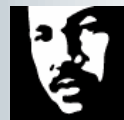


# A process-based approach to monitoring restoration effectiveness

## PART 1: APPROACH, HYPOTHESES, & DESIGN

J. Latterell, D. Eastman, T. Butler, R. Timm, H. Berge  
King County Water and Land Resources Division (DNRP)



**King County**

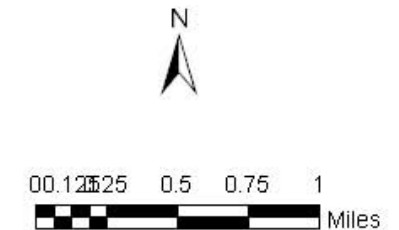
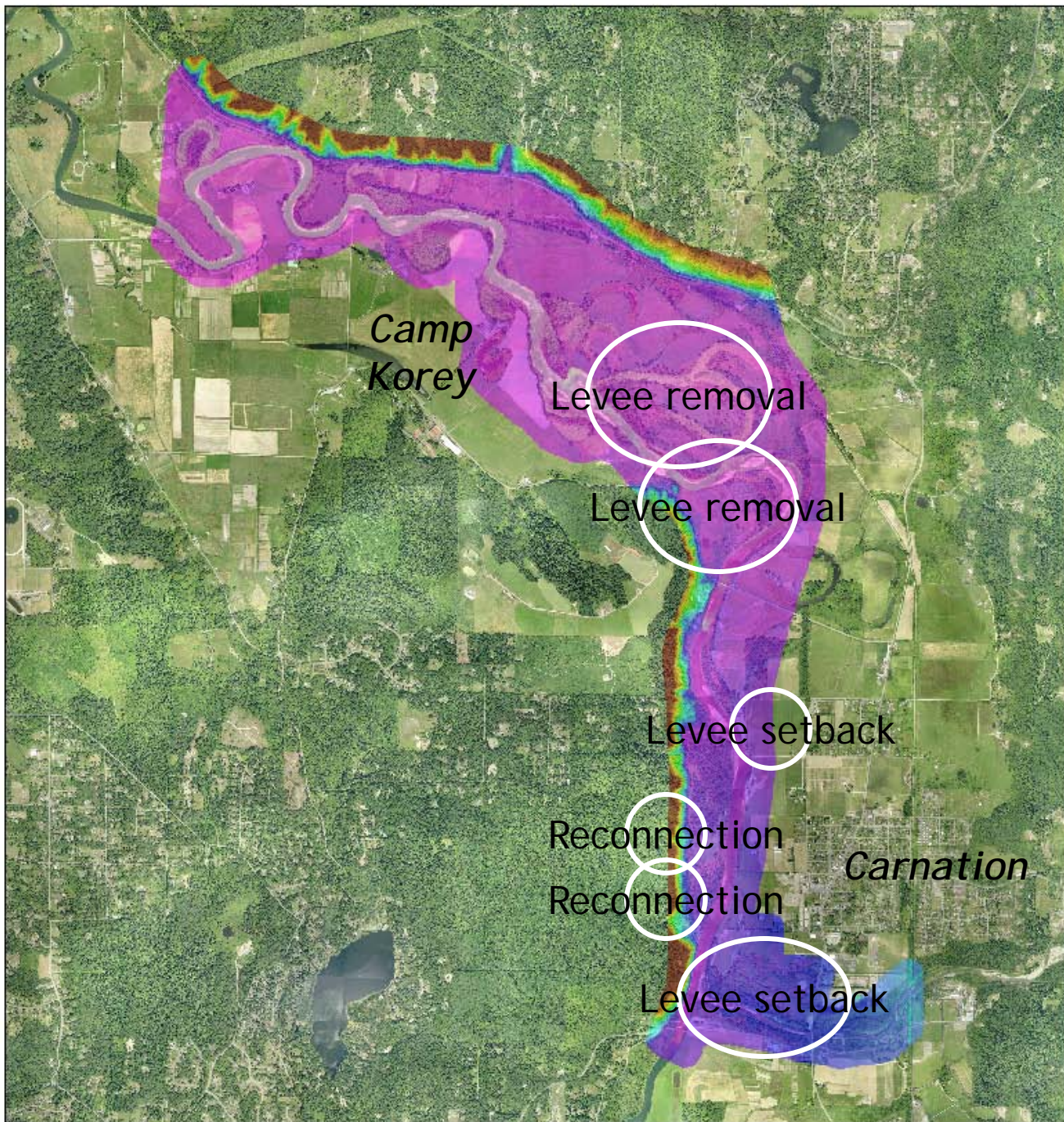
# The Situation

- Large river restoration is accelerating
  - *(Acquisitions)*
  - *Channel migration*
  - *Floodplain connectivity*
  - *Wood placement & recruitment*
  - *Revegetation*
- Outcomes are uncertain, potentially risky
  - High cost of 'failure'
  - High cost to achieve success (\$\$)
  - High potential benefit!
- *Effectiveness monitoring warranted*

# A Case Study

Reasons to integrate monitoring:

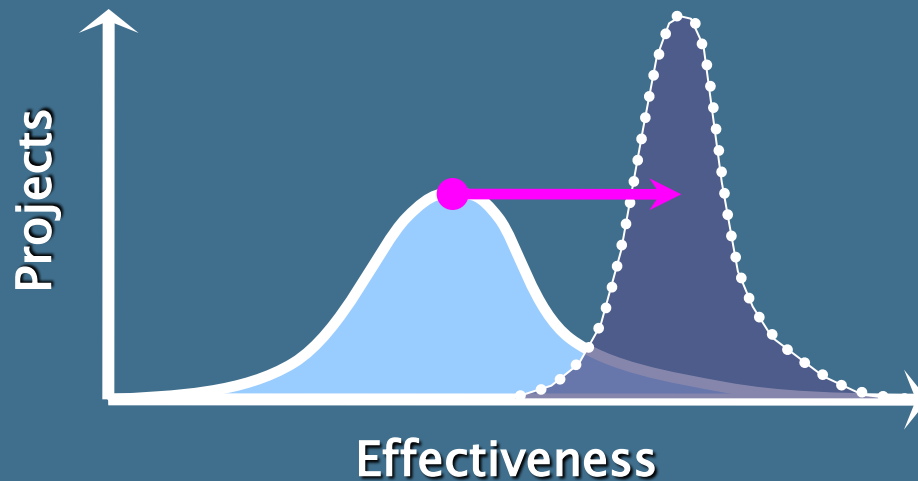
- Relevant scale
- Off-site effects
- Interactions
- Efficiency



Project Effectiveness Monitoring

Treatment/Restoration Reach

# Why monitor?



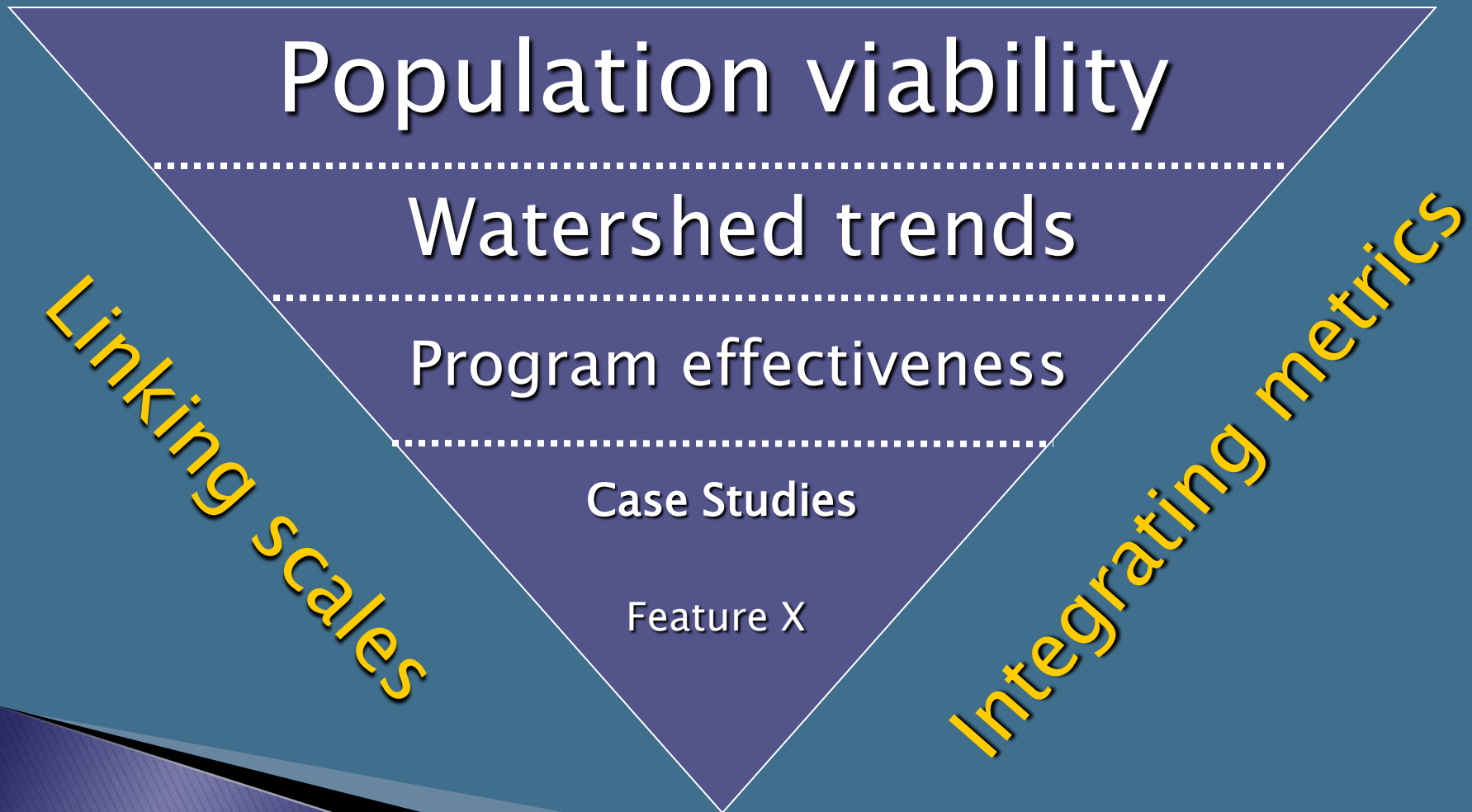
## Monitoring

Are projects are meeting objectives?  
Reduce uncertainty in future projects!

“We only  
progress  
through a  
series of  
**regulated  
errors.**”

Every move is  
a **partial  
failure** to be  
corrected by  
the next one.”

# Technical Challenges





Time

Habitat

Process

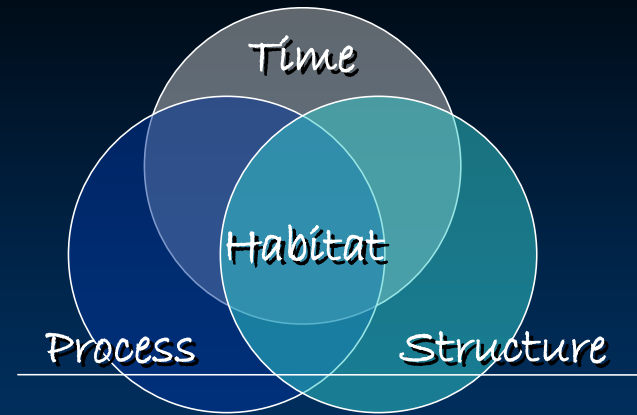
Structure

Key premises



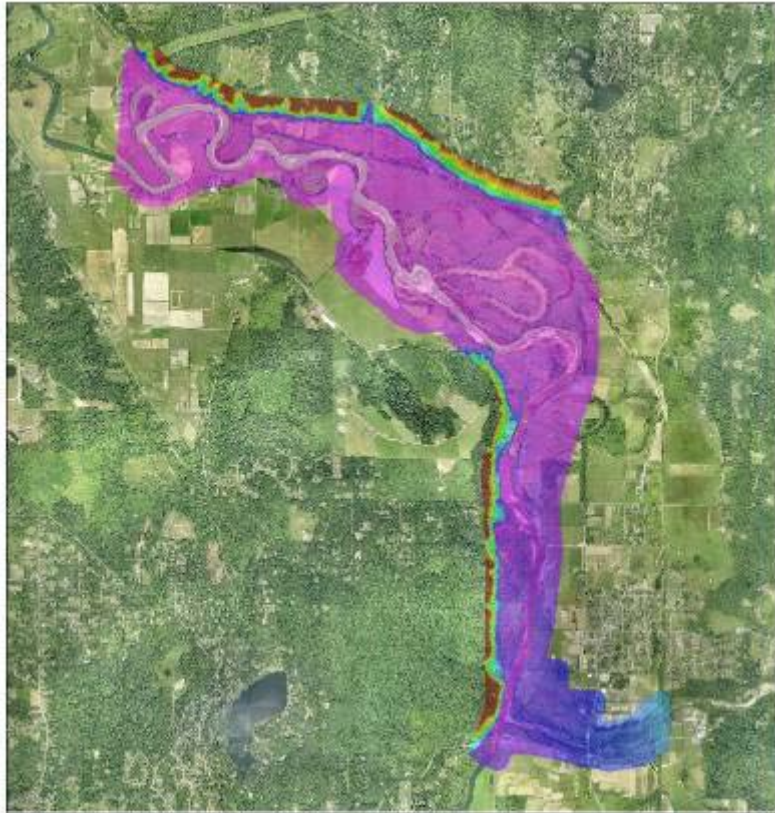
# Hypotheses

- Rearing habitat & fish
  - More, larger, diverse, and used
- Floodplain
  - Available more often
- Channel
  - Dynamic, habitat-forming, complex
- Wood
  - More delivery, more trapped, more effective
- Sediment
  - Patchier, better quality
- Riparian
  - More natural regeneration, faster turnover

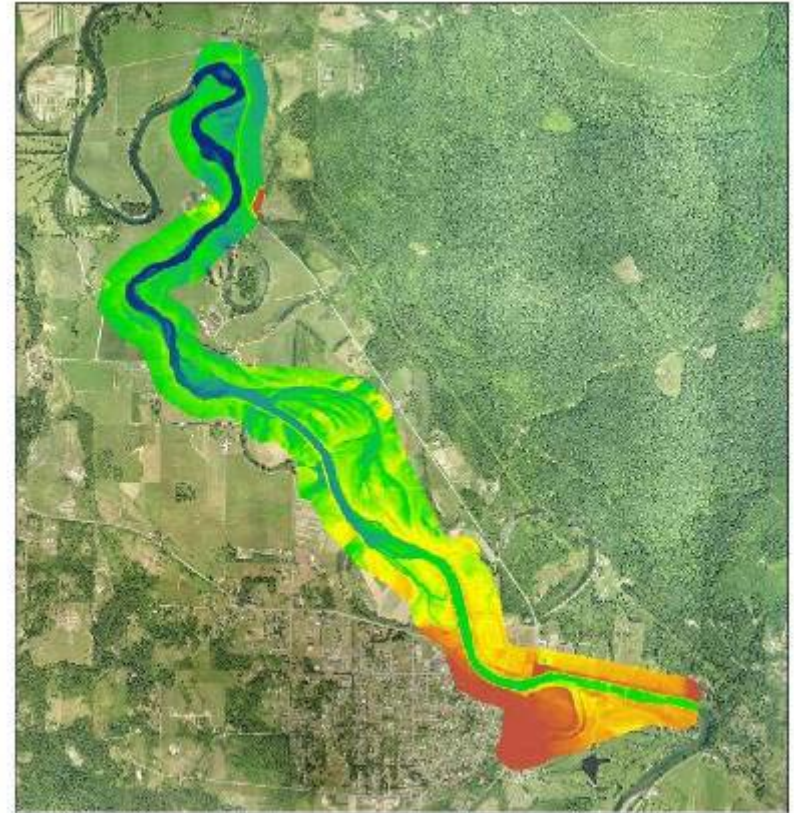


# Design & Scope

Treatment Reach

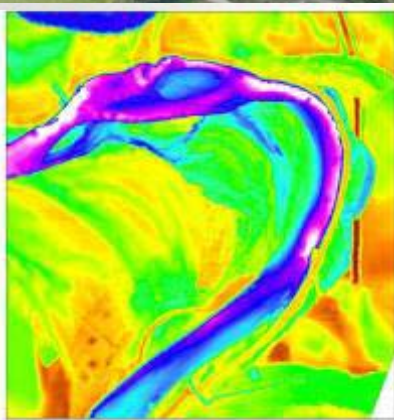


Control Reach

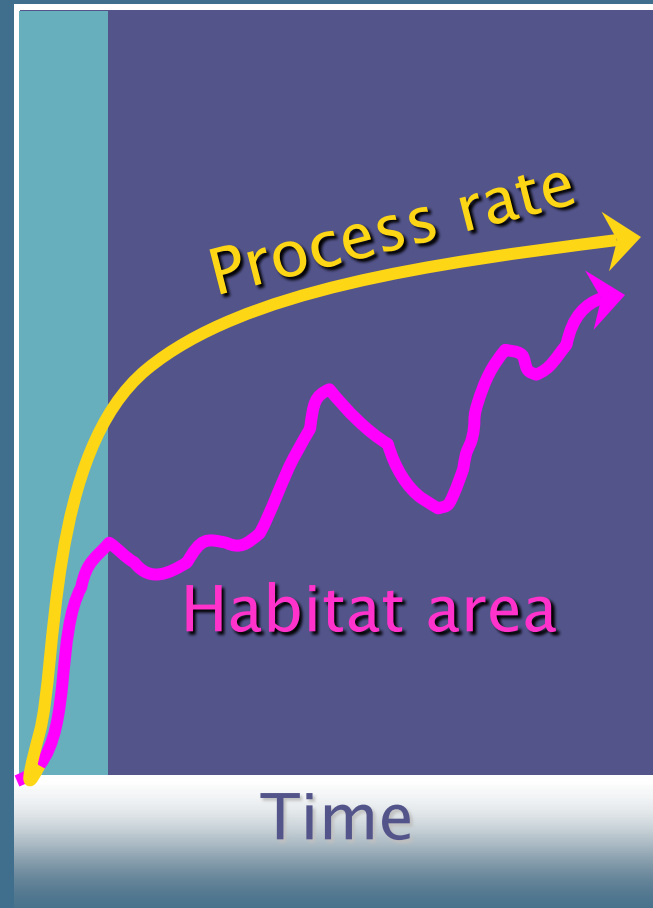
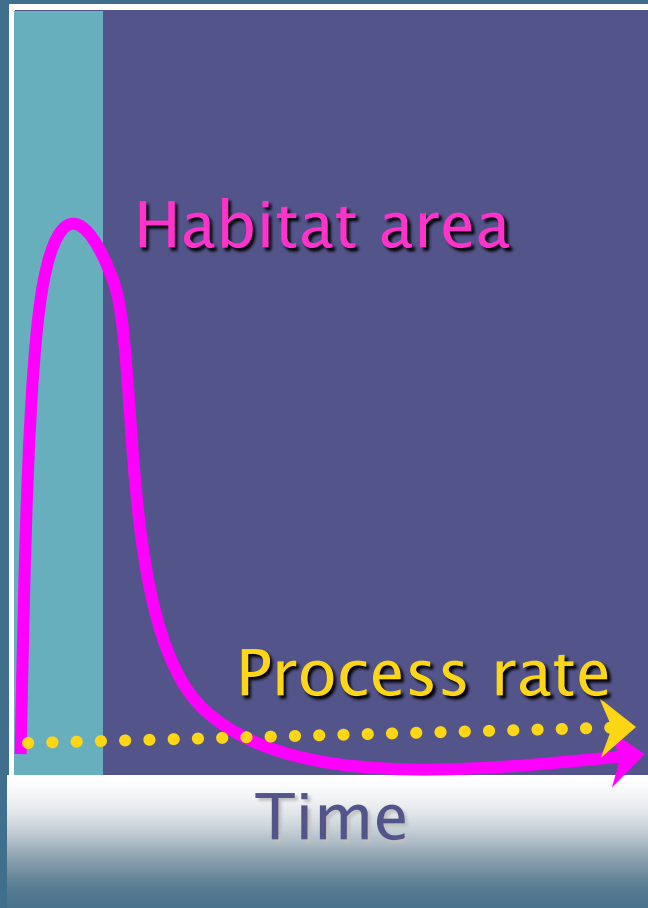


# Process Rates

- ▶ Floodplain connectivity
- ▶ Channel migration
- ▶ Scour and deposition
- ▶ Large wood recruitment
- ▶ Forest regeneration



# Why monitor processes?



“What drives our planet are processes, and the products are incidental and temporary”- *Stettler*

# Structural Changes



- ▶ Habitat Units
- ▶ Channel pattern
- ▶ Form of streambed
- ▶ Wood loading
- ▶ Spawning gravels

# Fish Use

➤ Adults



➤ Juveniles

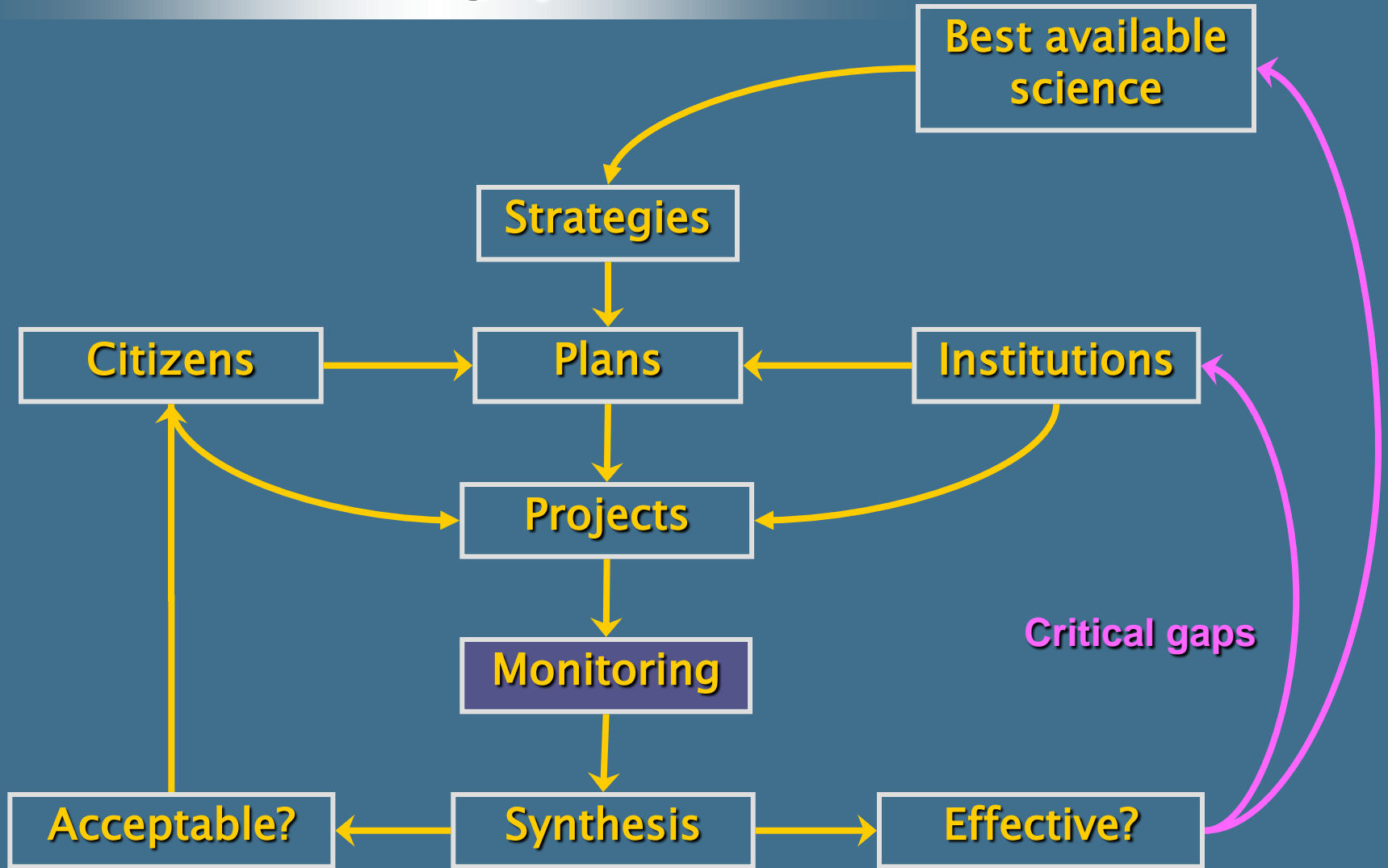


# Synthesis

An aerial photograph of a river system. A section of the river and its immediate surroundings is highlighted in a bright cyan color. The river flows from the top left towards the bottom right. The surrounding landscape is a mix of dark, forested areas and lighter, possibly agricultural or developed land. The cyan highlight follows the course of the river and encompasses several meanders and bends.

- ▶ Are processes recovering?
- ▶ Are critical habitats enhanced?
- ▶ Do fish use/prefer restored habitats?
- ▶ Were public interests protected?
- ▶ Improvements? Surprises?

# The learning process...



# Acknowledgments

- King Conservation District
- WRIA 7
- King County WLRD staff
- City Light (S. Powell, E. Albow, D. Chapin)
- NOAA (G. Pess, T. Beechie, P. Roni)
- SRFB/Tetra-Tech (J. O'Neal)
- Wild Fish Conservancy (M. Wait, J. Glasgow)
- Stillwater Sciences (D. Booth)

