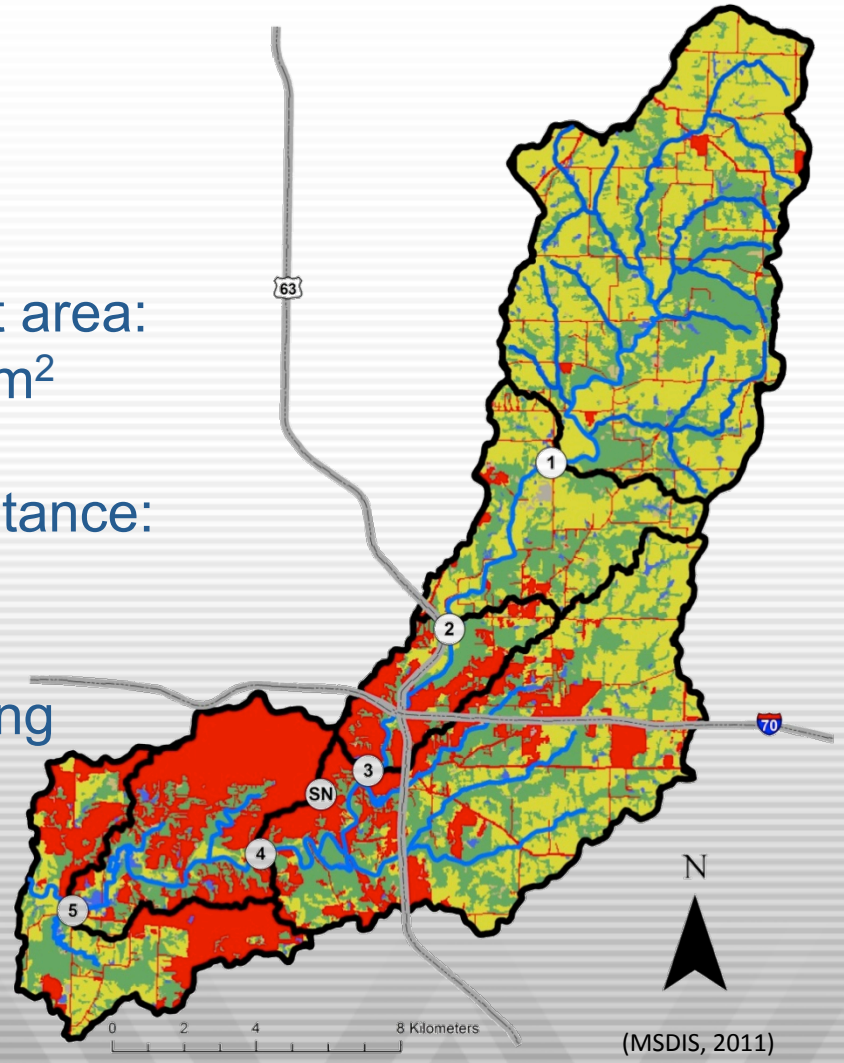
Other Work

- Suspended sediment
- Snow hydrology
- Hydrologic modeling
- Temperature regime
- Forest productivity
- Soil respiration
- Isotopes
- Invertebrates
- Salmonids
- Water Temperature

Hinkson Creek Experimental Watershed: MO USA



- 2008-2015
- Catchment area:
  - ~231 km^2
- Stream distance:
  - ~56 km
- 303(d) listing
  - 1998



(MSDIS, 2011)

HCEW: Some Results to Date

- Suspended sediment levels are high for the region (lower watershed)
  - Disproportionate fine-sediment from urban area
- Total ammonia and total phosphorus levels in Hinkson Creek are high for the region (upper watershed)
- Stream water temperature altered in the lower watershed
- Urban microclimate – heat island
- Urban altered runoff regime
  - Baseflow, rainfall/runoff, time to concentration.. Pollutant flushing
- Rerouting urban stormwater runoff
  - Level spreader: Floodplain project
- Reforesting lower floodplains
- Many other results: forh2o.net/publications

The Experimental Watershed Approach

- Advantages
  - Scalable (one monitoring site to many)
  - Annual climate and hydrologic differences can be controlled
  - Can validate Best (or Better) Management Practices
  - Cause-effect relationships can be identified
- Disadvantages (nested scale studies)
  - Response to treatment likely to be gradual over time, hence need for long-term commitment
  - Study design is vulnerable to unpredicted climate anomalies, land-use impacts (i.e. catastrophic events)

Experimental Watershed Approach: Key Points

- Potlatch Corporation: The MCEW (Idaho)
  - > $2million investment since 1991
  - Advancing Science / Forest Management / Increasing Productivity of Working Forests
  - Major boost for public perceptions (PR boost) / relations of the timber industry
- Hinkson Creek Watershed (Missouri)
  - > $1.5million investment since 2008
    - City of Columbia / Boone Co / Mizzou / EPA / MoDNR
  - University of Missouri Stormwater Monitoring Program
    - $100k 2012-2015 (7 sites, nested in larger Hinkson project)
  - Advancing Science / Contemporary Watershed Management / Improving Human Health / Increasing Productivity of Natural Resource Commodities in Sustainable ways
  - Collaborative Adaptive Management (helpthehinkson.org)
  - Major public relations boost, increased stakeholder acceptance of watershed management practices

Experimental Watershed Approach

- Why?:
  - Contemporary water resources problems are more complex than any time in history.
  - Resolving contemporary water resources problems requires new approaches and greater investment.
- My offer to you:
  - If the experimental watershed approach is appealing to you and you'd like to learn more:
    - Please reach out to the IWSS
    - We'd like to help!

Closing Statements

- The IWSS wants to hear from you:
  - What are we doing well?
  - What should we stop doing?
  - What should we start doing?
- Stay tuned:
  - Website / E-News
  - Let us know if you'd like to be kept informed
    - Jason.Hubbart@mail.wvu.edu
    - 304-293-2472

West Virginia University

West Virginia University
Institute of Water Security and Science

THANK YOU

IWSS: Mission Statement

To develop sustainable solutions for watershed management, water quality and quantity problems, and to strengthen West Virginia's water security, and environmental, economic, social and cultural well-being, while broadening West Virginia University's water stewardship impact and prominence nationally and globally.

- Meets the land grant mission of WVU
- Enhances collaborative, interdisciplinary activities across and beyond the WVU Campus
- Integrates existing resources and generates new resources that will facilitate study, problem solving and growth