



Emerging National Trends in Stormwater

KC Urban Stormwater Conference 2017

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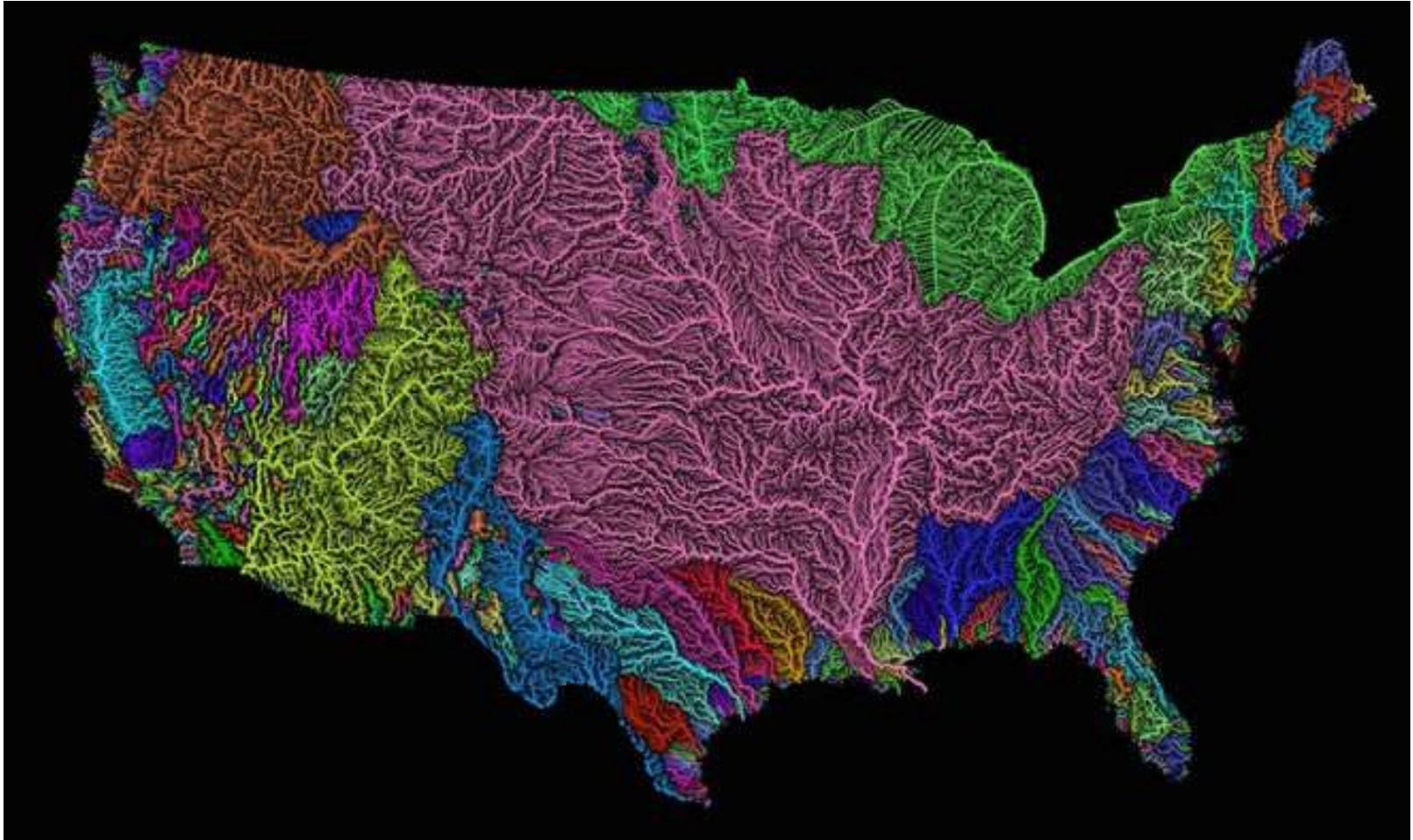
AGENDA

- CONTEXT
- PLANNING APPROACHES
- FUNDING APPROACHES
- TECHNOLOGY ADVANCES

Disclaimer 1: NOT a sales pitch
Disclaimer 2: NOT comprehensive



“NATIONAL” TRENDS AND DRIVERS



CONTEXT



JOHNSON COUNTY STORMWATER PROGRAM

2016 Strategic Business Plan

- Benchmarking Effort – Review of similar programs around the country
- Determine Best Practices
- Evaluate National Trends



STORMWATER – MAJOR TRENDS

Johnson County Benchmarking Effort

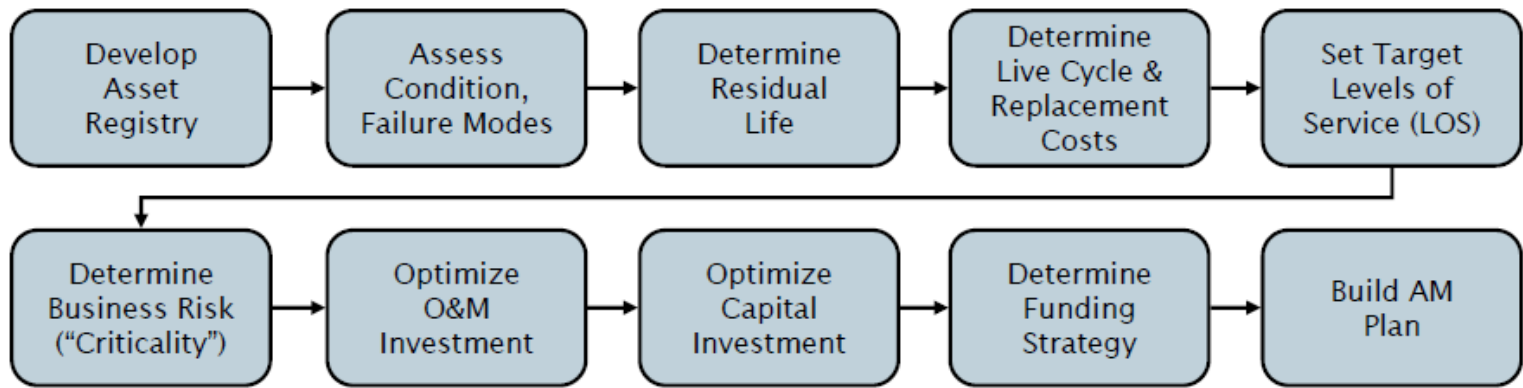
- King County, WA
- County of Asotin, WA
- Orange County, CA
- Santa Clara County, CA
- Pikes Peak Stormwater Task Force, CO
- Southeast Metro Stormwater Authority, CO
- New Braunfels, TX
- City of Springfield/Green County, MO
- DuPage County, IL
- Cook County, IL
- Lake County Stormwater Management Commission, IL
- City of Frankfort/Franklin County, KY
- York County, PA
- Wake County, NC
- Stormwater Coalition of Albany County, NY
- Westchester County, NY
- Stormwater Coalition of Monroe County, NY
- Nassau County, NY
- Montgomery County, MD
- St. Georges County, MD
- Hampton Roads Regional SMP, VA
- Augusta-Richmond County, GA
- Long Creek Watershed Towns, ME



KEY ISSUES FROM NATIONAL BENCHMARKING

Asset Management

- System Definition
- Condition Assessment
- Risk-based Analysis
- System Investment (Capital Improvement, O&M)



KEY ISSUES FROM NATIONAL BENCHMARKING

Watershed-Based Organization

- Holistic Approach
- Westchester County, New York



VALIDATION OF BENCHMARKING

- “Rainfall to Results: The Future of Stormwater” by WEF
- **Objectives for Stormwater Success:**
 - Work at the watershed scale
 - Transform stormwater governance
 - Support innovation and best practices
 - Manage assets and resources
 - Close the funding gap
 - Engage the community
- **Link to the Document:**
 - <http://www.wefnet.org/stateofstormwater/index.html>

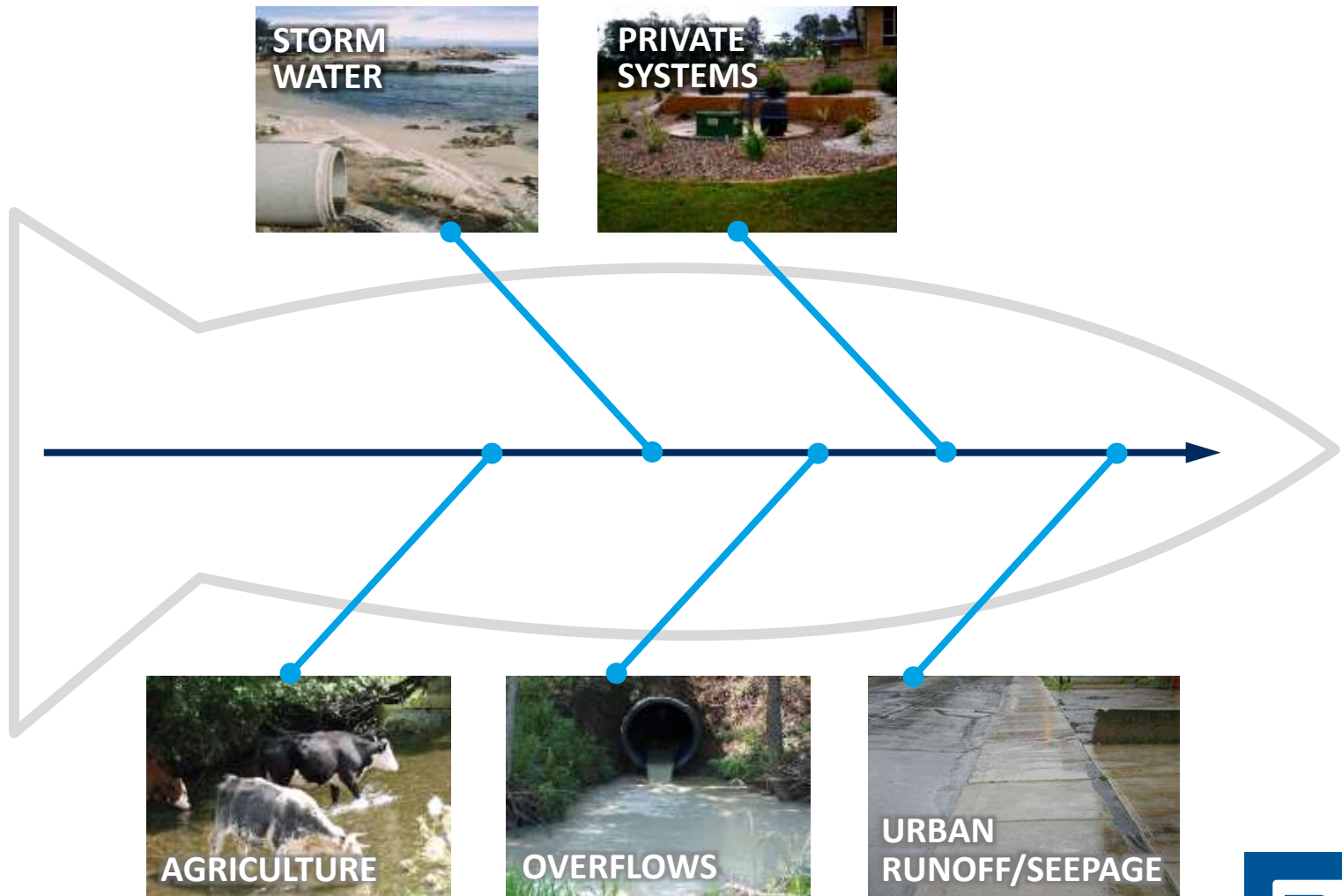


PLANNING APPROACHES



INTEGRATED PLANNING

Considers All Watershed Pollution Sources



Many potential sources of pollution

INTEGRATED PLANNING

Considers Multiple Stakeholders

Utilities

- Manage the system
- Develop plans to improve water quality
- Responsible compliance entity
- Quality drinking water relies on VA and MD

Researchers

- Can help to understand physical/biological processes
- Leading edge for emerging contaminants of concern

Regulators

- Federal and State
- Protect water quality
- Involvement can ease the approval process
- Help to evaluate potential site specific standards

NGOs

- Vested interest in health of local waters
- May be vocal and adversarial
- Buy in will help process

RESILIENCE PLANNING

System Resilience

- IRAM (Infrastructure Resilience Analysis Methodology)

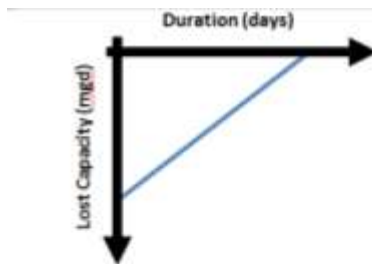


Figure 1. Resilience graph demonstrating sudden impact and gradual system recovery.

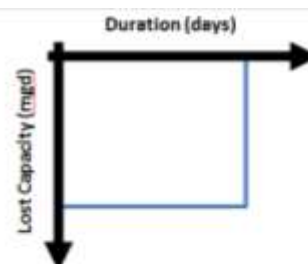


Figure 2. Resilience graph demonstrating sudden impact and sudden system recovery.

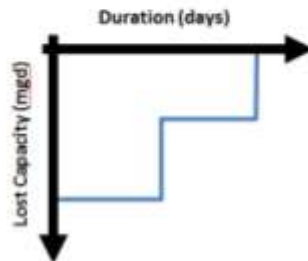


Figure 3. Resilience graph demonstrating sudden impact and incremental system recovery.

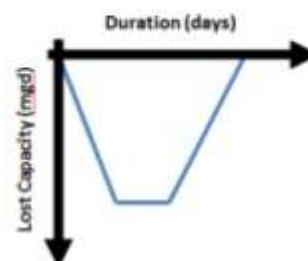
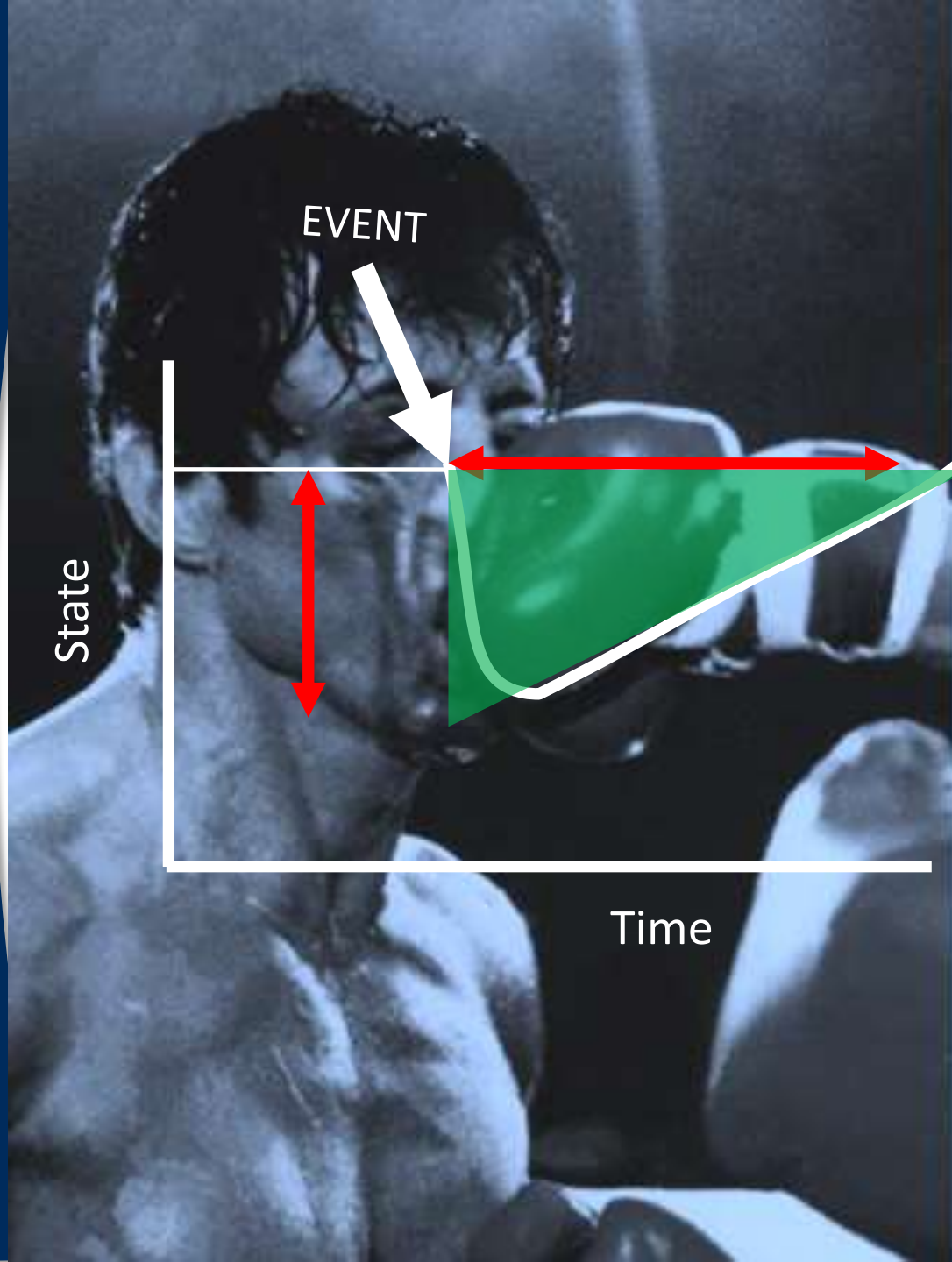


Figure 4. Resilience graph demonstrating gradual impact and gradual system recovery.



More or less, the vertical red arrow represents diminished capacity (reliability) – independent.

The horizontal red arrow represents duration of diminished capacity (resilience) – dependent.

The area of the “dip” represents cumulative system impact.

RESILIENCE PLANNING

- **Climate Change**
 - Hydrologic Impacts
 - How do we plan?
- **Sea Level Rise Planning**



STORMWATER PLANNING PERSPECTIVES

Social Justice



STORMWATER PLANNING PERSPECTIVES

Socio-Economic Modeling



FUNDING APPROACHES



INNOVATIVE FUNDING FOR STORMWATER

D.C. Water and Sewer Authority

- **Environmental Impact Bond**
 - Pay for Green Infrastructure projects
 - Performance-based
 - Tiered success rates tied to repayment terms for investors
- **Exploring P3 Approach for Program Management**



Optimized Green and Gray
Infrastructure

INNOVATIVE FUNDING FOR STORMWATER

Unique Programs

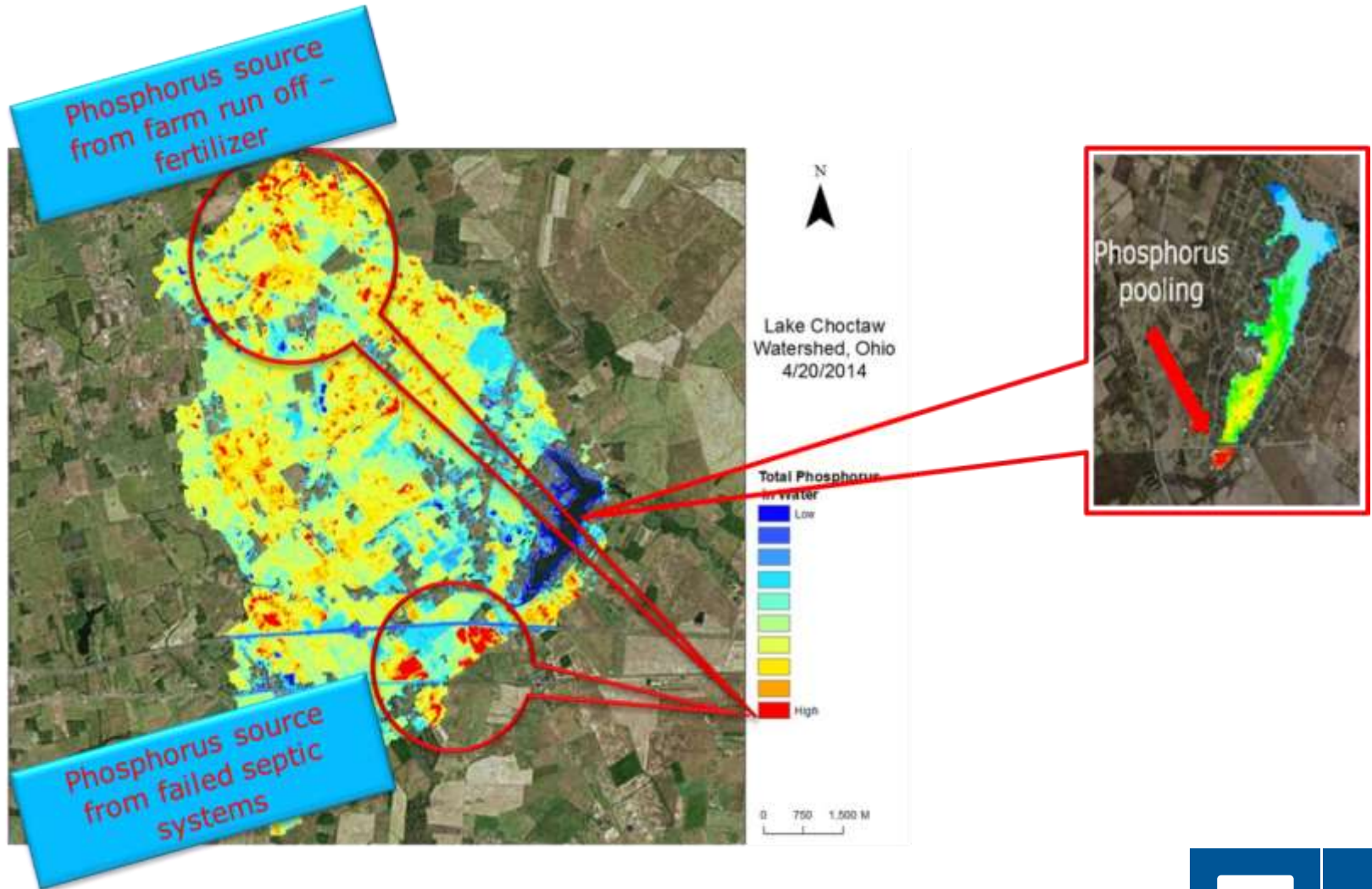
- Urban Forestry
- Liability Reduction
- Another P3 Opportunity



TECHNOLOGY ADVANCES



REMOTE SENSING SHOWS WATERSHED SOURCES OF PHOSPHORUS



REMOTE SENSING SHOWS HOTSPOTS OF COPPER CONTAMINATION



Relative copper



The relative abundance of copper on impervious surfaces, including roads, pavement, concrete, asphalt, and buildings, is shown above. The image used in analysis was acquired on June 20, 2015



USING SPOT
1.5 METER
RESOLUTION -
IMPERVIOUS
SURFACE
AUGUST 2015

COPPER BUILD-UP AND WASH OFF RESULTING FROM 2" RAIN EVENT IS VISUALIZED

ROADS



12/31/2015



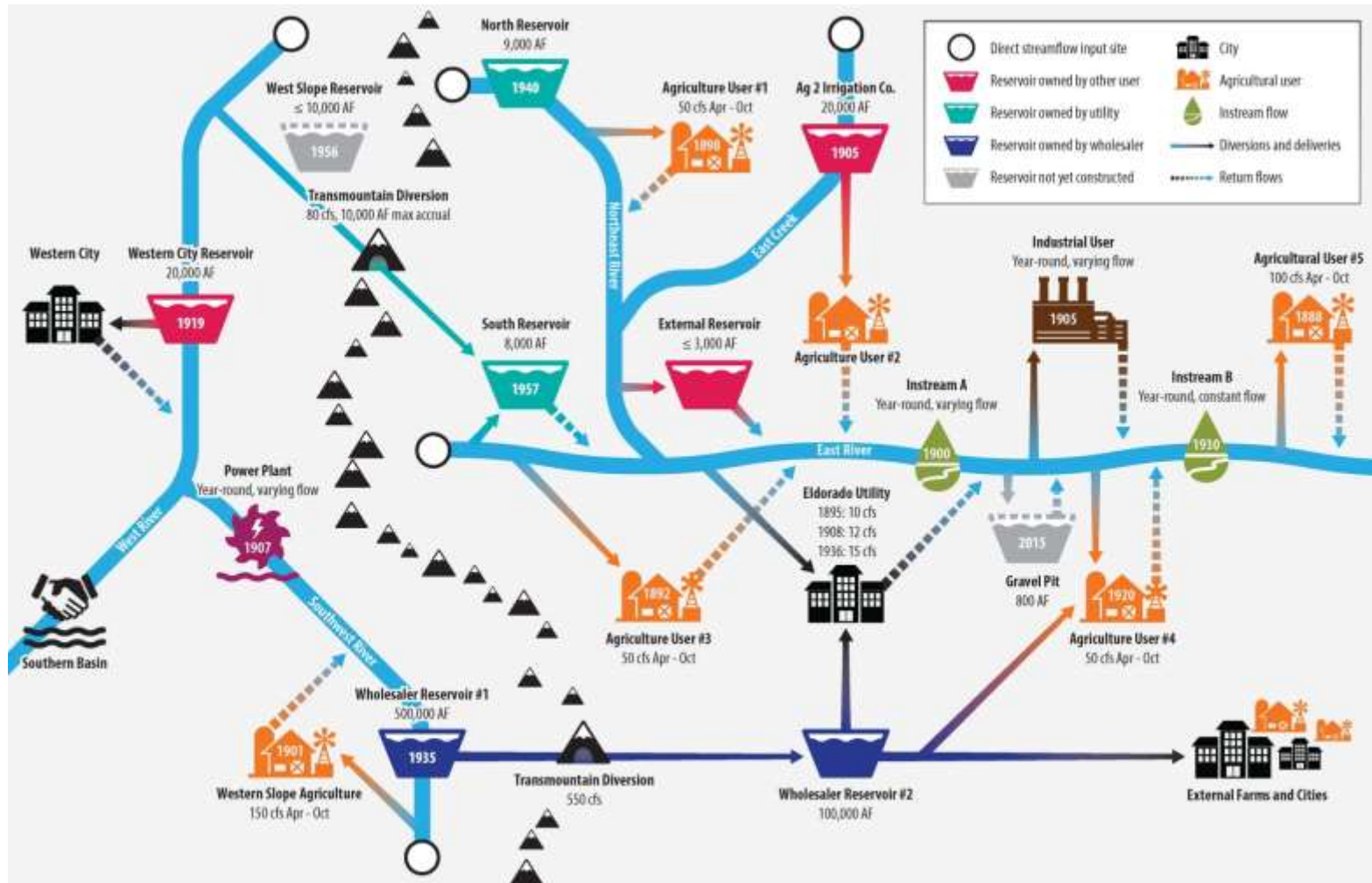
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REAL-TIME CONTROLS

- CSO Applications
- Detention Basin Applications

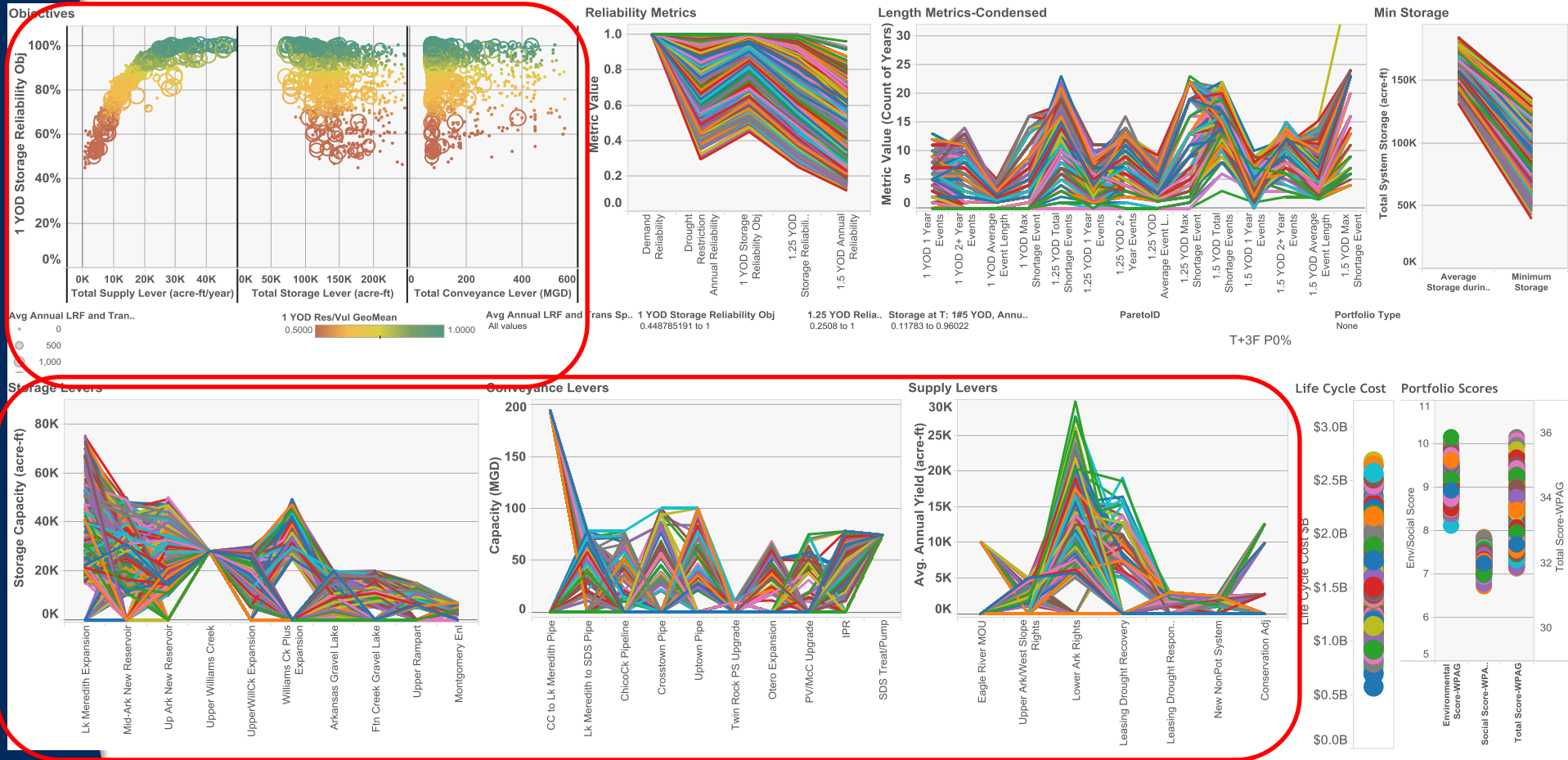


MULTI-OBJECTIVE EVOLUTIONARY ALGORITHMS (MOEAs)



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Six Objective Functions



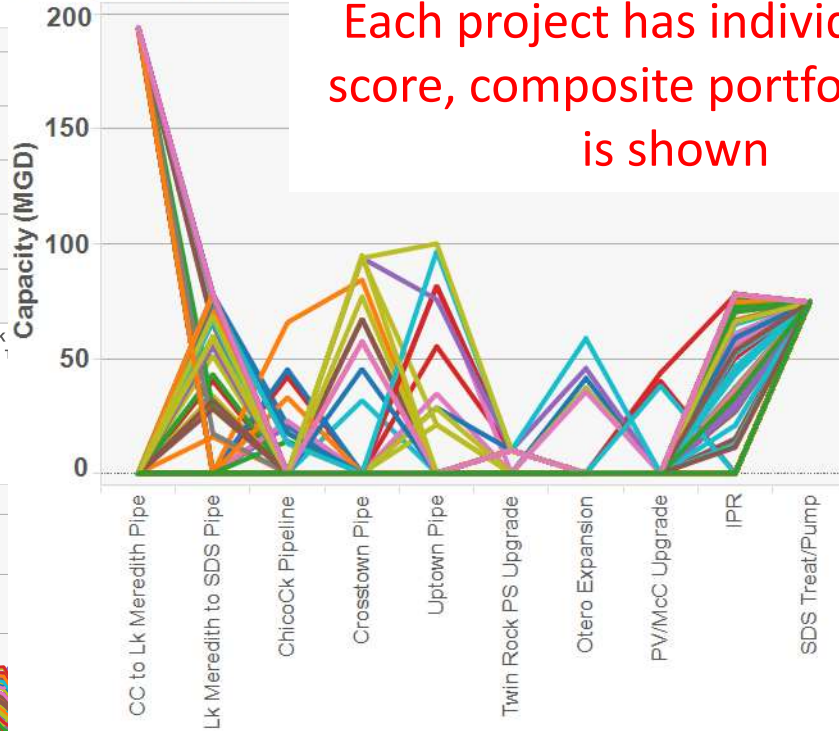
27 Decision Variables



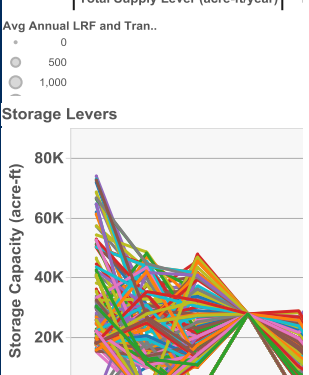
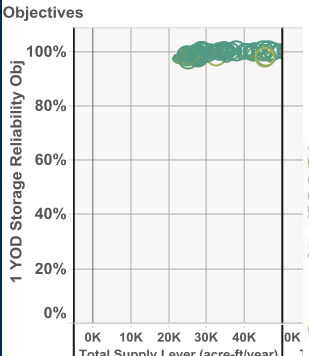
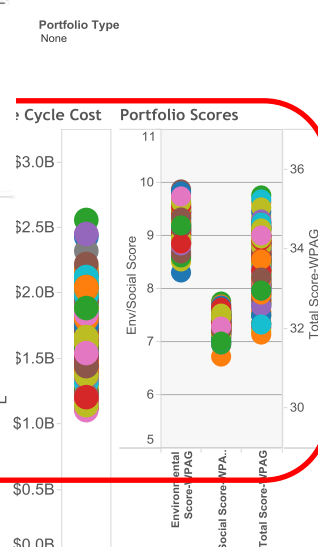
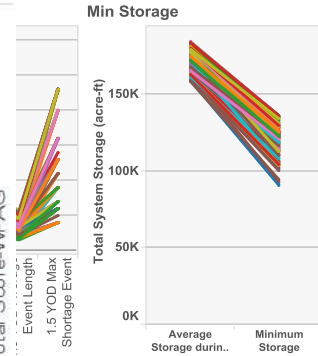
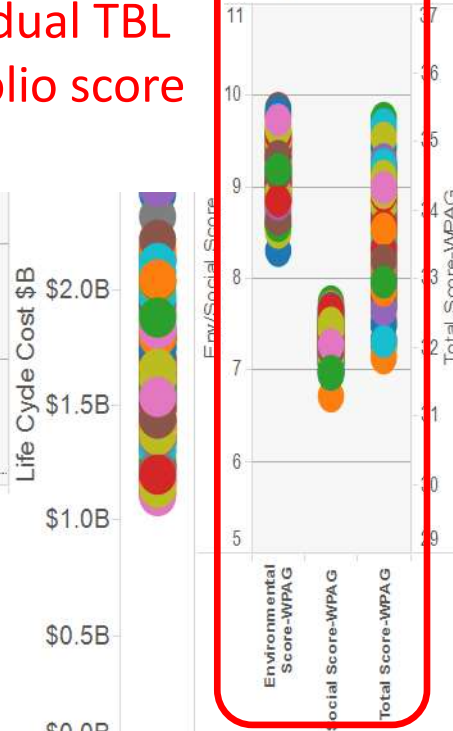
MULTI-OBJECTIVE EVOLUTIONARY ALGORITHMS (MOEAs)

Each project has individual TBL score, composite portfolio score is shown

Conveyance Levers



Life Cycle Cost Portfolio Scores



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