



EPA Tools and Resources Webinar

EPA's Regional Sustainability and Environmental Sciences Research (RESES) Program

Supporting Work with States on Landfills with Elevated Subsurface Temperatures and Resilience to Flood Impacts

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US EPA Office of Research and Development

March 18, 2020

Outline

- RESES Overview
- Landfills with Elevated Temperatures
- Resilience to Flood Impacts



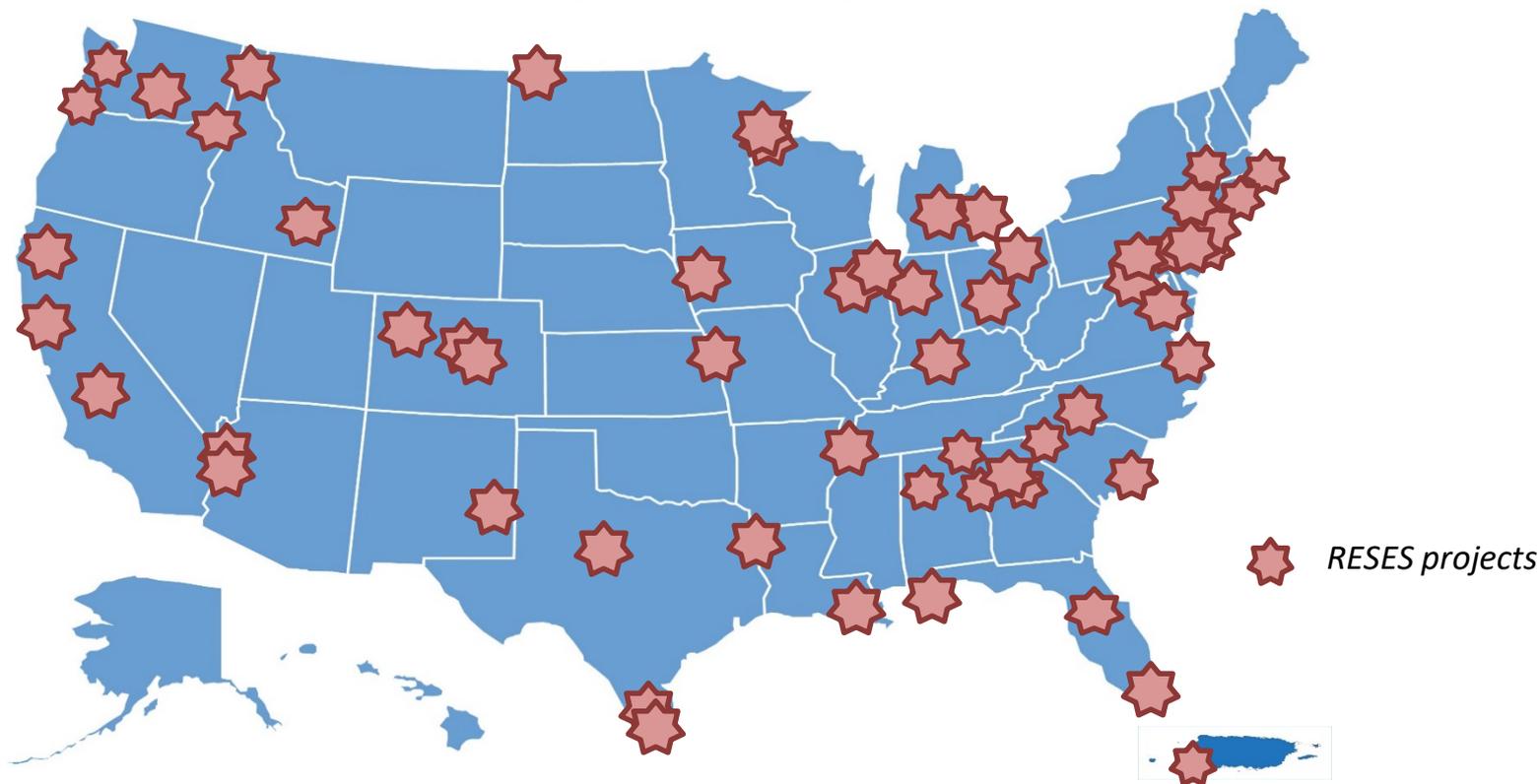
*Photo Credits: Max Krause
(top), Joyce Stubblefield
(bottom)*

What is RESES?

- Collaborative research that engages stakeholders to address environmental issues facing local communities
- Goals
 - Promote ORD-Regional partnerships
 - Deliver targeted solutions on Regional science priorities
 - Assist EPA, state, tribal and local communities dealing with environmental problems
 - Provide opportunities to translate research into action
 - Develop transferrable methods and results

What is RESES?

***RESES has supported over 40 projects in 34 states and Puerto Rico
(2012-2019)***



Regional Sustainability and Environmental Sciences Research Program
Collaboration and Partnership for Sustainable and Healthy Communities

How Does RESES Work?

- Annual internal solicitation managed by EPA ORD's Sustainable and Healthy Communities Research Program
- 3 research focus areas:
 - Cleaning up contaminated sites
 - Reducing the burden of contamination
 - Resilience and revitalization of communities affected by contamination and extreme events
- 5 criteria:
 - Soundness of scientific approach
 - Direct, meaningful stakeholder interaction
 - Transferability
 - Feasibility
 - Use of existing SHC databases or science-based tools

Example RESES Projects

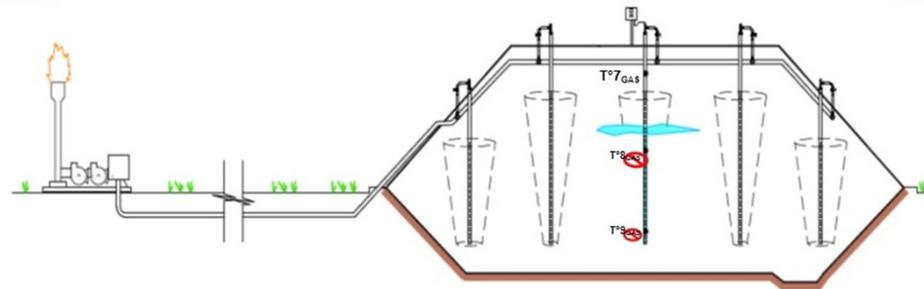
- *Detecting Elevated Temperature Landfills Using Landsat Thermal Imaging* – Camille Lukey & Max Krause
- *A Deeper Look at the Ouachita River: Approaches to River Maintenance for Sustainability & Resilience to Flood Impacts* – Joyce Stubblefield & Rich Fulford

Problem

- Elevated Temperature Landfills have wide-spread subsurface chemical reactions inside
 - Municipal solid waste landfills (RCRA Subtitle D)
 - Temperatures can go from ~90 °F to +200 °F
- For neighbors
 - Nuisance odors
- For regulators and operators
 - Rapid settlement at some sites/slope stability concerns
 - High temperatures are a future concern for liner integrity
 - Huge remediation, observation, management costs

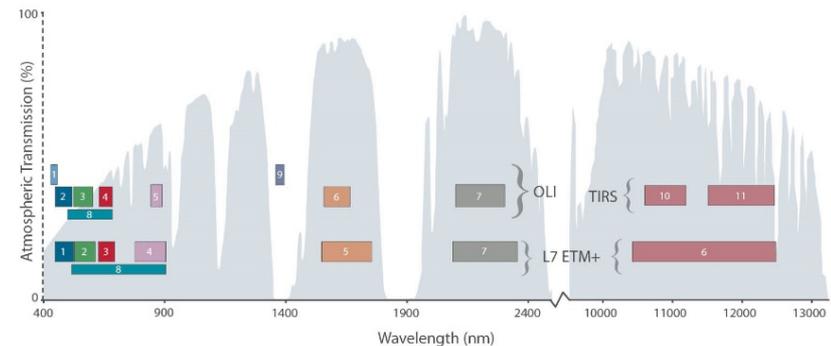
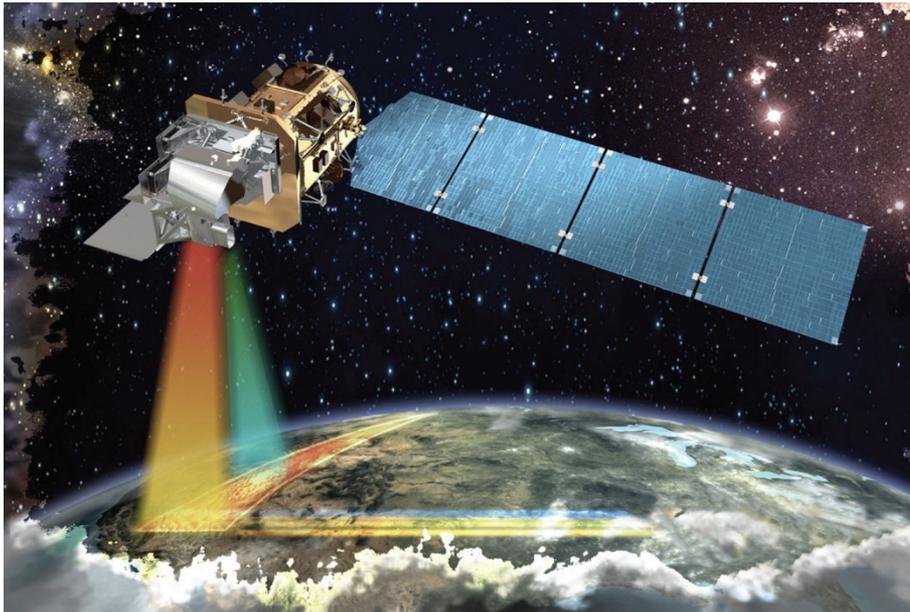
Problem

- Problem is usually found by technicians checking temperature of gas wells
- NSPS landfill temperature limit of wells is 131 °F
 - Above requires corrective action
- Wells are spread across landfill, but we don't know what is happening in the spaces between landfills
- Is there a way to track these reactions?



Approach

- LandSAT8 is a satellite operated by USGS
- Has several sensors on board
 - One measures thermal infrared (TIR)



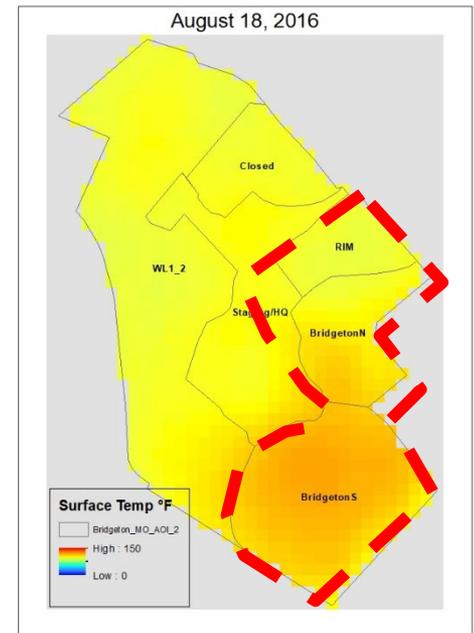
Aerial imagery (pictures)

Thermal imagery (pictures in Infrared)

- Report land surface temperatures
- Volcanoes, power plants, agriculture

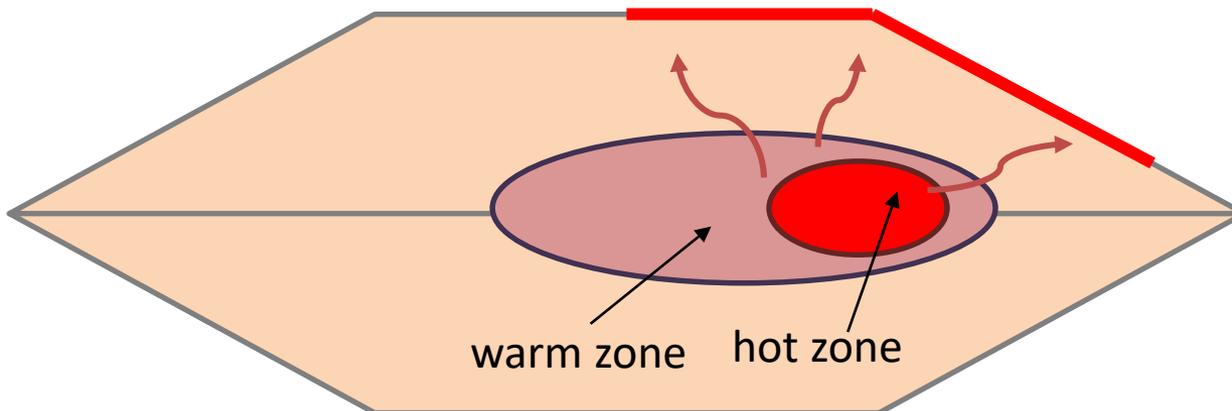
Approach

- USGS outlines a method to translate TIR data to land surface temperatures
- Satellite orbits every location every 15 days
 - Get repeatable measurements
- USGS has validated the data from 1980s-2019
- Continuously updated



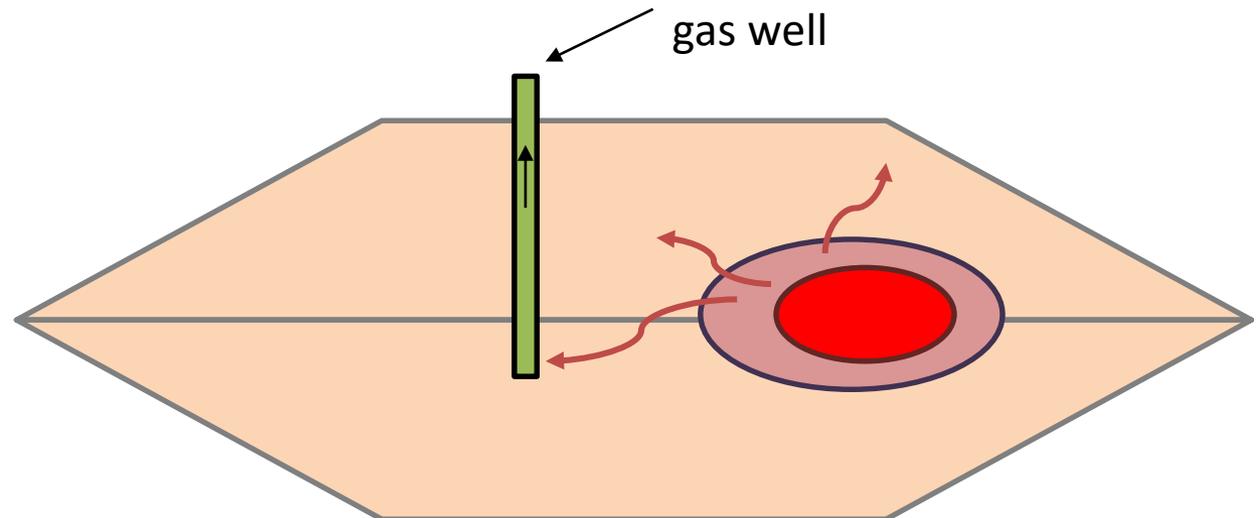
Approach

- Determine if subsurface reactions in landfills can be observed by LandSAT
 - Do Elevated Temperature Landfills have higher surface temperatures?
- If so, can we track them in time?
 - Do they move?
 - Do we see them evolve before they were found by the operator?



Approach

- Can we correlate gas well temperatures with LandSAT temperatures?
- Do the hottest well temperatures match with LandSAT surface temperatures?



Results

- 8 sites evaluated – OH, MI, TX, TN, MO and FL
 - Testing at sites known to have reactions and known not to have reactions
 - 4 more planned
- All landfills have temperatures above “background”
 - This is good, confirms previous work by others
- Elevated temperatures detected at landfills is consistent at some, intermittent with others
 - Seasonal weather greatly affects surface temperature

Impact

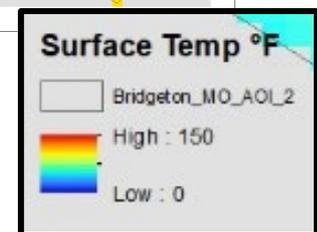
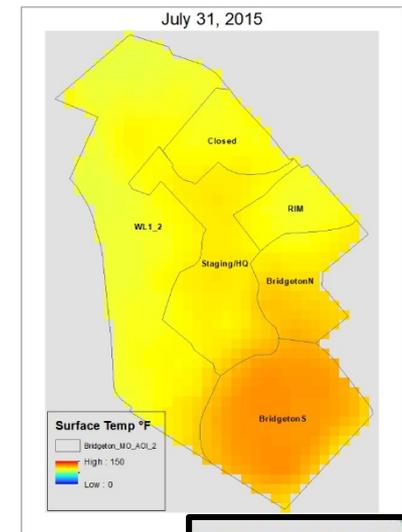
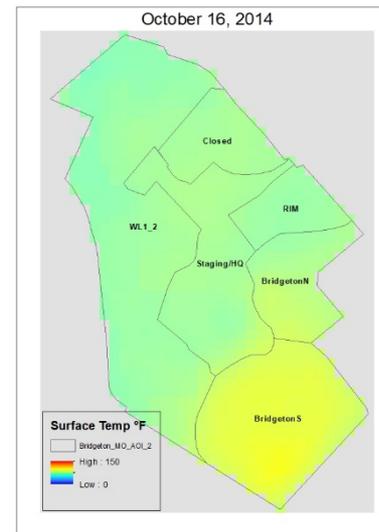
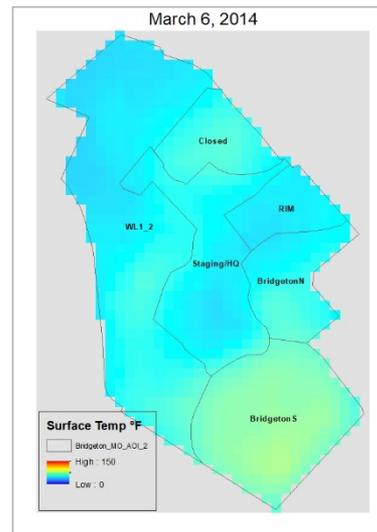
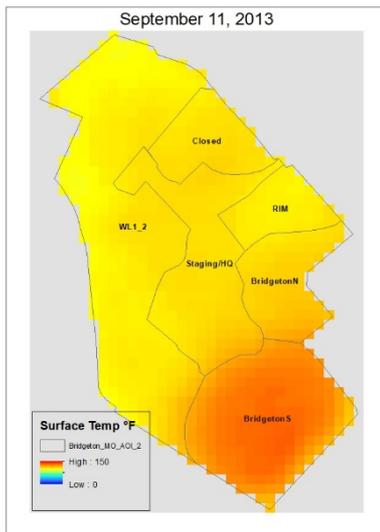
- If successful, would allow regulators and/or operators to track the progress of the reaction remotely
- Ability for repeat measurements over time
- Data free and available to the public from USGS
 - Landsat Collection 1
- Working with Ohio EPA to get gas well data from Elevated Temperature Landfills
 - Perform the analysis for several landfills

Impact

- ORD will give all data to each state agency
- Ohio will track reactions without relying on operators
 - Collaboration among Air and Solid Waste Divisions
 - Now retaining data that are geolocated and digital, easier to visual and look for patterns
- ORD is creating a report and guide for states to use our method to examine sites
 - Automated code to sort out bad images will be available
 - Webinars will be scheduled in the future

Take Home Messages

- Landsat may be promising to track landfill surface temperature, tracking subsurface hot reactions
- Webinars to educate states still will be available



Deeper Look at the Ouachita River



Problem: Vulnerable communities need to be more resilient to flooding but lack the resources and technical skill to apply available tools for complex decision making.

Action: EPA engaged a vulnerable community in Louisiana using **Structured Decision Making** to examine flood resilience actions in the context of maintaining Ecosystem Goods and Services while also increasing public safety.

Results: This effort will provide clear decision guidance based on trade-offs between different stakeholder priorities in an organized framework useful for decision making. It will also provide information for helping other communities.



Deeper Look at the Ouachita River



PARTNERS

Tracy Hilburn and Neal Brown, Project Champions

Ouachita Parish Office of Homeland Security And Emergency Preparedness

Kevin Crosby, Robbie George and Kim Golden, Parish and City Engineers

Ouachita Parish, Cities of Monroe and West Monroe

Tom Malmay, Disaster Recovery Manager

Ouachita Parish

Sandra Gunner and Genea Lathers, State of Louisiana

Governor's Office of Community Development

Governor's Office of Homeland Security & Emergency Preparedness

Tonia Pence & others, FEMA

Community Planning and Capacity Building

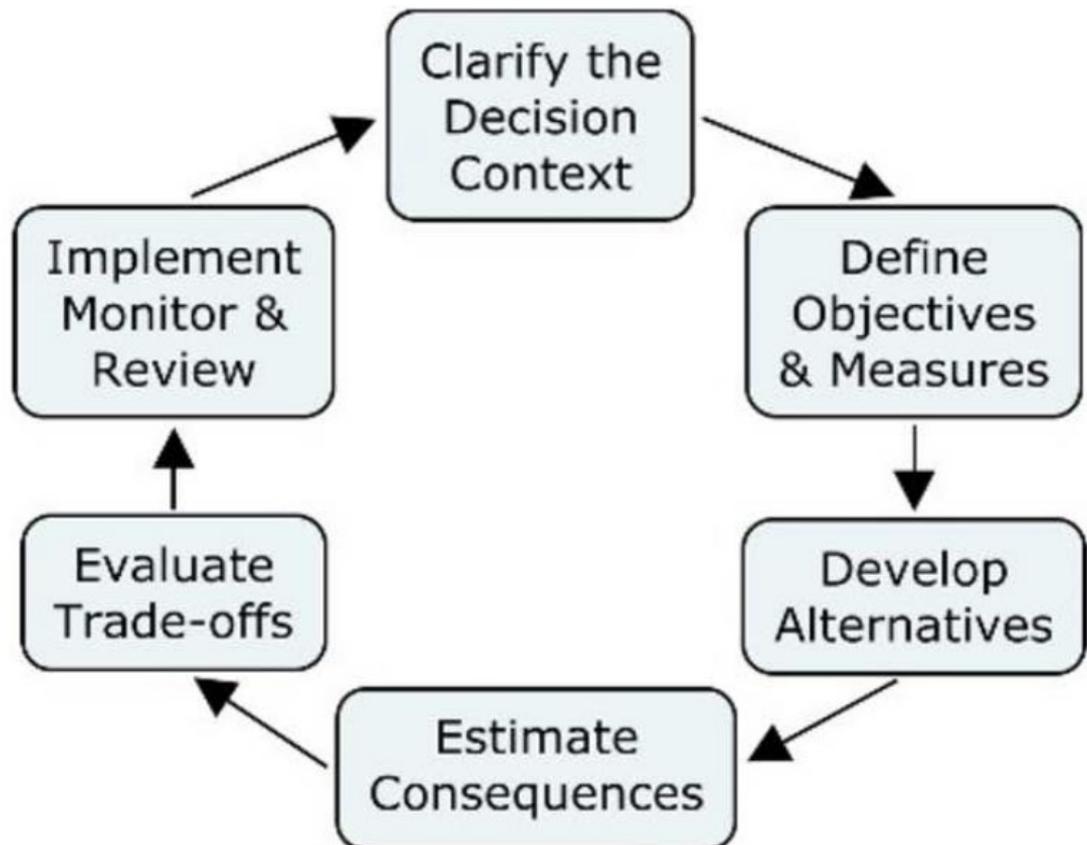
Joyce Stubblefield & others, EPA Region 6

Approach

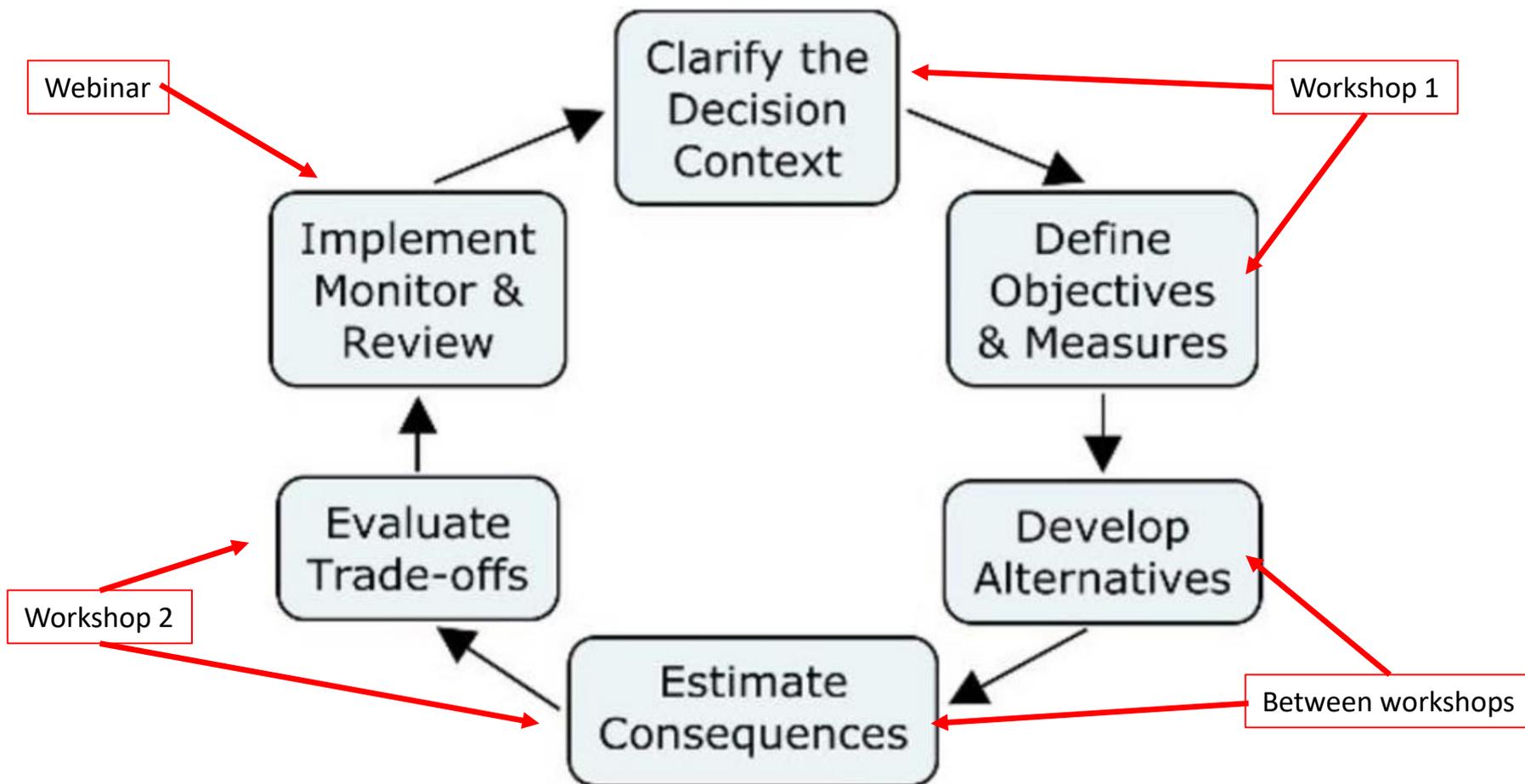


Structured Decision Making is...

- Transparent
- Inclusive
- Action-oriented



Structured Decision Making Ouachita River Timeline



Approach

Estimating Consequences



Ecosystem Goods and Services

“**components of nature**, directly
enjoyed, consumed, or used to yield
human well-being” *(Boyd & Banzhaf 2007)*

Human Well-being Domains

Education

Living Standards

Cultural Fulfillment

Health

Safety and Security

Social Cohesion

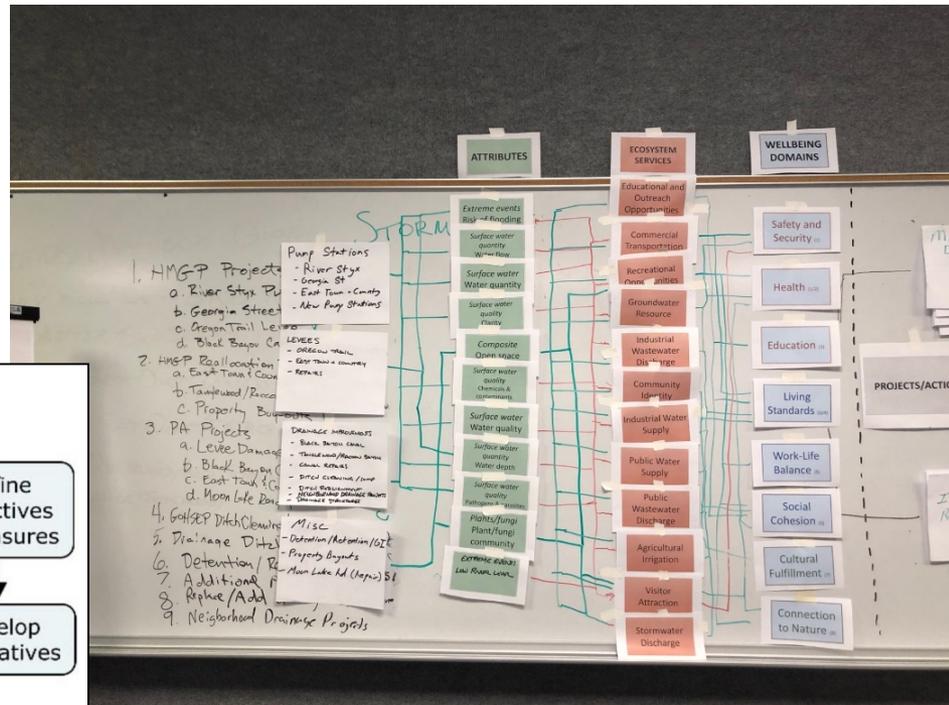
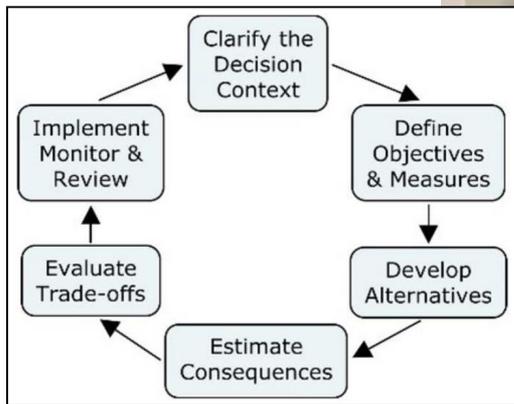
Work-life Balance

Connection to Nature

Example Mapping: Ouachita Parish, LA

Understanding the complete impact of proposed actions leads to community resilience

Structured Decision Making

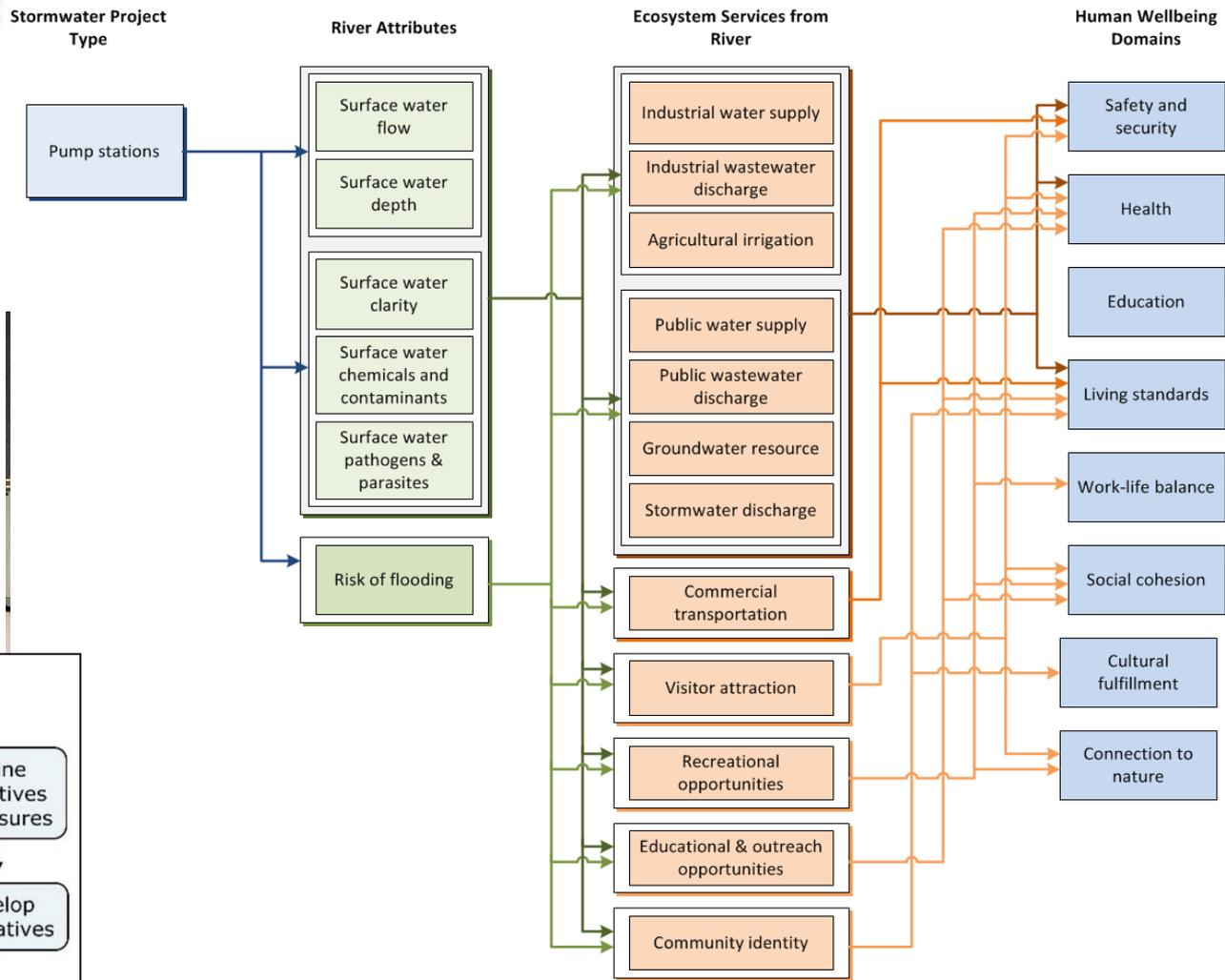
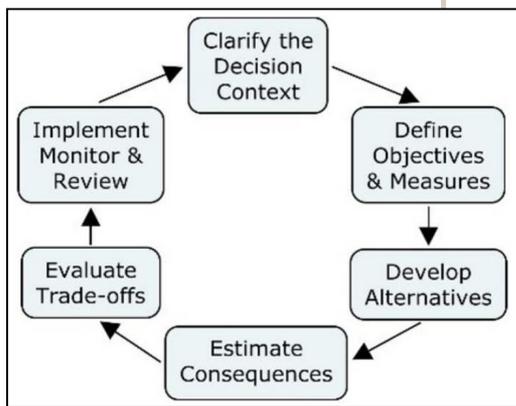


Bringing together stakeholder objectives and ORD tools

Example Mapping: Ouachita Parish, LA

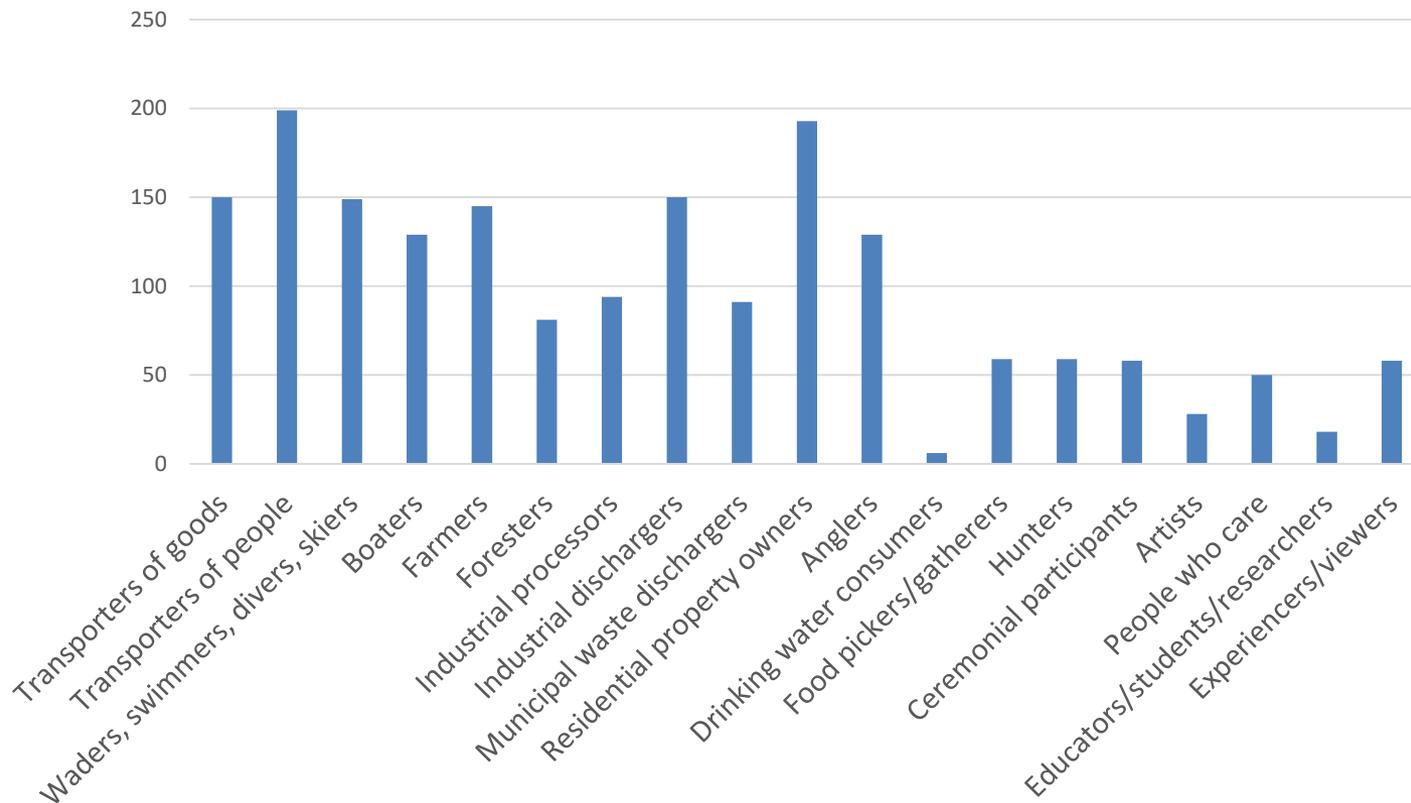
Understanding the complete impact of proposed actions leads to community resilience

Structured Decision Making



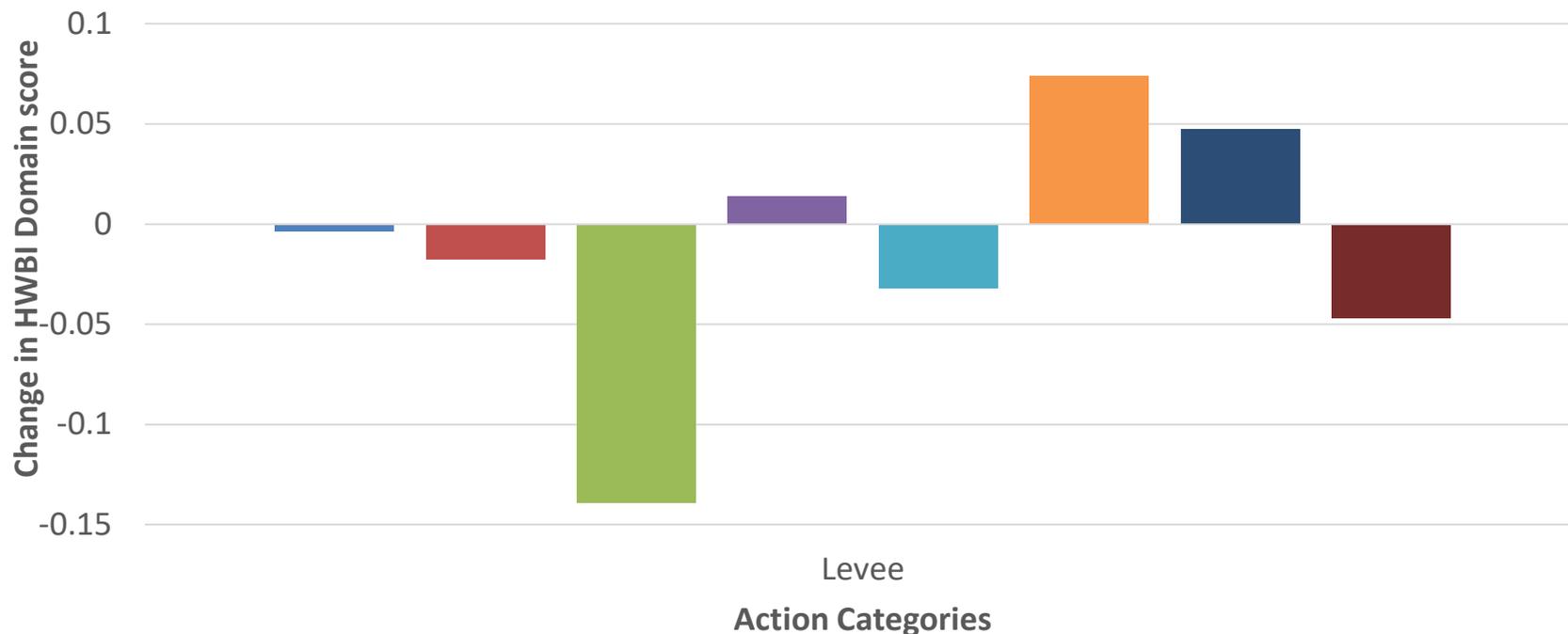
Bringing together stakeholder objectives and ORD tools

Results – Levee Maintenance



Who benefits from Levee Maintenance?

Results – Levee Maintenance



■ Connection to Nature	■ Cultural Fulfillment	■ Education	■ Health
■ Leisure Time	■ Living Standards	■ Safety & Security	■ Social Cohesion

Well-being impacts of Levee Maintenance?

Impact

Increased community access to tools and options for improving flood resilience that benefit the most people, establish a transparent decision process, and maximize stakeholder engagement.

- Cities of Monroe/West Monroe and Ouachita Parish will use this information to petition the Army Corps of Engineers on levee and river channel maintenance
- EPA Region 6 and ORD are working with state of Louisiana on transferring approach to other communities under the Louisiana Watershed Initiative

Take Home Messages

- ORD science-based tools are being used by the Monroe/West Monroe community to understand how proposed actions may impact stakeholder well-being.
- This suite of strategies and tools is transferable both between communities and between issues.
- ORD researchers are working with state and regional partners to make these strategies more accessible.
- Ecosystem goods and services and human well-being are effective tools for connecting people to benefits.

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