

A stylized graphic of a river or stream flows across the top of the slide. It consists of a thick blue line representing the main channel, with several thinner, wavy orange lines branching off to represent tributaries or floodplains.

Columbia Environmental  
Research Center

## *River Corridor Habitat Dynamics*

# Conceptualizing and Communicating Ecological River Restoration

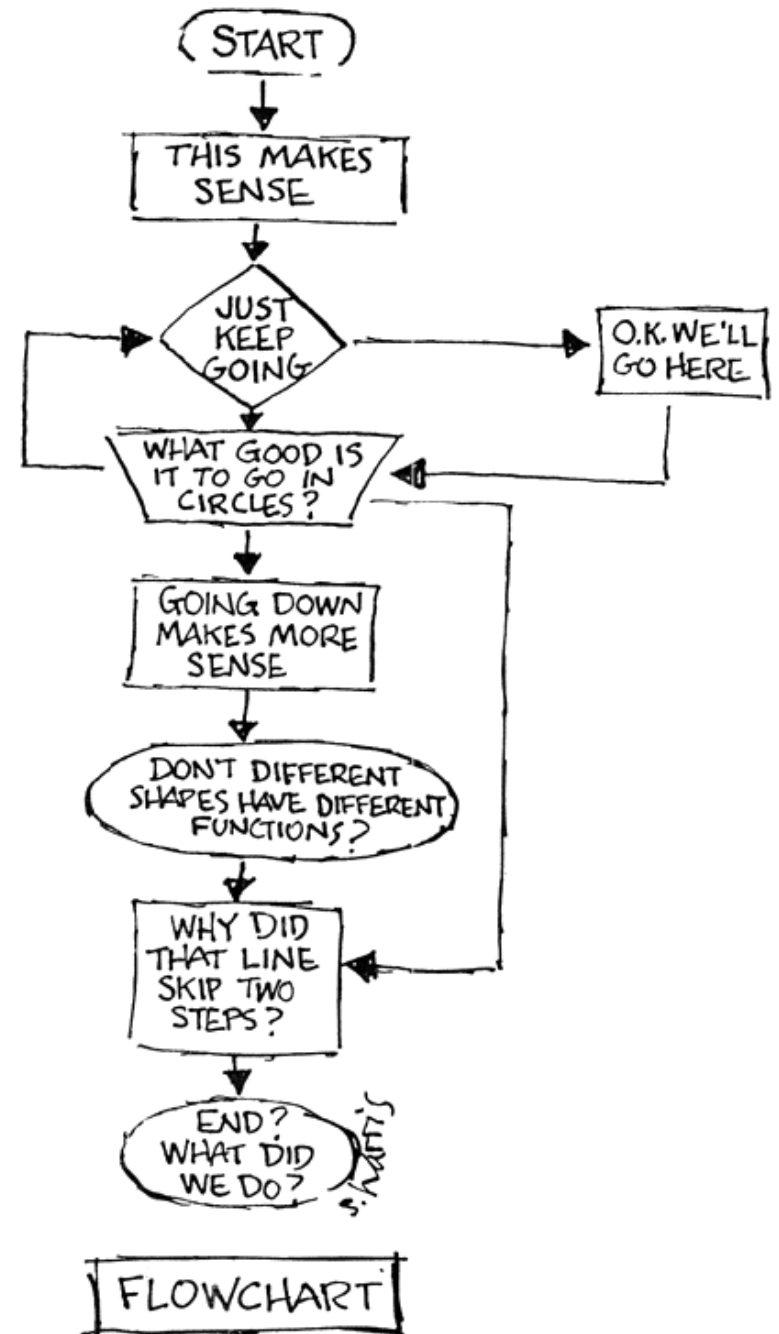
**Robert B. Jacobson**  
U.S. Geological Survey  
Columbia, Missouri

**Jim Berkley**  
EPA, Denver

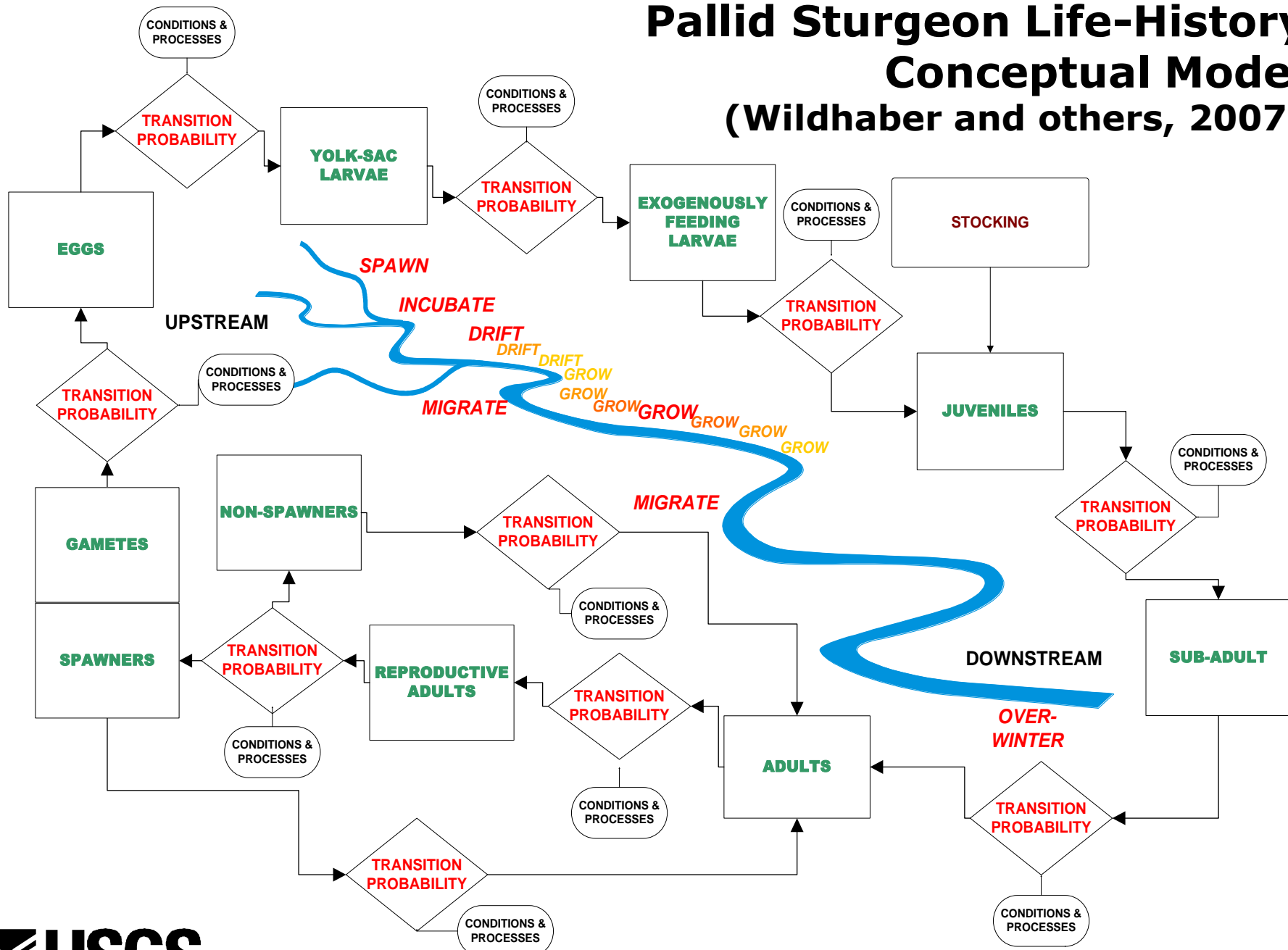
U.S. Department of Interior  
U.S. Geological Survey

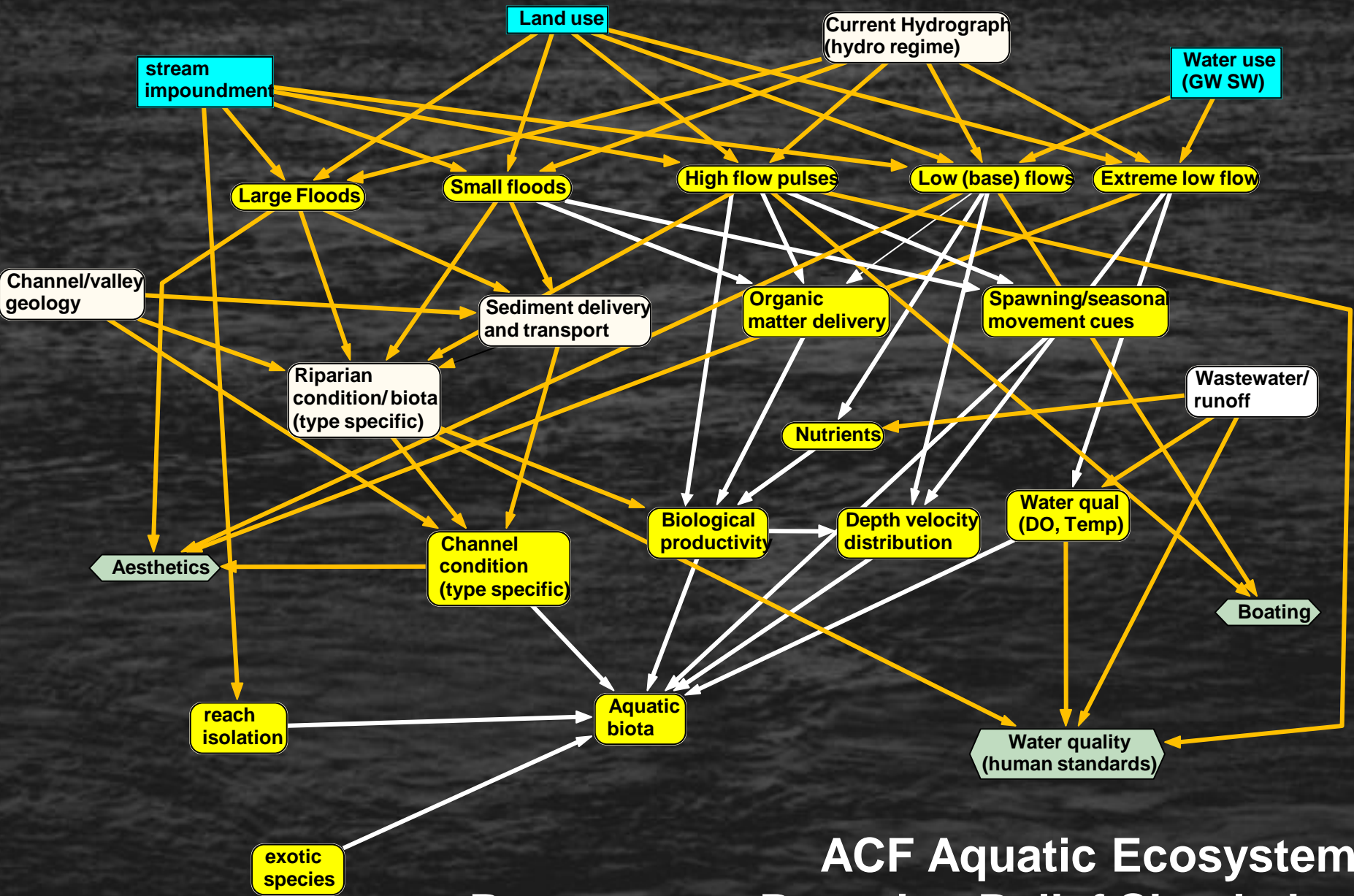
# Conceptual Models:

- Communicate – diffuse knowledge about complex systems
- Organize understanding
- Enforce systematic thought
- Formulate hypotheses
- Plan assessments
- Precursor to simulation



# Pallid Sturgeon Life-History Conceptual Model (Wildhaber and others, 2007)



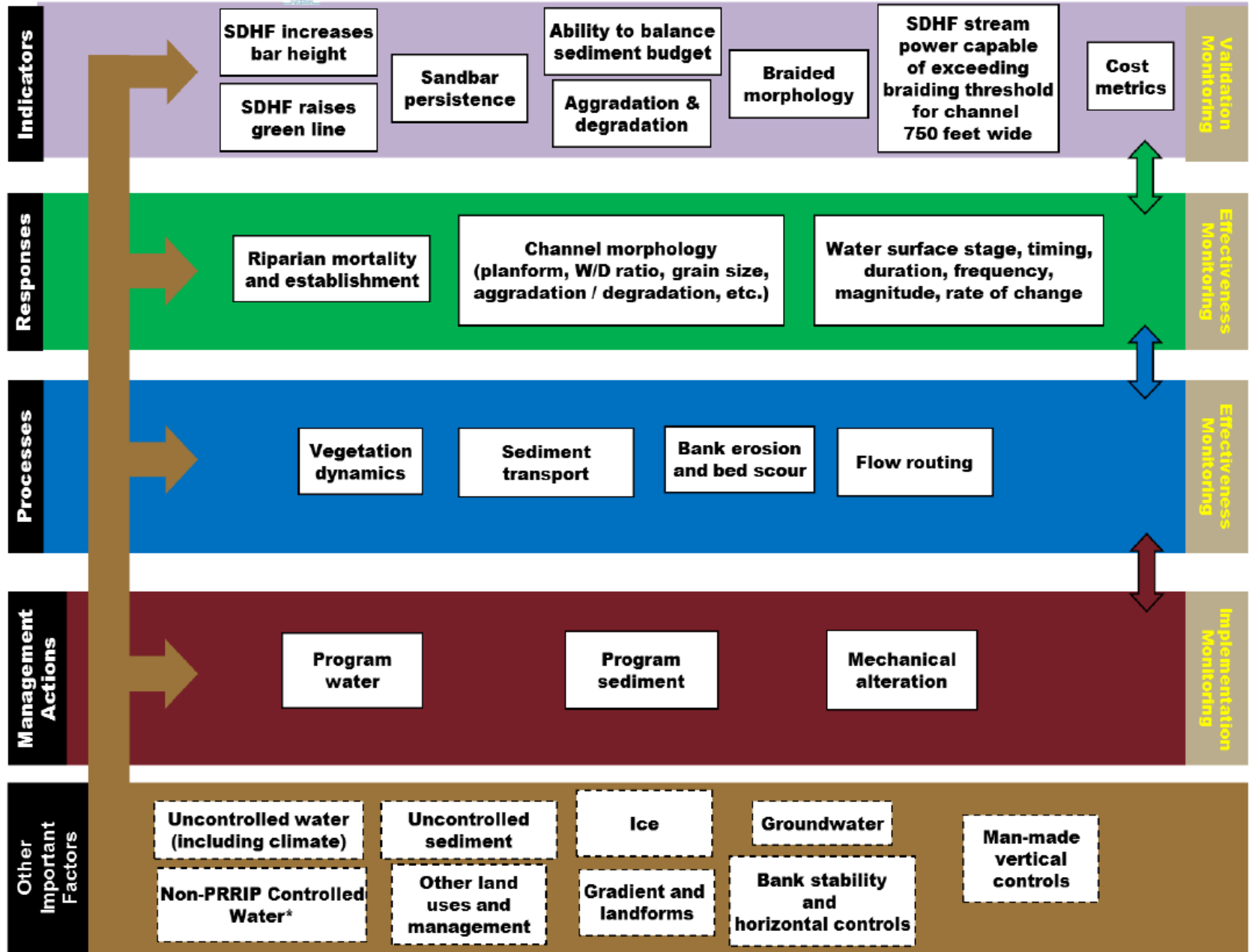


# ACF Aquatic Ecosystem Precursor to Bayesian Belief Simulation

(USGS SERAP TEAM; James Peterson)



# Platte River Recovery Implementation Program





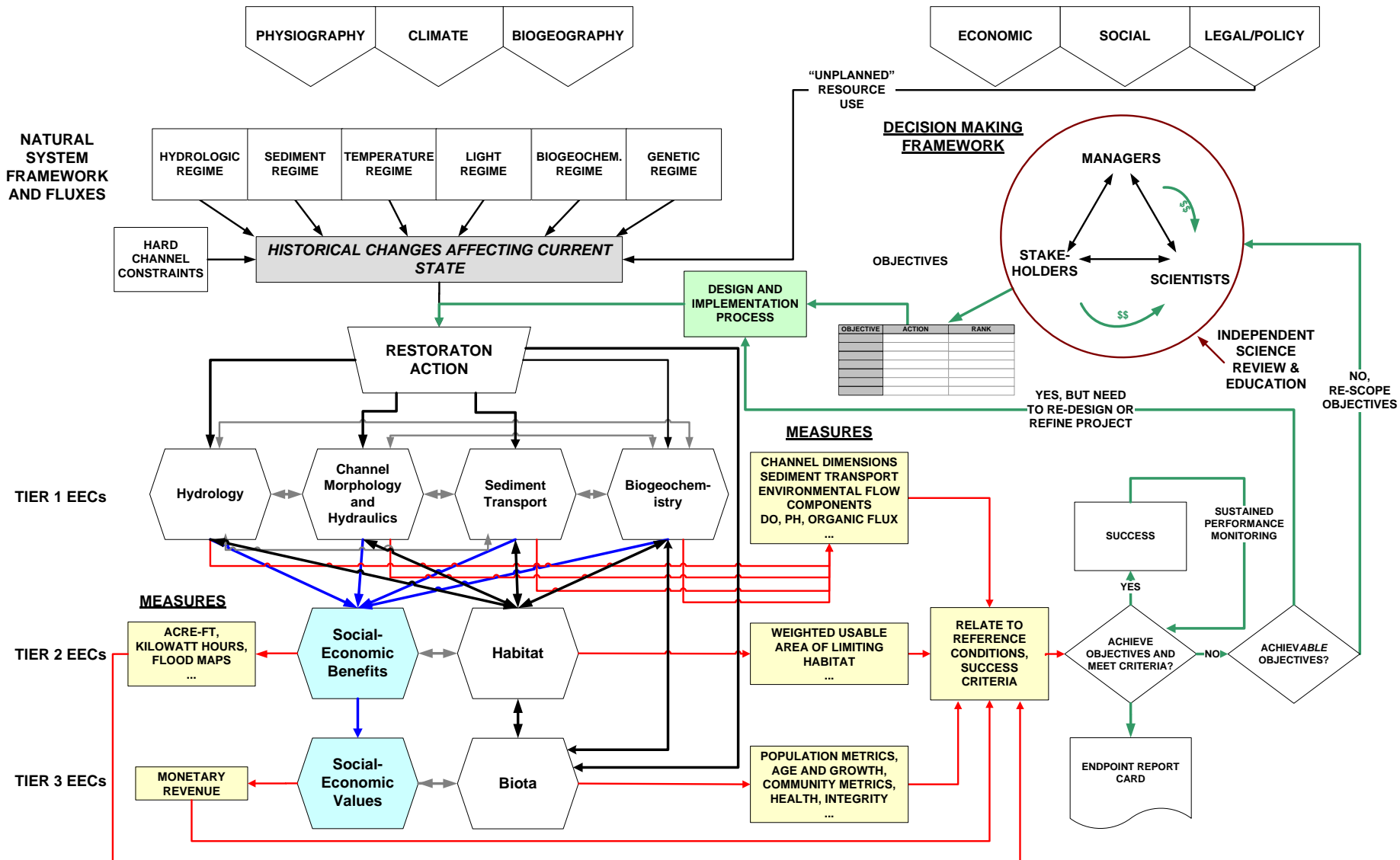
# *Properties*

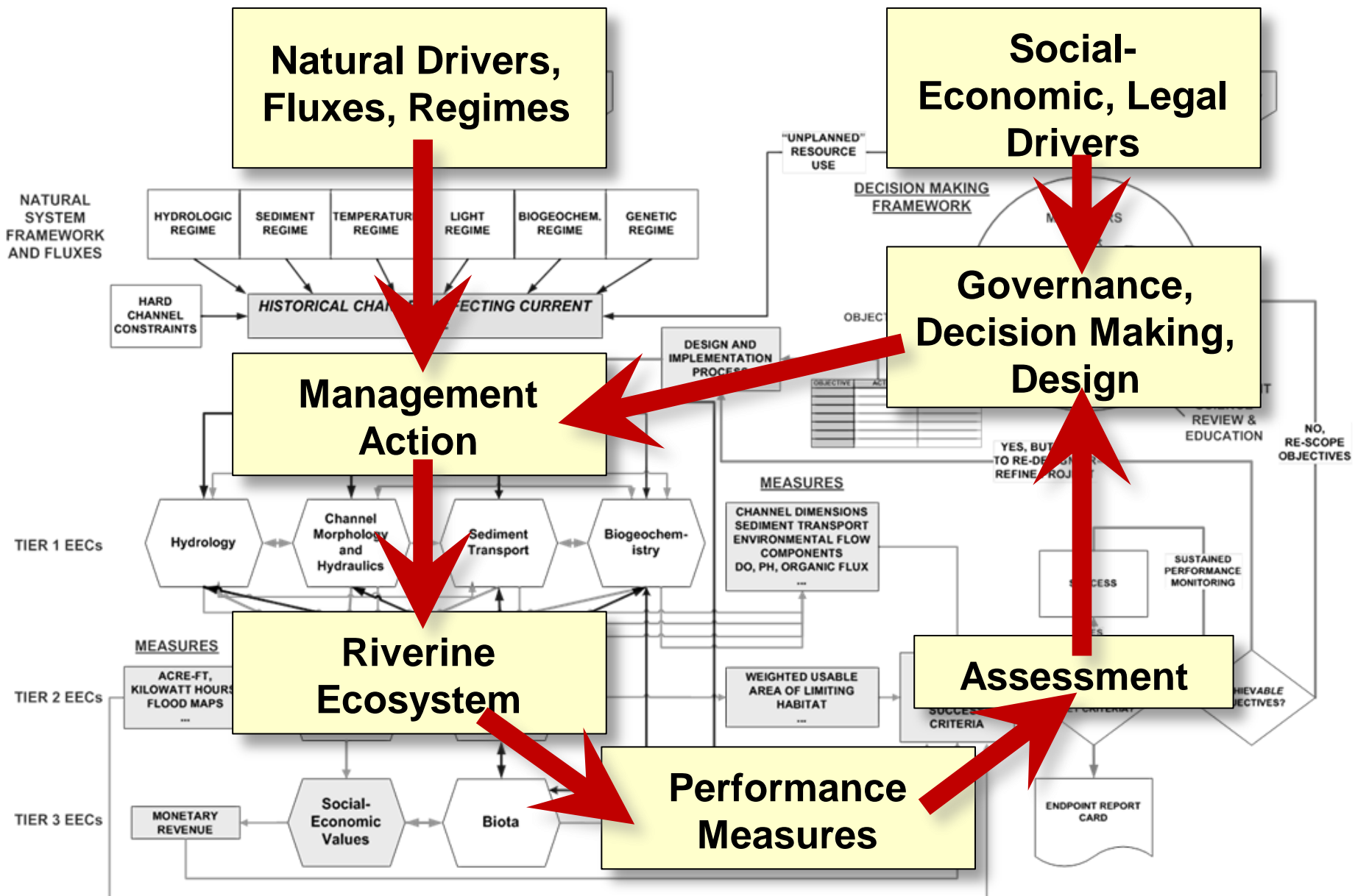
A conceptual model should be:

- Generic
- Specific
- Comprehensive
- Focused, parsimonious
- Simple
- Sufficiently realistic
- Efficiently developed
- Inclusive and organically developed

## NATURAL DRIVERS

## SOCIAL-ECONOMIC DRIVERS

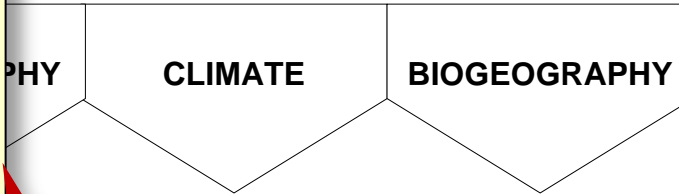




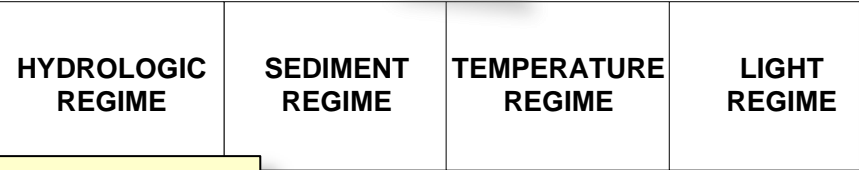


# NATURAL DRIVERS

**Fluxes: mag, freq, duration, timing, rates...**



**History and non-reversible changes**



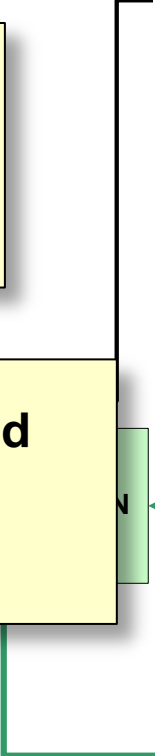
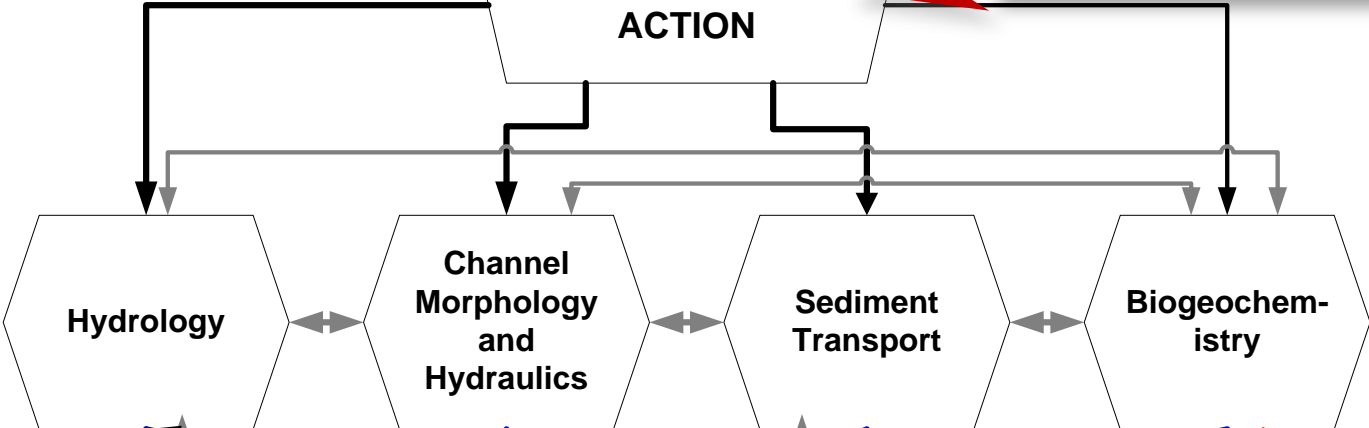
**NATURAL SYSTEM FRAMEWORK AND FLUXES**

**Geologic and engineered constraints**

**HISTORICAL CHANGES AFFECTING CURRENT STATE**

**Restoration and management decisions**

**RESTORATION ACTION**

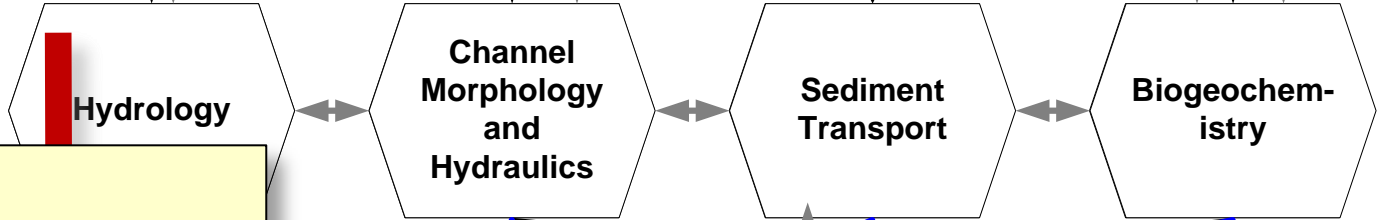


**MEASUREMENTS**  
CHANNEL SEDIMENT ENVIRONMENT COMPOSITION (DO, PH, C)

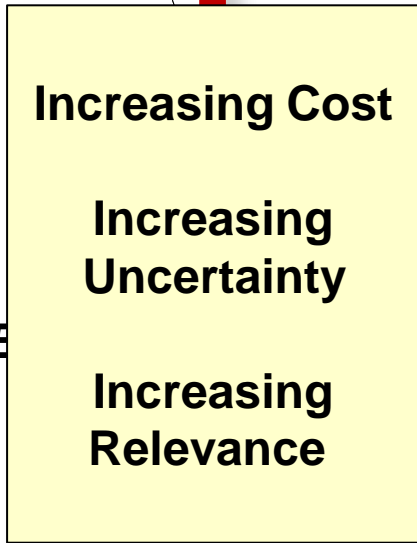
**Essential Ecosystem  
Characteristics:**

Harwell and others, 1999  
Lubinski and Barko, 2003  
Jacobson and Galat, 2008

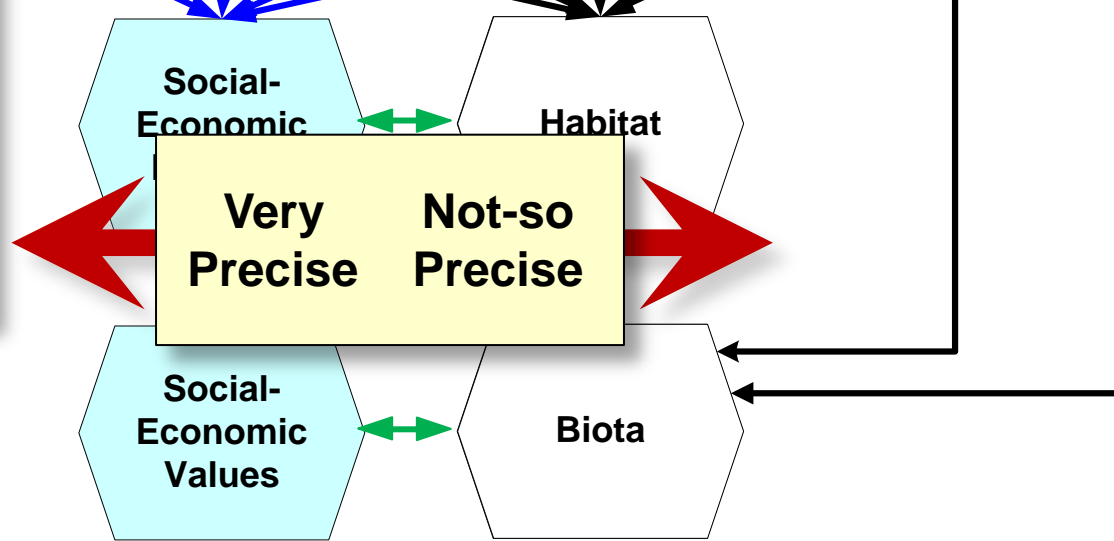
**TIER 1 EECs**



**TIER 2 EECs**



**TIER 3 EECs**



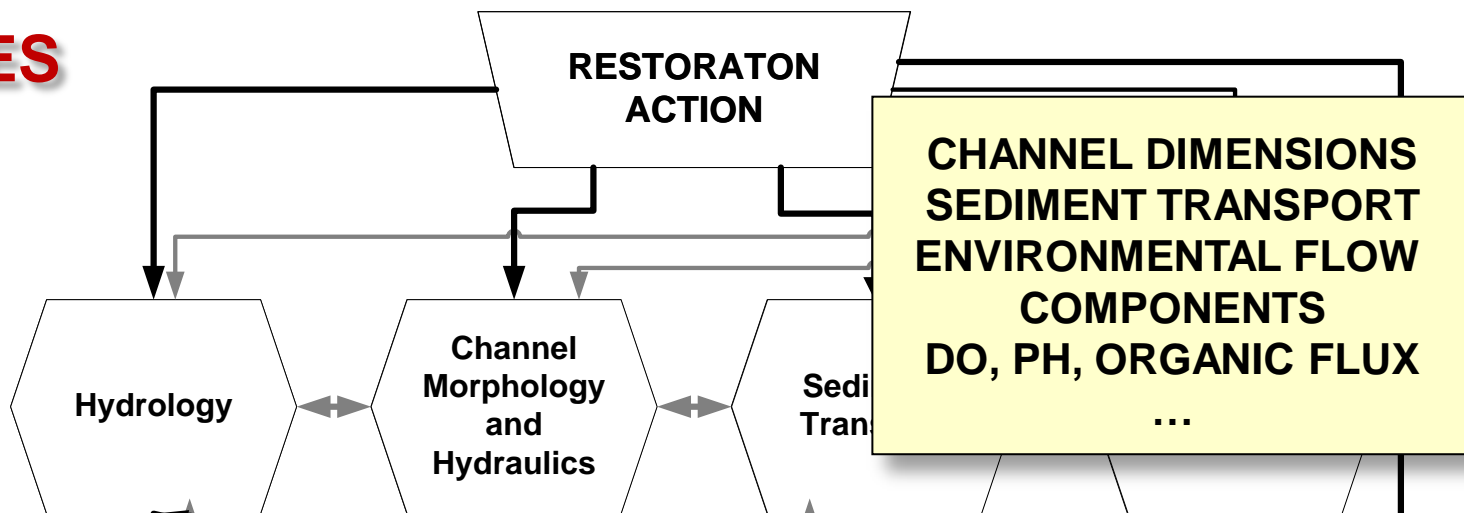
Social-Economic "Natural"

**Ecosystem Services**

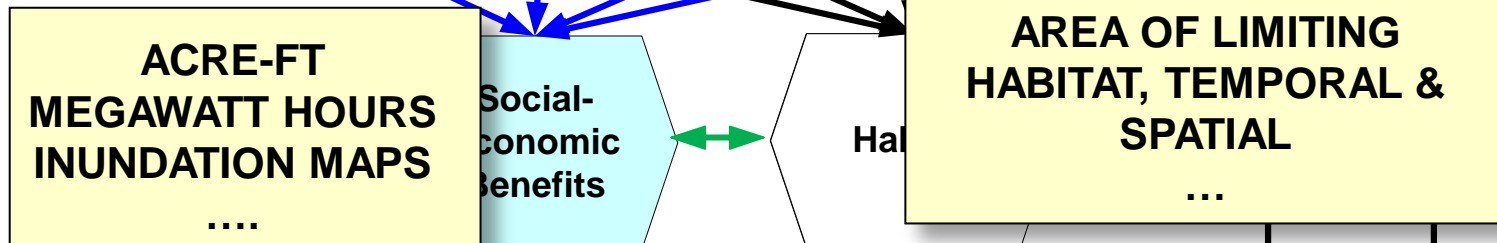


# MEASURES

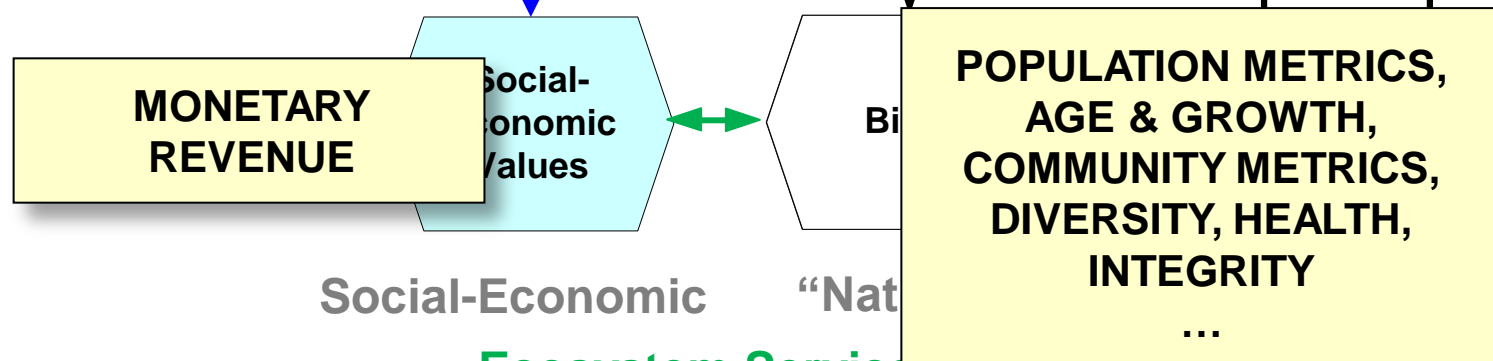
*TIER 1 EECs*



*TIER 2 EECs*



*TIER 3 EECs*



Social-Economic "Nat  
Ecosystem Services

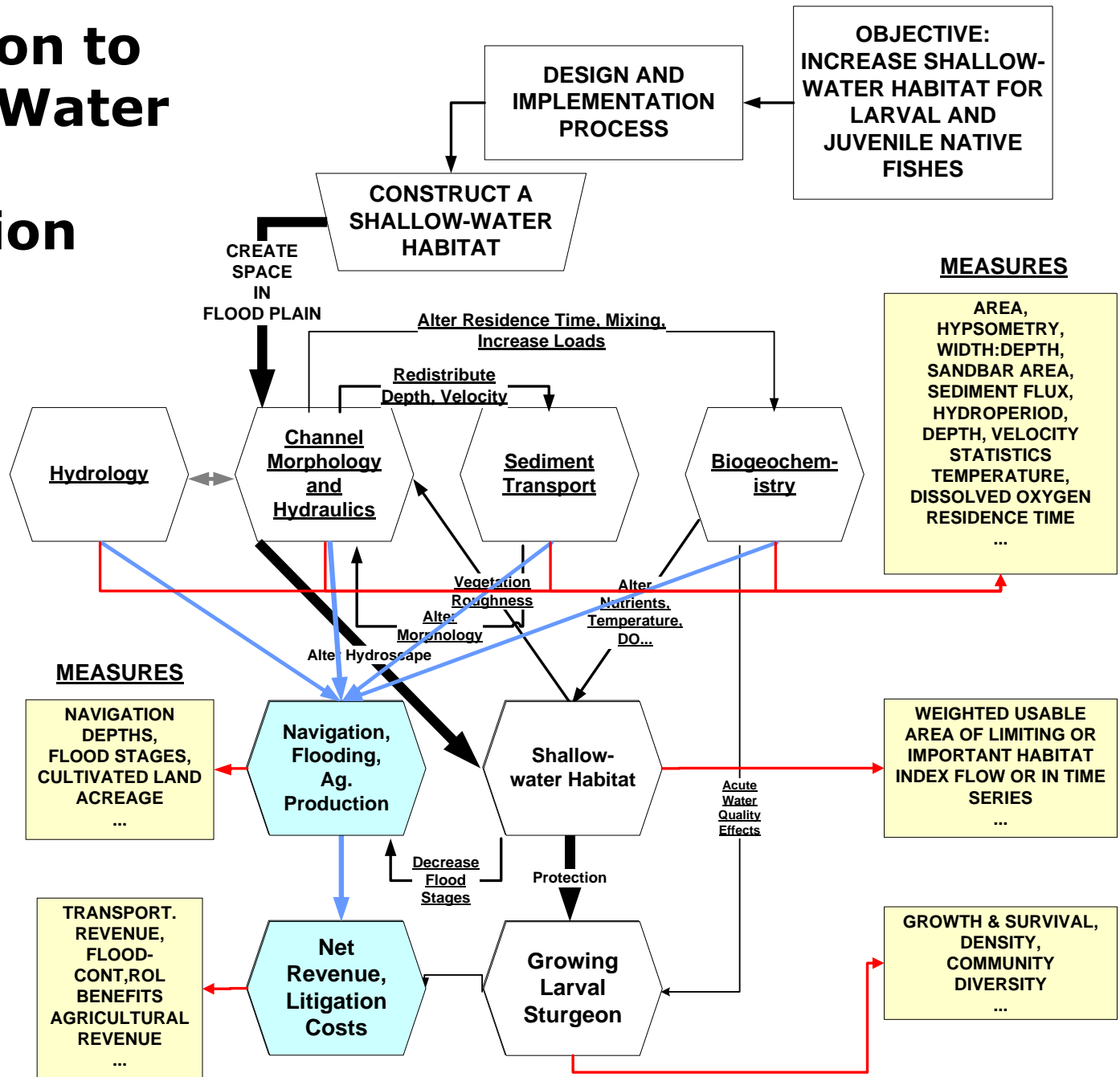


# Shallow-Water Habitat Restoration

## Side-Channel Chute at Lisbon Bottom, Missouri

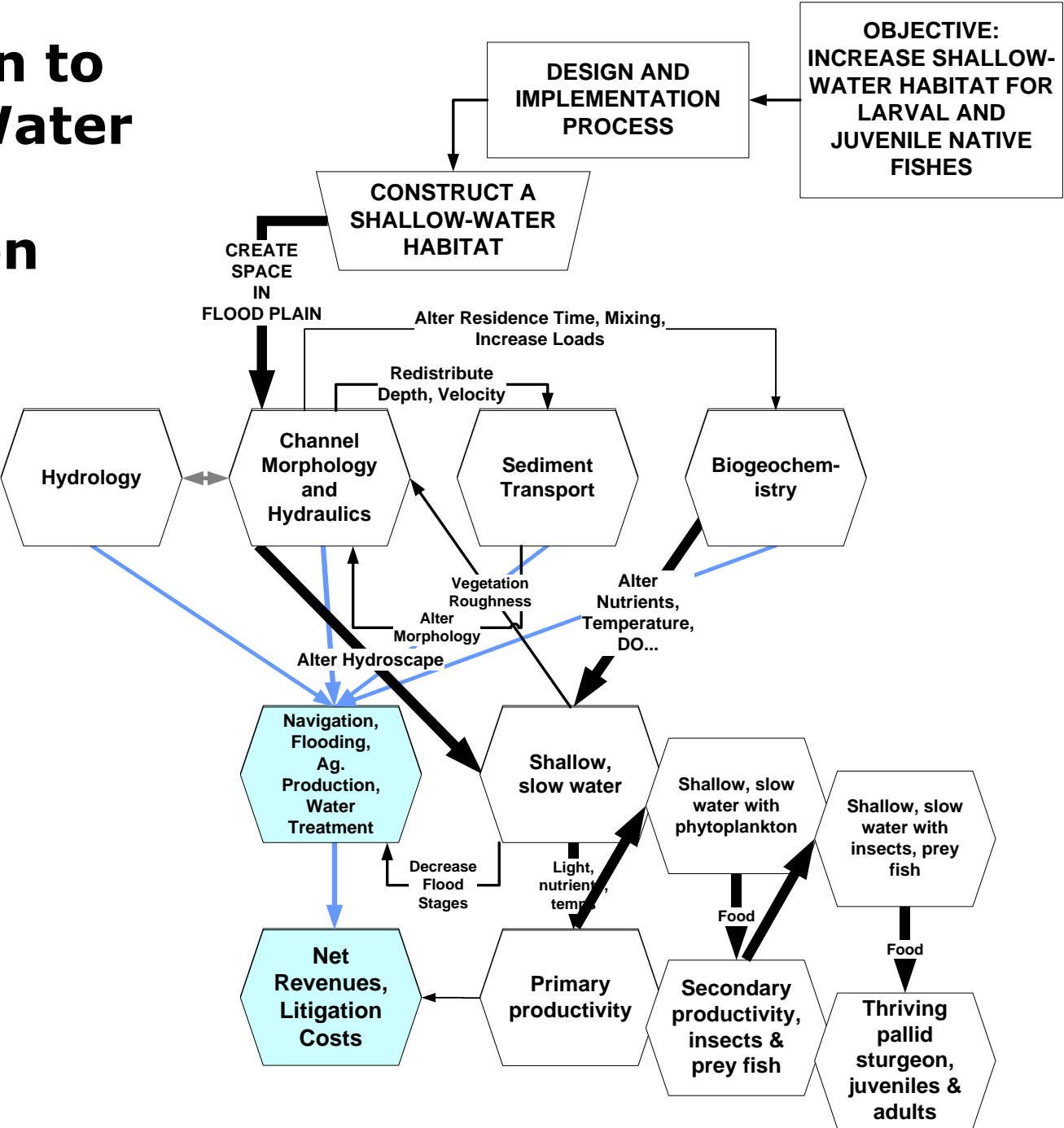


# Application to Shallow-Water Habitat Restoration





# Application to Shallow-Water Habitat Restoration



# ***Summary: Conceptualizing and Communicating Ecological River Restoration***

## **CEMs benefit from including:**

- Separation of natural & social-economic drivers
- Fluxes & changes of fluxes: magnitude, frequency, duration, timing, rate of change
- Hard constraints: natural and engineered
- History: lags, complex responses – especially when sediment is involved.

# ***Summary: Conceptualizing and Communicating Ecological River Restoration***

## **CEMs benefit from including:**

- Comprehensive structure of EEC's stimulates questions and hypotheses that may not be readily apparent, surprises
- Hierarchical structure of EECs and metrics that enforces consideration of cost:benefit and value of cause & effect information
- Parallel "natural" pathway and social-economic pathway to consider tradeoffs



# *Shameless Advertisement*

Jacobson and  
Berkley, 2011

In

Simon, Bennet,  
Castro, Stream  
Restoration in  
Dynamic Fluvial  
Systems

Stream Restoration  
in Dynamic Fluvial Systems:  
Scientific Approaches,  
Analyses, and Tools



Andrew Simon, Sean J. Bennett,  
and Janine M. Castro  
*Editors*

