Instream Flow Issues & Opportunities

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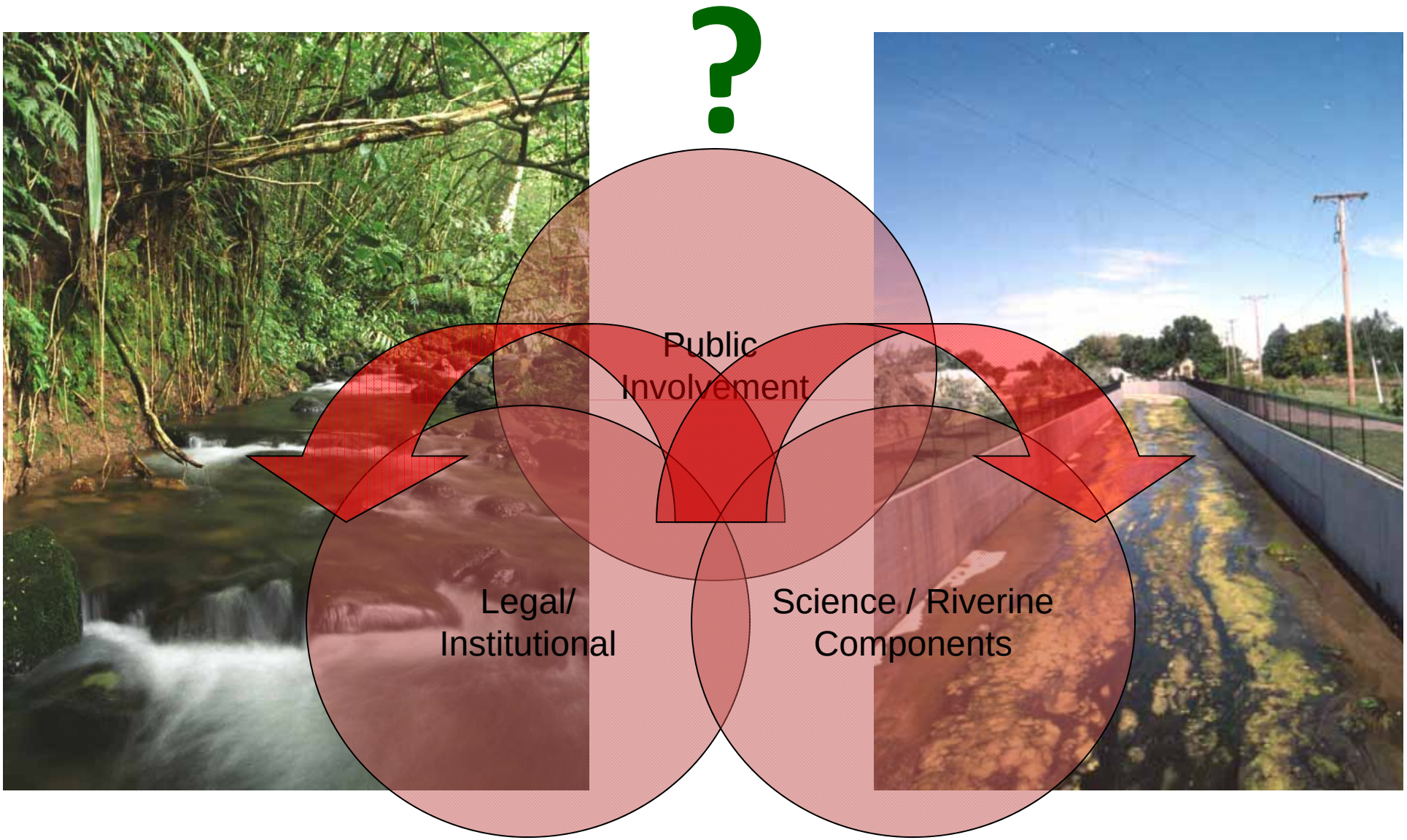
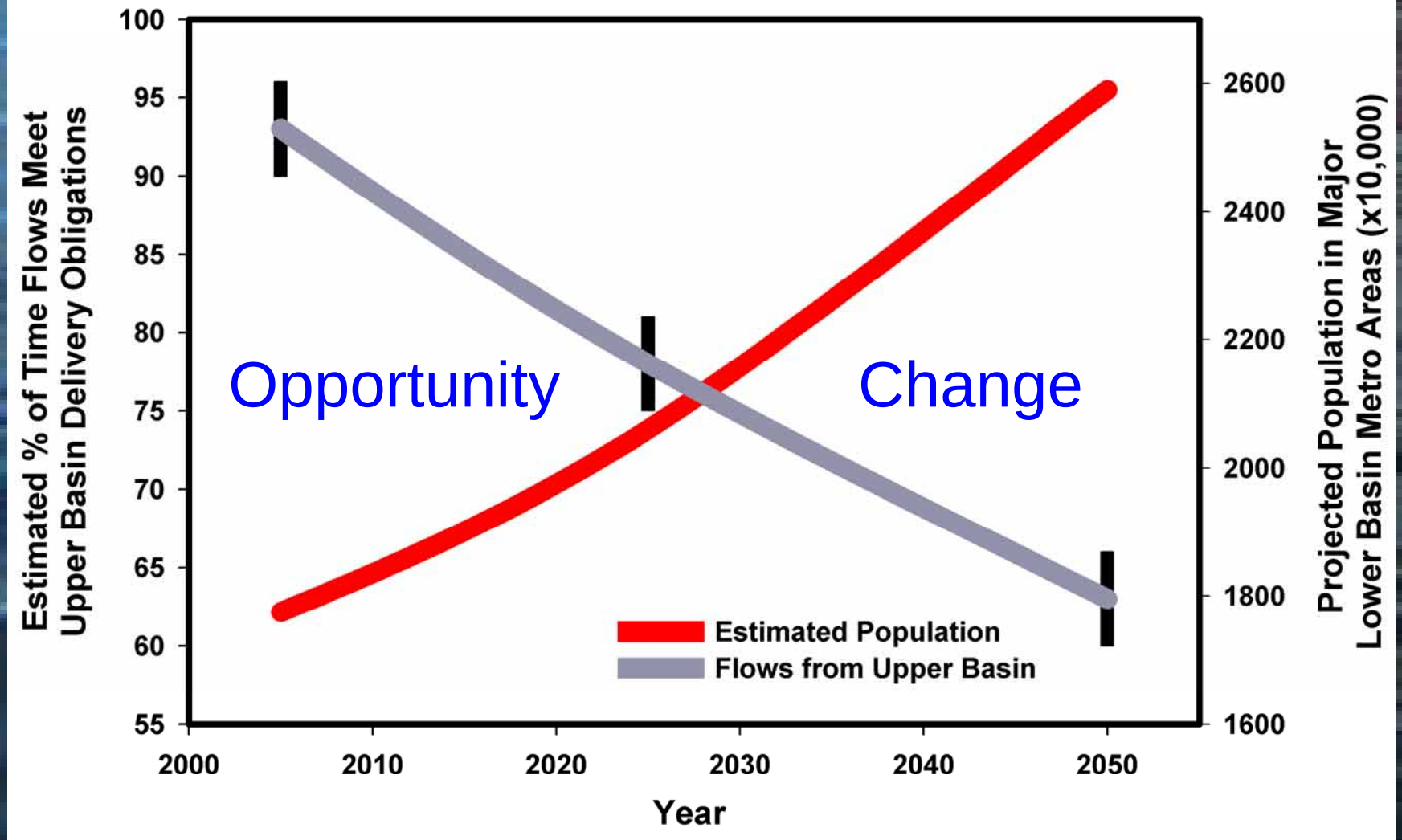
• Instream flow perspectives
• Definitions & concepts
• The science of instream flow
• Challenges and opportunities



How we integrate each element affects how the world looks and our quality of life.

Projected Upper Colorado River Flows vs. Population Growth in Major Lower Basin Metropolitan Areas



Source: McCabe and Wolock 2007

Achieving maximum beneficial use of water involves more than building "buckets and pipes" and delivering commodities.

The value of water is measured by the full range of functions it provides.


These Benefits Are
Broadly Termed
'Ecosystem Services'

Finding Balance is a Matter of Value

Valuation, in practice, involves some of the oldest problems in economics – revealing and aggregating preferences and addressing uncertainties

Values are perpetually evolving

from Daily et al. 2000

Instream Flows Play a Key Role

(that's not always recognized)

Instream Flows Myths

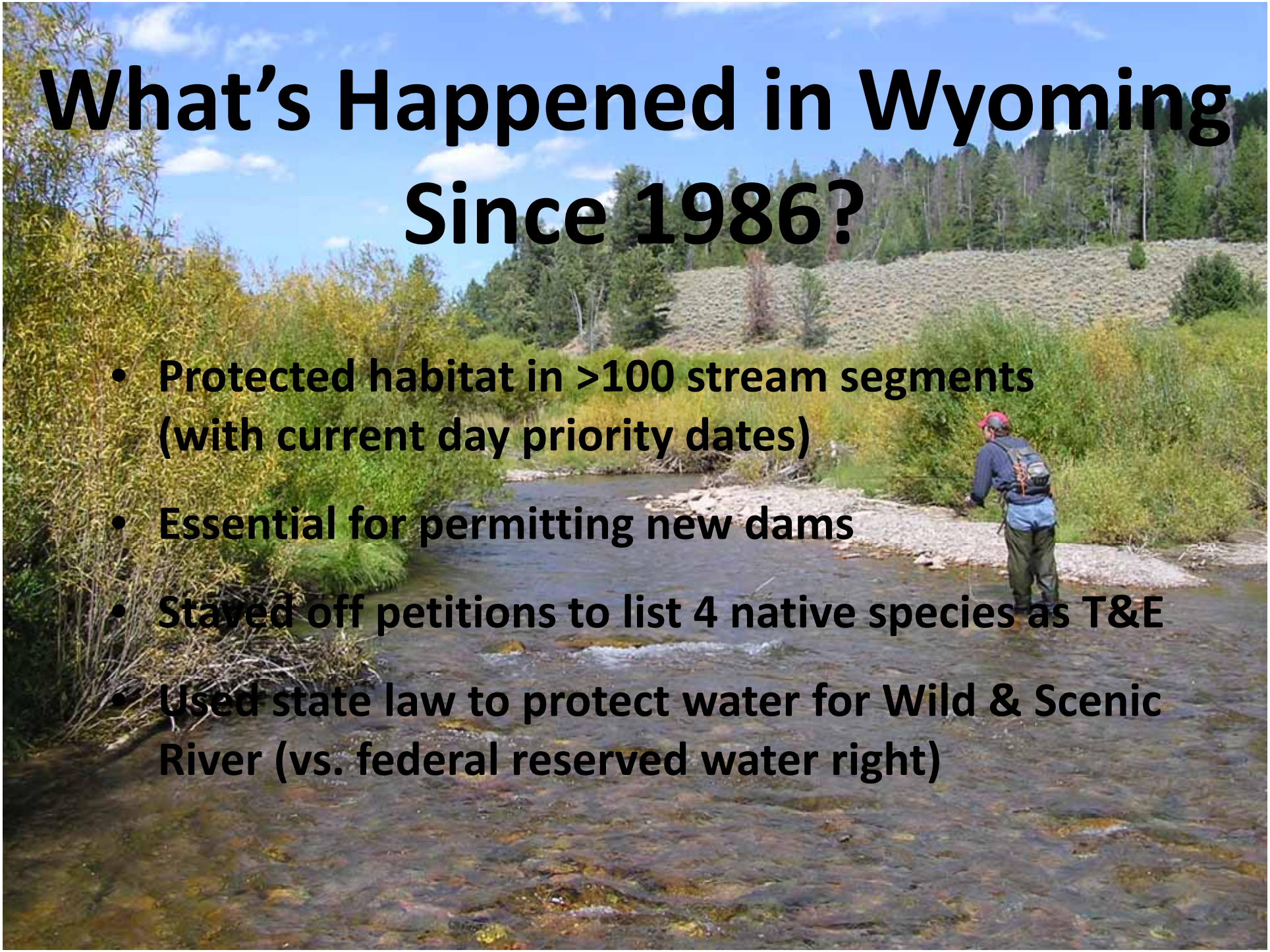
- Water needs to be diverted
- Costs too much to measure
- Will cause streams to go dry
- Will impact interstate compacts
- Will stop economic development
- Need dams to get an instream flow
- A gov't. plot to take back water rights
- That won't work in (*fill in state name*)

Instream Flow in Wyoming

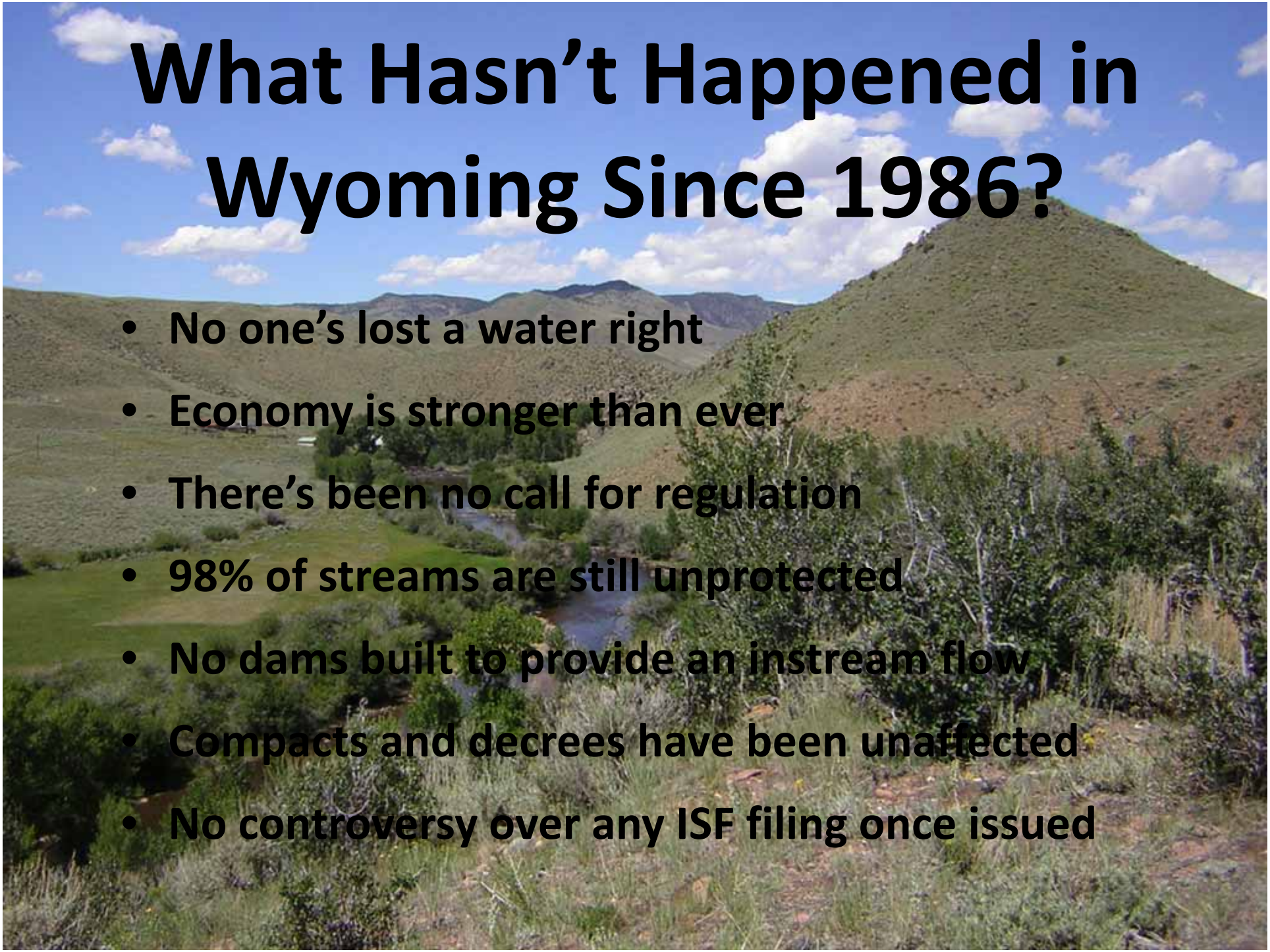
41 Years of History

- First application submitted in 1969
- Denied by State Engineer in 1972
- 17 failed laws from 1974 to 1985
- Successful legislation in 1986
- 100th instream flow filing in 2006

What's Happened in Wyoming Since 1986?

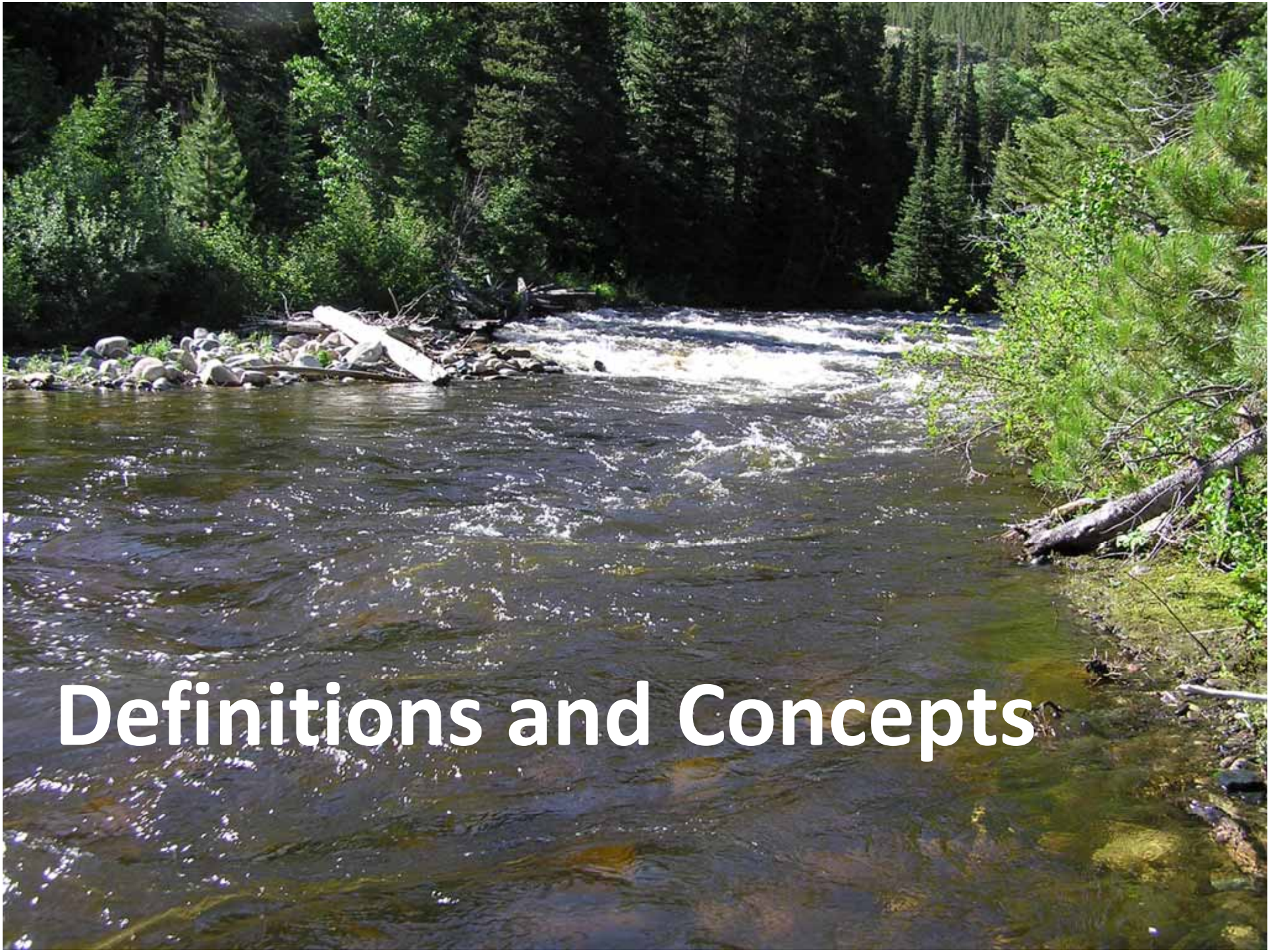


- Protected habitat in >100 stream segments (with current day priority dates)
- Essential for permitting new dams
- Staved off petitions to list 4 native species as T&E
- Used state law to protect water for Wild & Scenic River (vs. federal reserved water right)



What Hasn't Happened in Wyoming Since 1986?

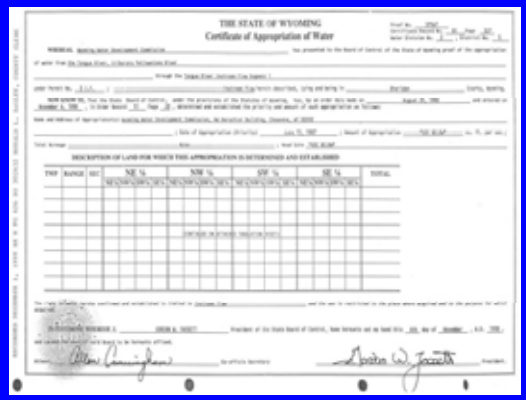
- No one's lost a water right
- Economy is stronger than ever
- There's been no call for regulation
- 98% of streams are still unprotected
- No dams built to provide an instream flow
- Compacts and decrees have been unaffected
- No controversy over any ISF filing once issued



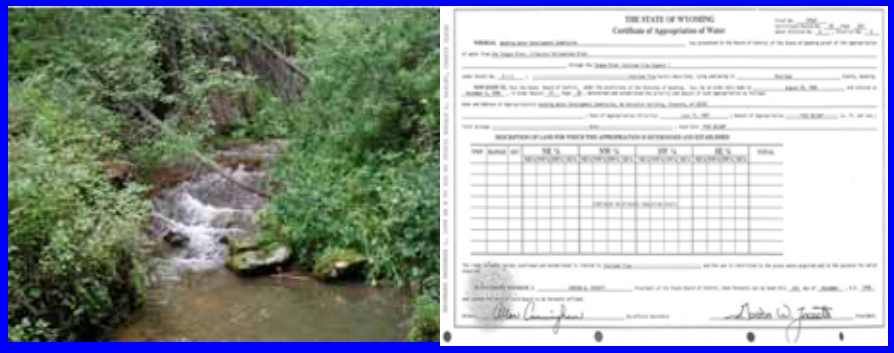
Definitions and Concepts

Instream Flow Can Mean:

Water in the creek but no regulatory mechanism



Enforceable regulatory mechanism but no water



Water in the creek that’s protected by an enforceable regulatory mechanism

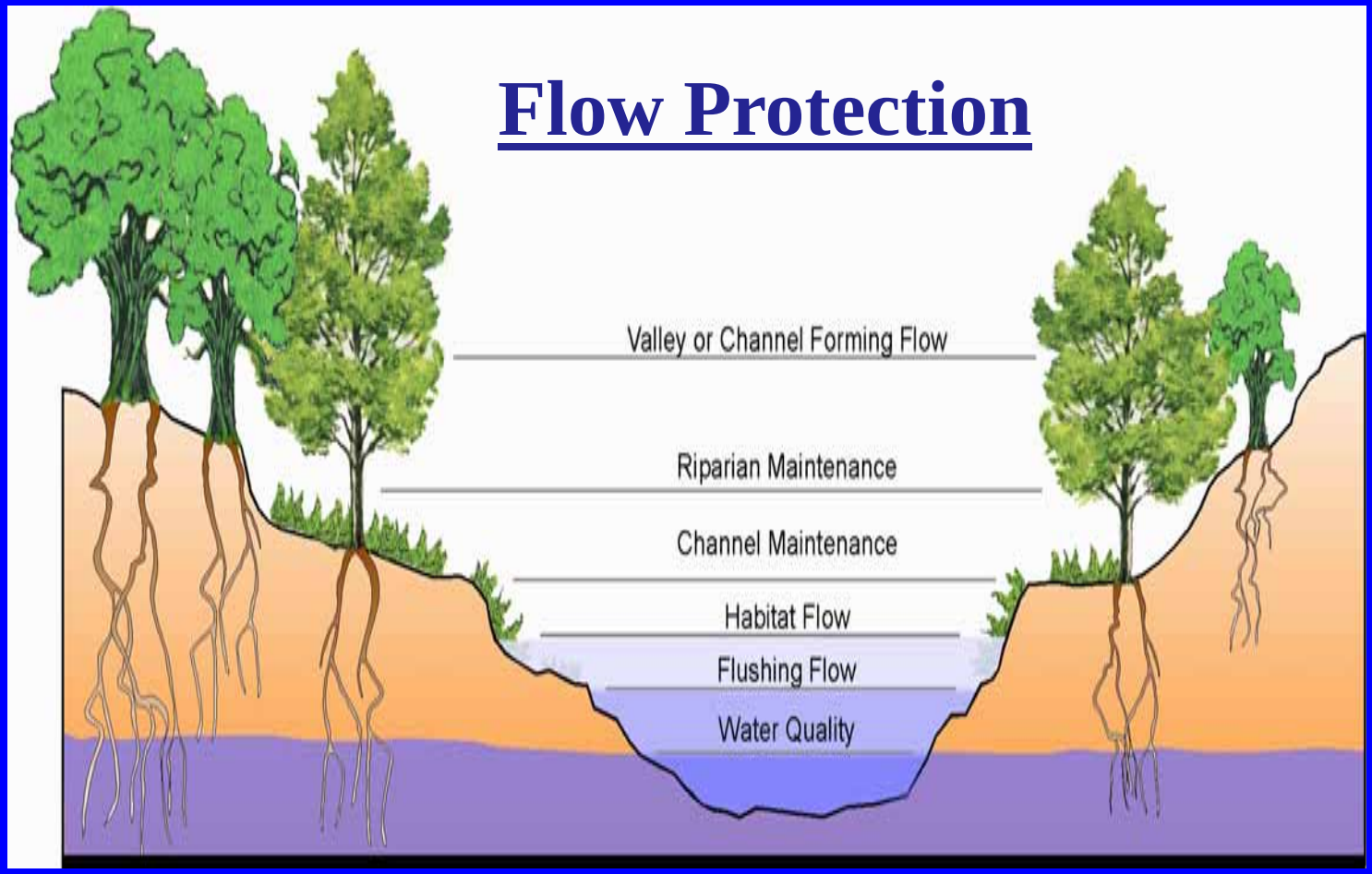
A little water, some of the time?

All the water, all the time?

A seasonally adjusted flow regime?

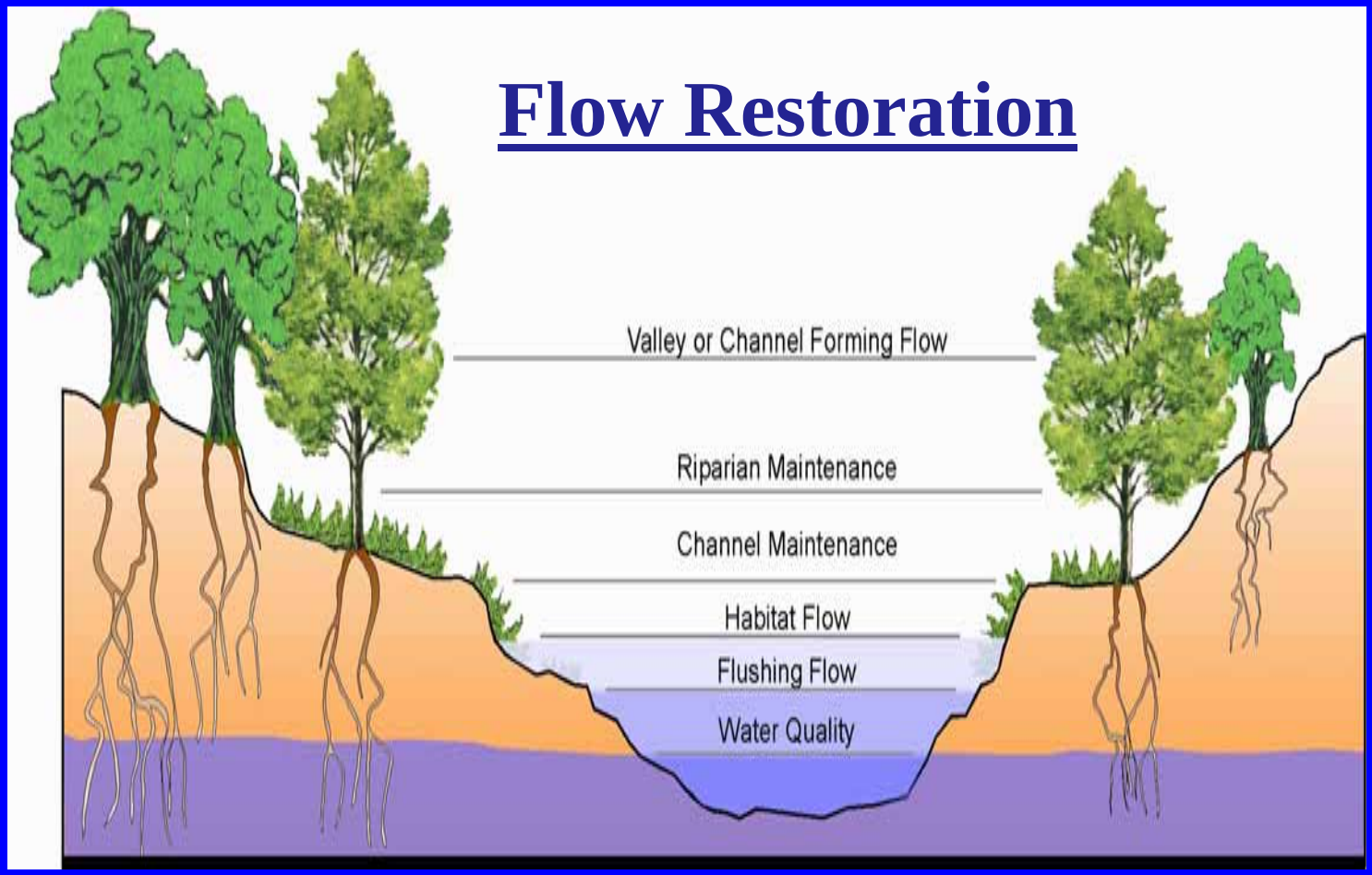
Protection or Restoration?

Flow Protection

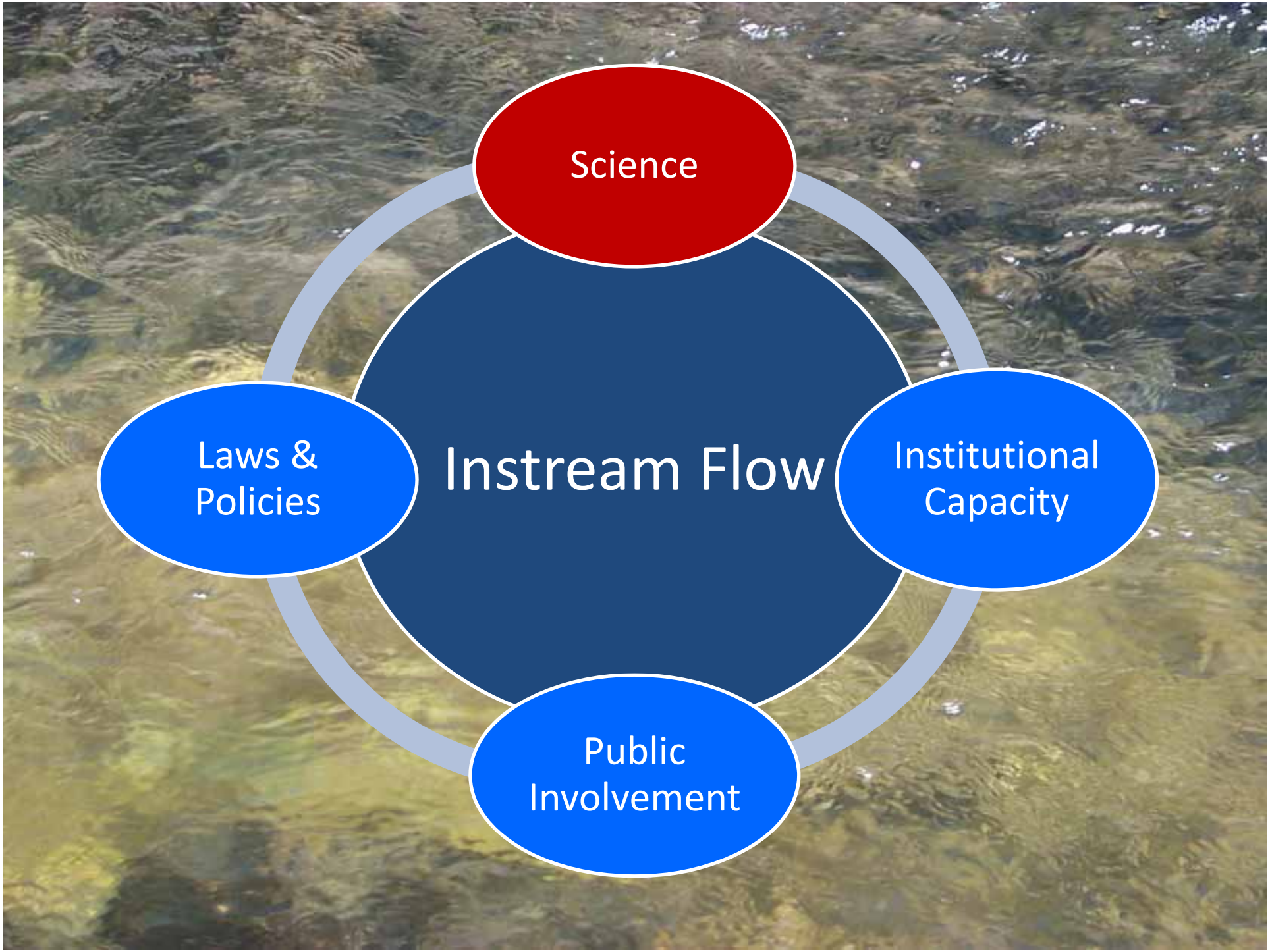


- *Upside Down Instream Flow*
- *Water is usually available*
- *Public land issue*

Flow Restoration

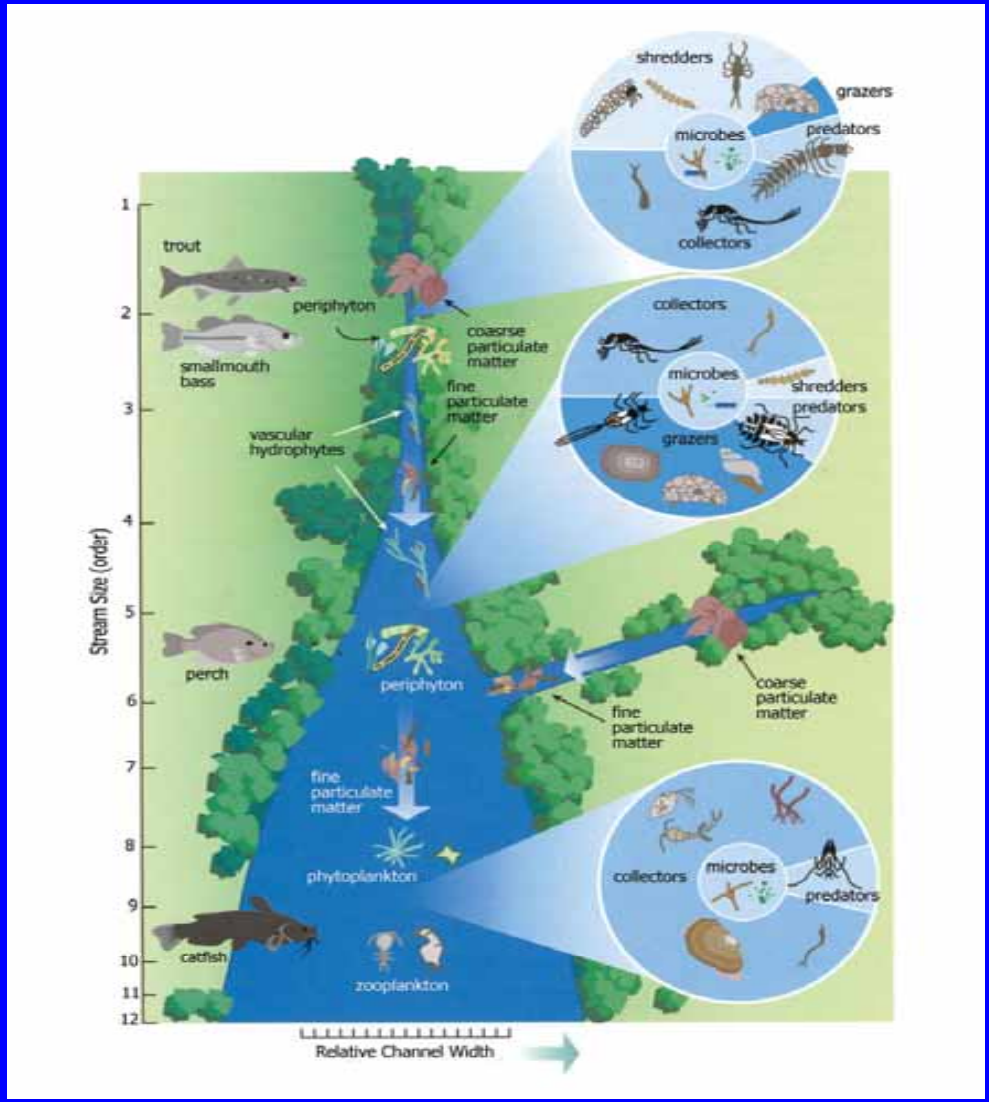


- *Bottom up instream flow*
- *Need to find water*
- *Private land issue*


Science
Laws & Policies
Instream Flow
Institutional Capacity
Public Involvement

Each Situation is Unique

Rivers and the species that live there change in predictable ways over distance.



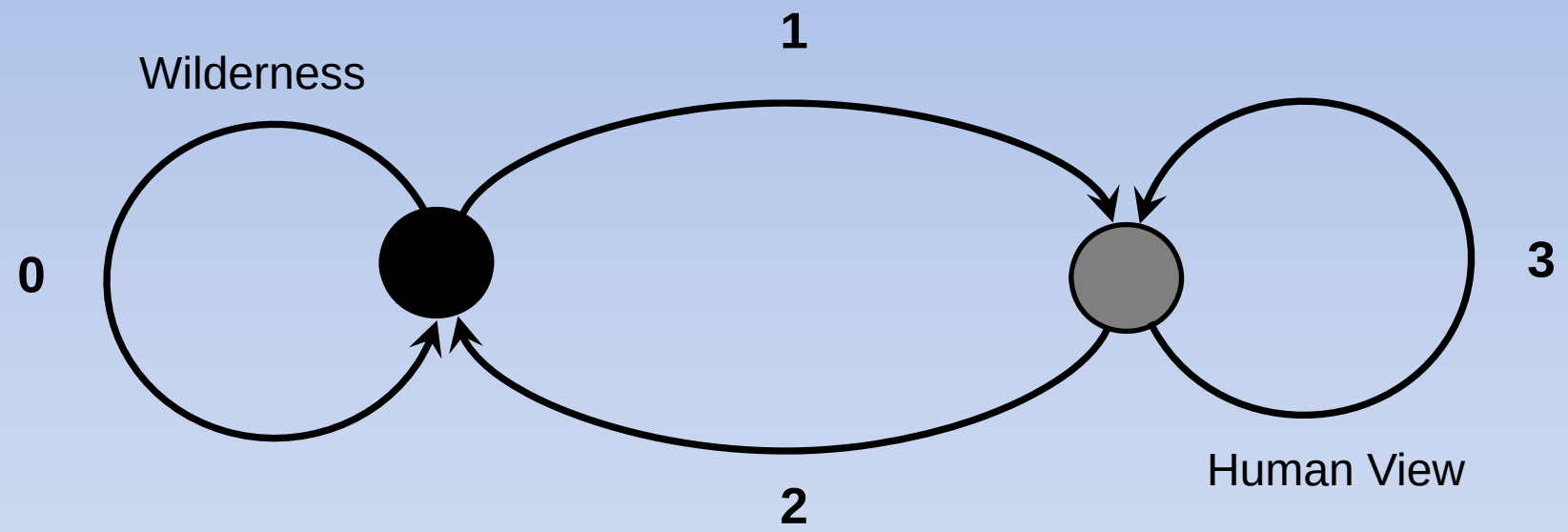
Models tell us about:

- **Hydrology**
  - Short and long-term water availability
- **Biology**
  - Short-term physical habitat availability
- **Geomorphology**
  - Long-term trends of channel conditions
- **Connectivity**
  - Multiple elements and concepts
- **Water quality**
  - Short and long-term

Habitat Modeling Caveats

- Models manage uncertainty – won't eliminate it.
- Relationship between flow & habitat isn't linear.
- A flow that's good for one species may be detrimental to others.
- There isn't a single "best" flow – think flow regimes.

Defining nature is a major limitation



0 – Original nature (wilderness)

1 – That nature which is perceived and described;

2 – The nature configured in laboratories or models;

3 – The nature constrained by laws & policies.

***Adapted from* Kull (1998)**

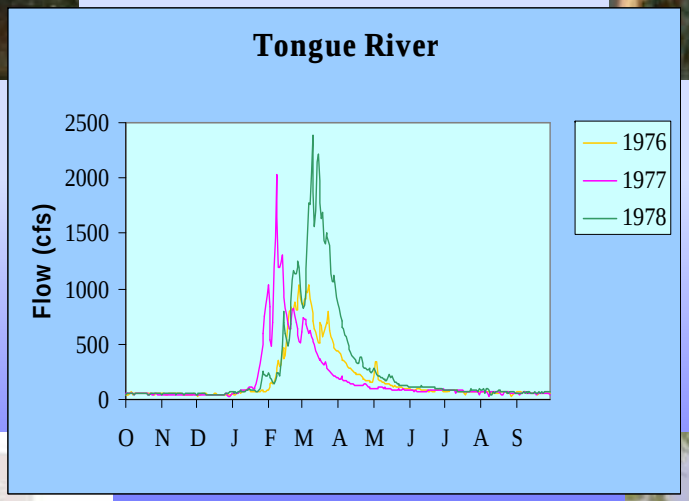
Not Preservationism

- Healthy ecosystems and economies are linked (goal = maximize ecosystem services).
- Fine tune legal & institutional opportunities.
- We are, after all, human – and we want it all.

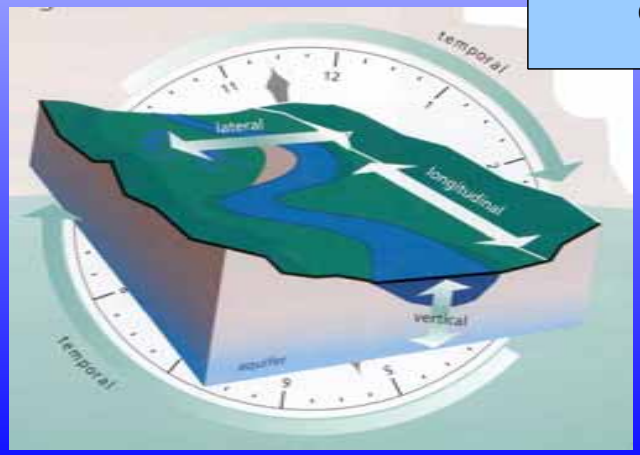
Geomorphology

Biology

Hydrology

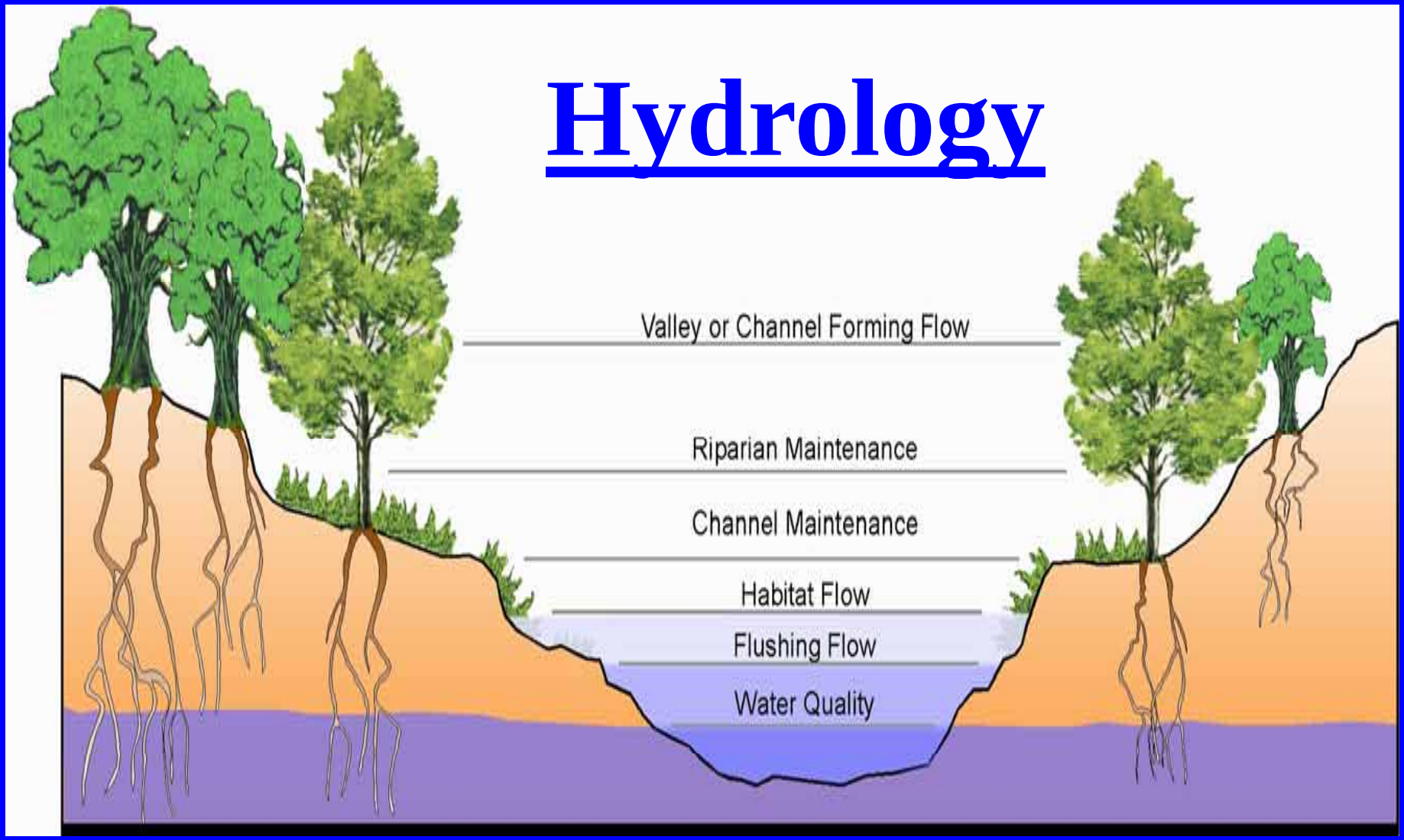


Connectivity



Water Quality

Hydrology



River systems were built and are maintained by different magnitudes of discharge occurring over time and space. (Hill et al. 1991)

Maximum flow

The problem with minimum flows . . .

Hydrology Considerations

- Methods rely on flow statistics
- Don’t identify incremental trade-off’s and
- Are not linked to riverine form and function
- Need other tools to assess needs for other flow elements

Biology

Biology also embraces other aquatic organisms in the stream . . .

and the riparian corridor

Biology Considerations

- Methods focus on fish habitat
- Poor link between habitat and number of fish – unrealistic to expect one
- Need other tools to assess needs for other flow elements

Geomorphology

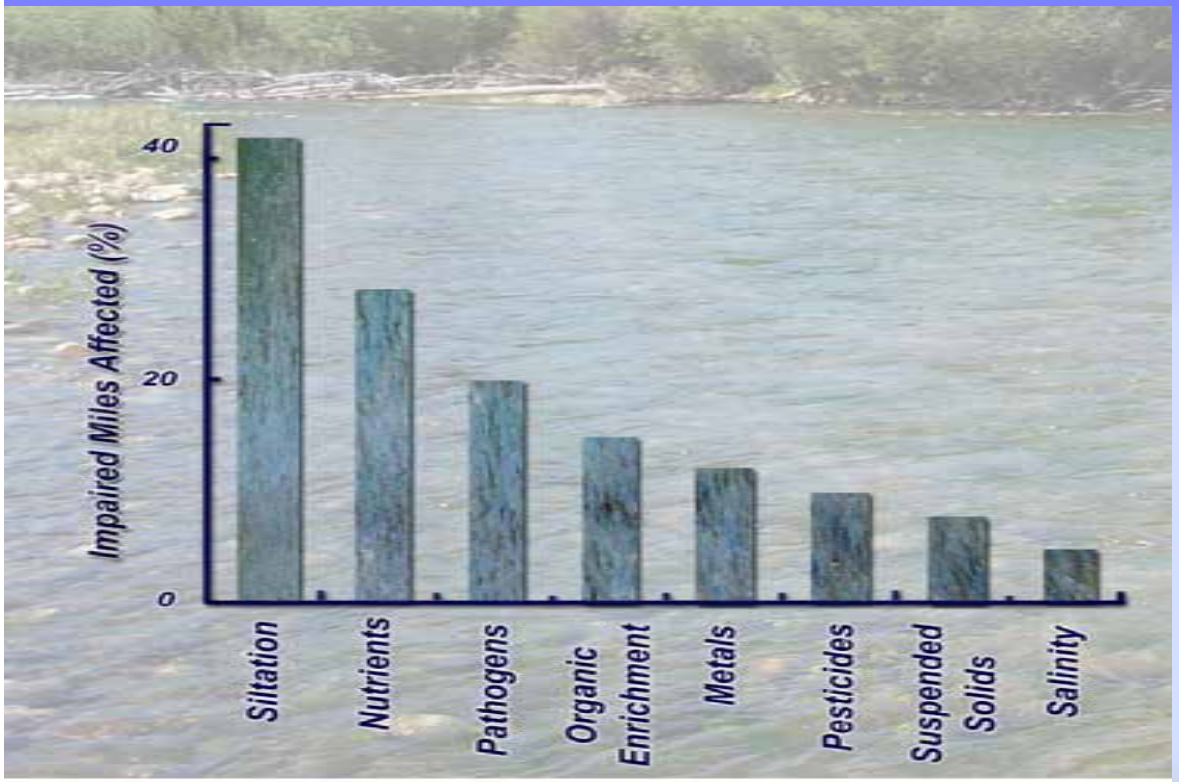
Geomorphic condition is a function of:

- Sediment addition or removal
- Flow addition or removal
- Channel form (alteration)

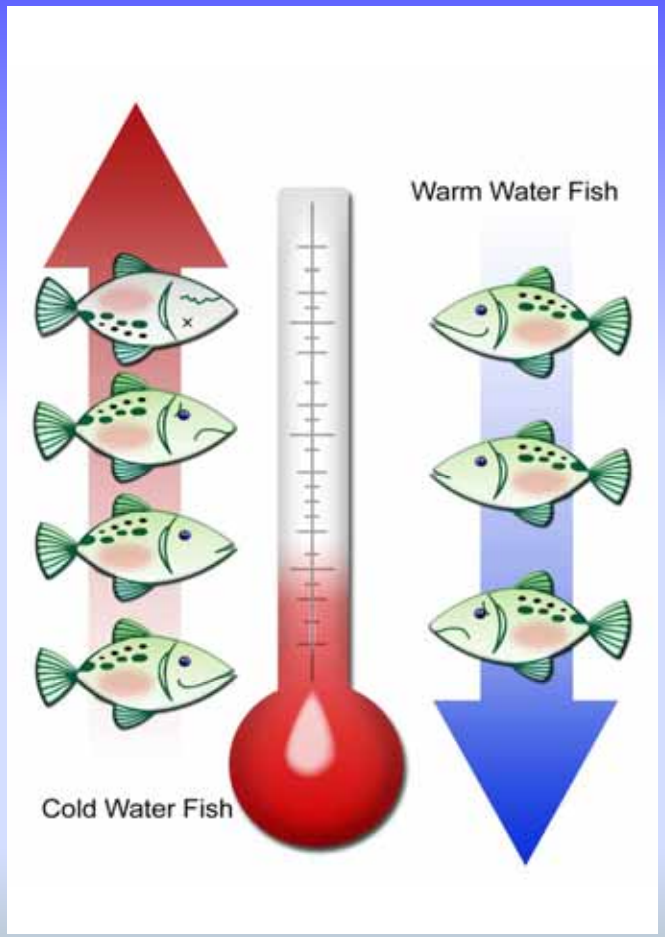
Geomorphology Considerations

- Address long-term physical habitat processes (not tied to species)
- Need to specify timing, duration, ramping
- Need other tools to assess needs for other flow elements

Water Quality



Pollutants

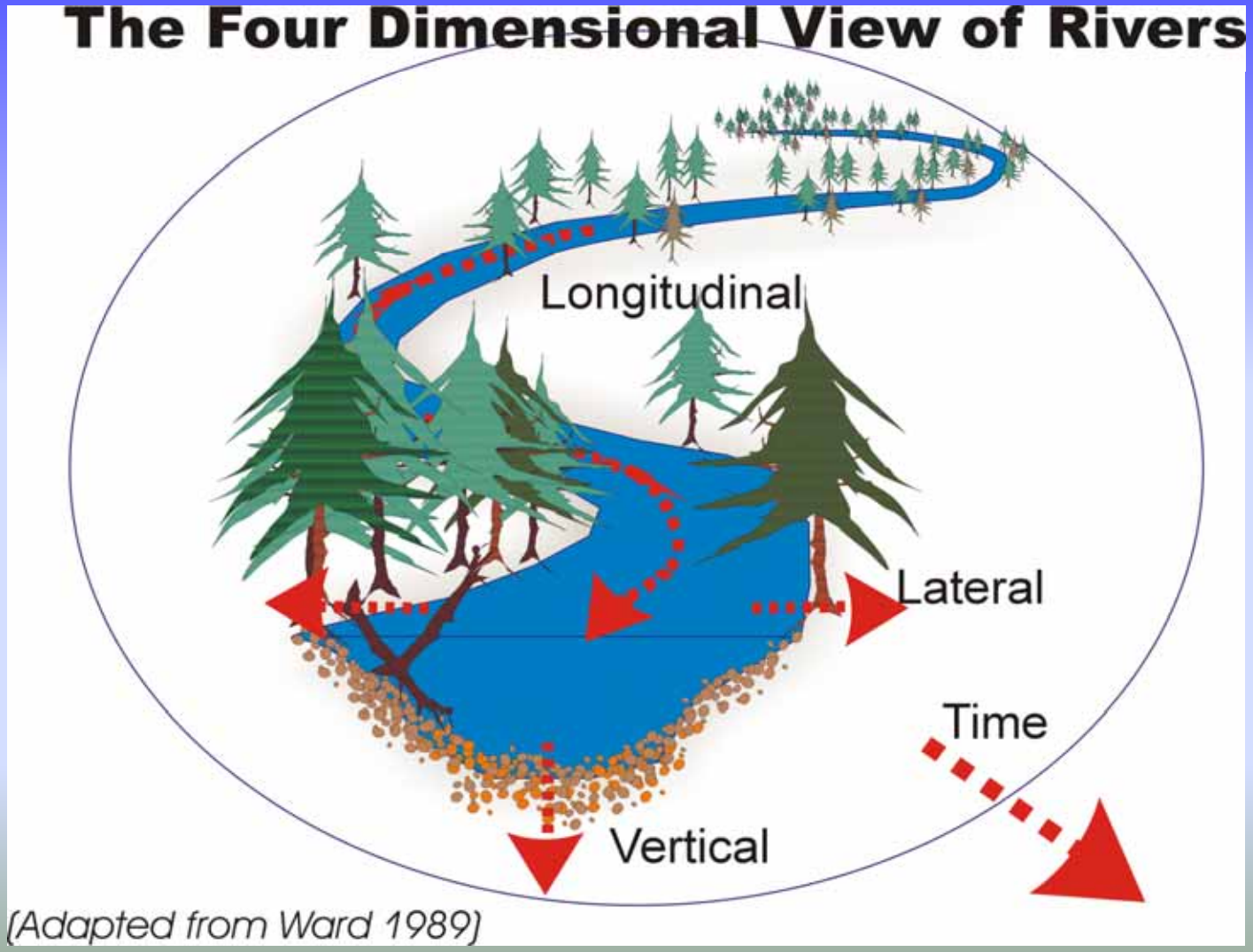


Temperature

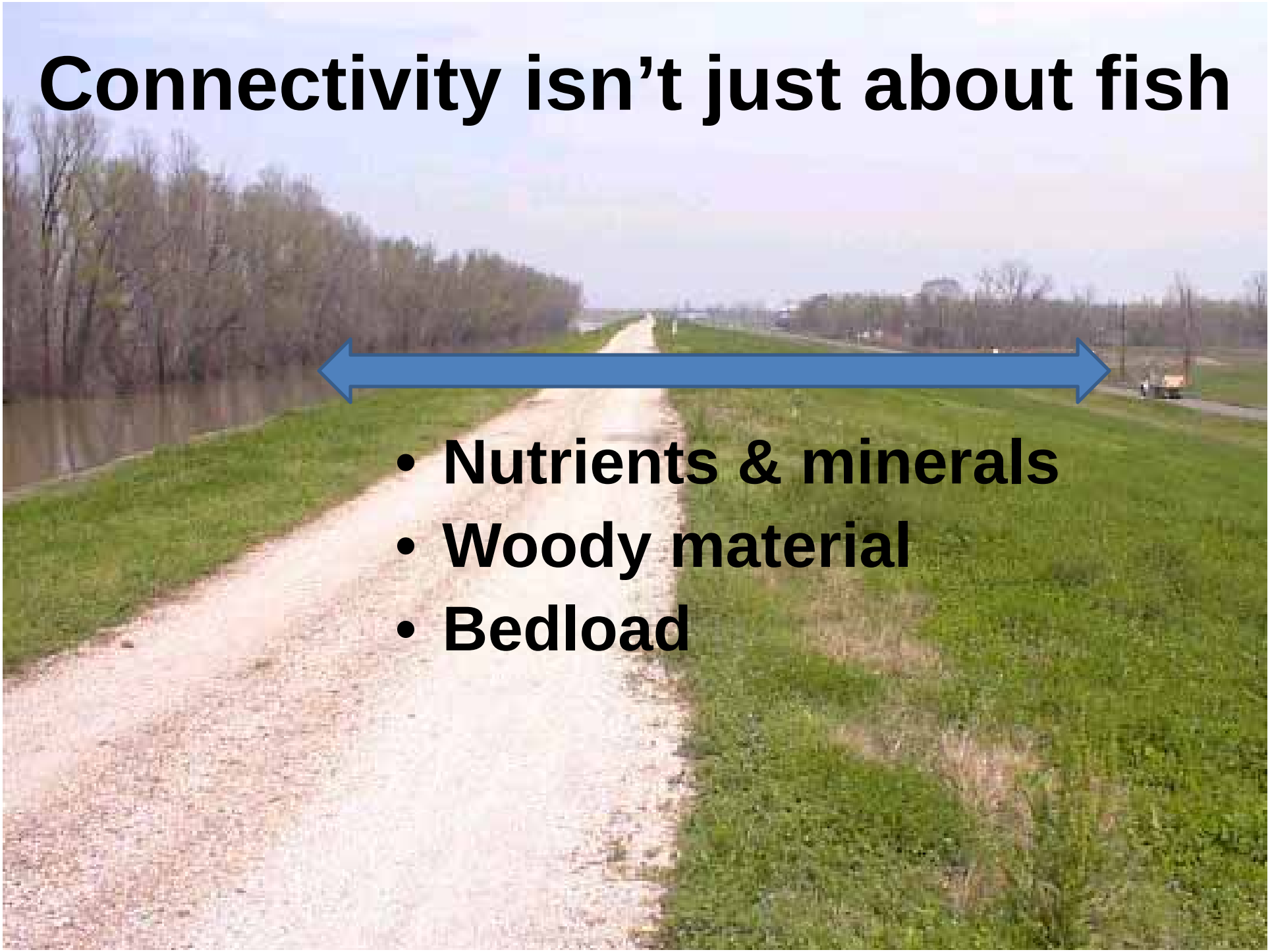
Water Quality Considerations

- Methods focus on minimum flows
- Don’t identify ecological trade-offs
- Need other tools to assess needs for other flow elements

Connectivity



Connectivity isn't just about fish

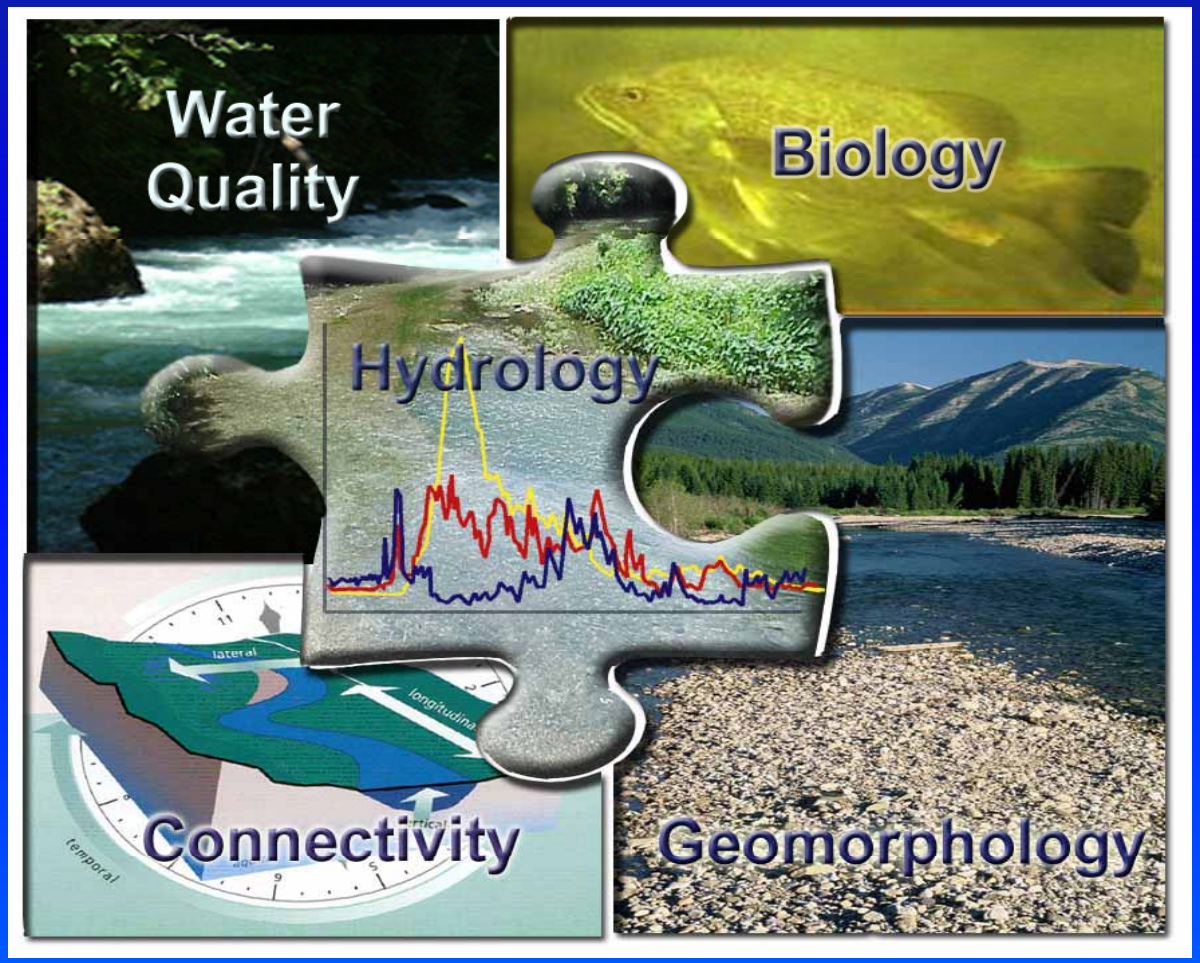


- Nutrients & minerals
- Woody material
- Bedload

Connectivity Considerations

- Few good models to directly address all connectivity elements.
- Specify time and duration when needed
- Need other tools to assess needs for other flow elements

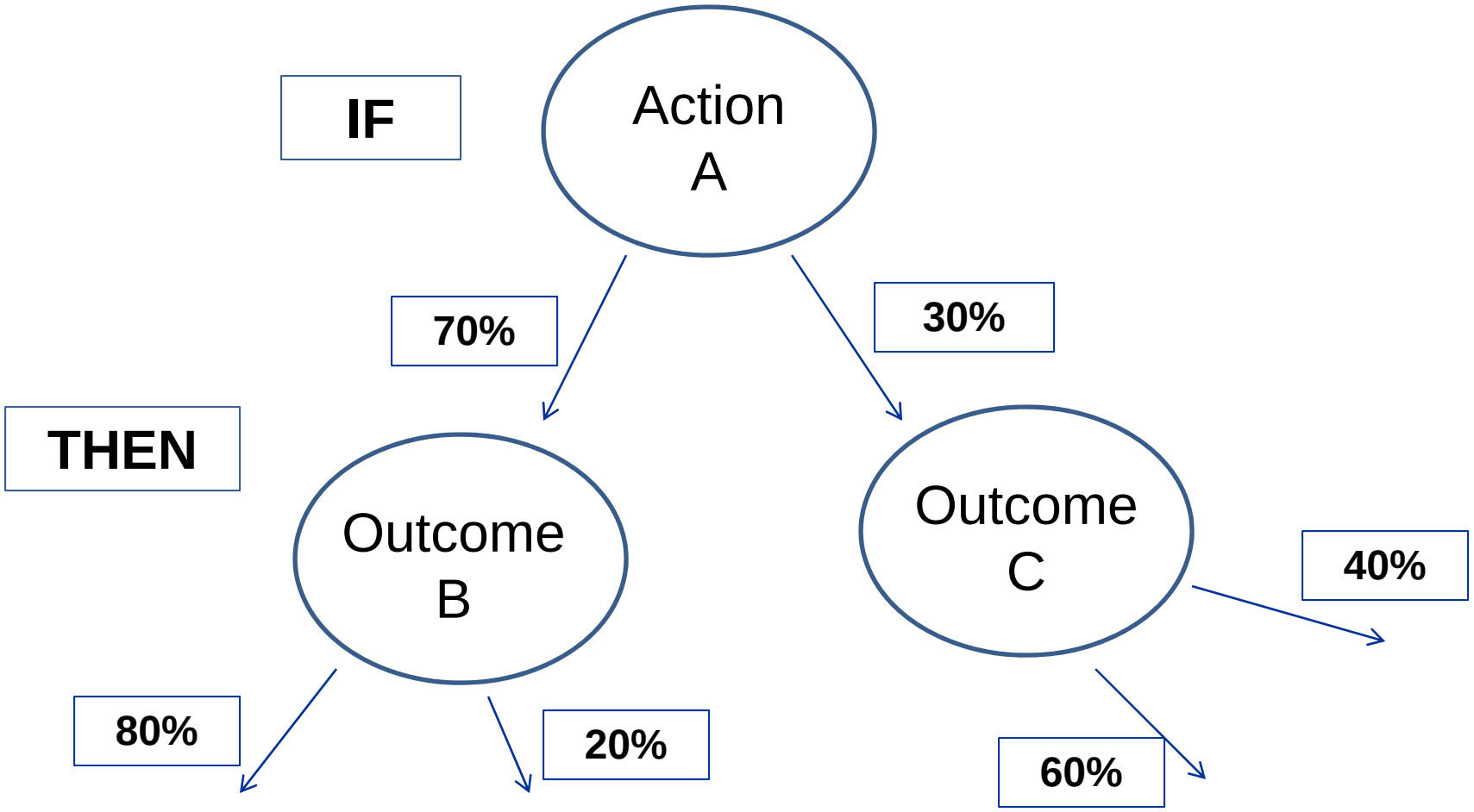
Holistic Methods



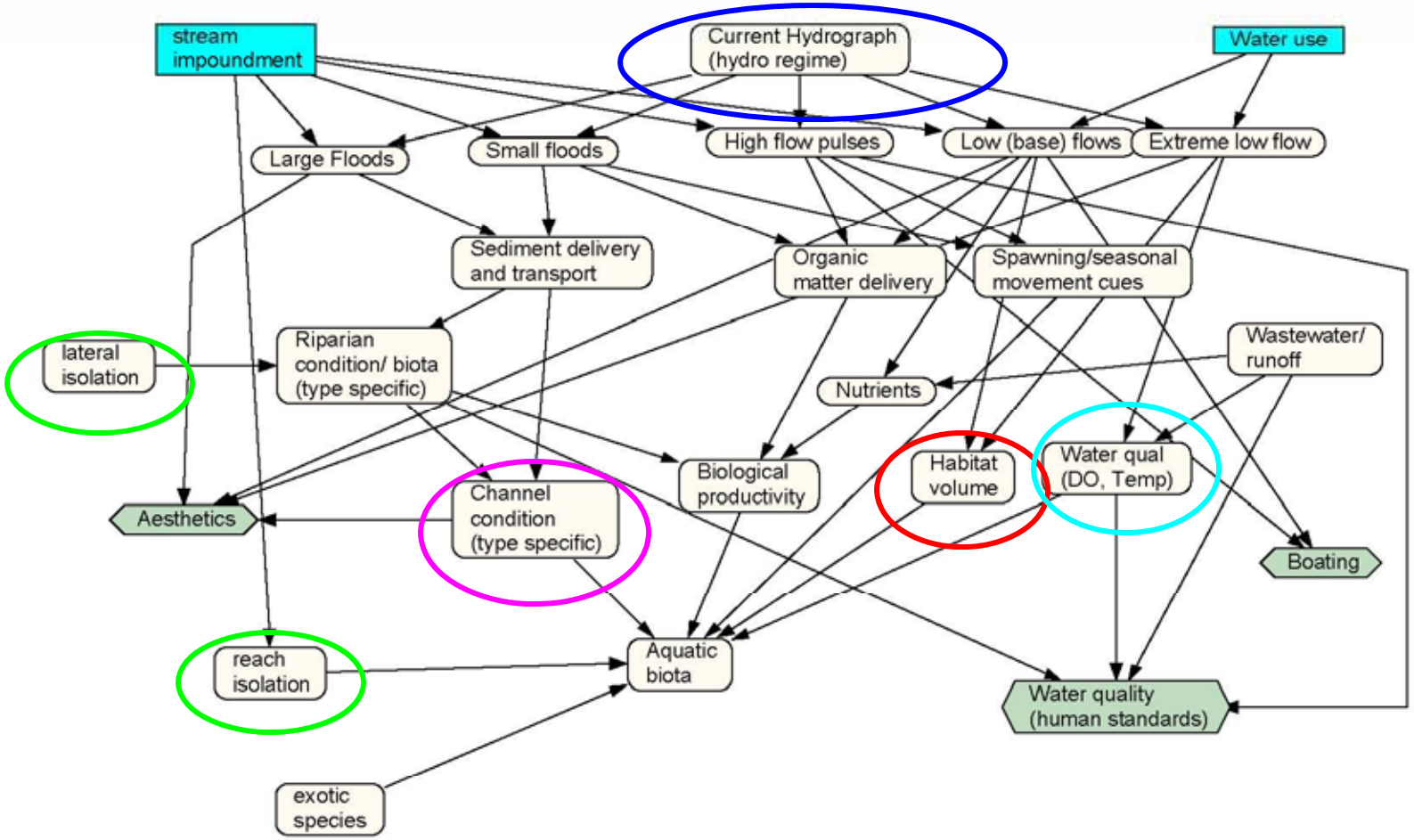
Examples of Holistic Methods

- Downstream Response to Imposed **Flow** Transformation (DRIFT)
- Decision Flow Assessment (DFA)
- Bayesian Probability Models
- Ecological Limits of Hydrologic Alteration (ELOHA)

Bayesian Probability Models



Even simple ecosystem modeling can be complicated



Holistic Model Considerations

- Still address limited range of elements
- Outcomes are still imprecise
- Research is focused here

Challenges and Opportunities

IFC's Instream Flow Program Initiative

www.instreamflowcouncil.org

Instream Flow Program Initiative
(2006-2008)

- Participants = state and provincial (Canada) fish & wildlife agencies
- Funded with federal multi-state grant
- 50 states and 6 provinces participated

Top resources for states to address instream flow needs:

- **More supportive state laws and policies**
- **More institutional capacity (agency staff, budgets, & training)**
- **More knowledgeable and <u>active</u> public**

Not more or better scientific methods

Instream Flow Status in Western States*

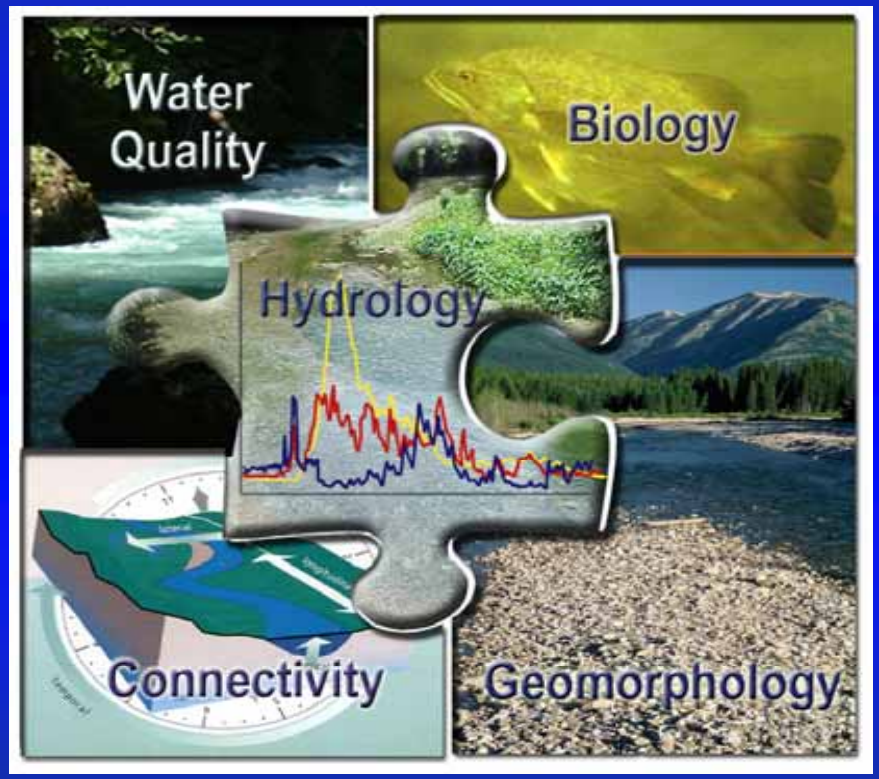
Alaska
Colorado
Washington
Oregon
Montana
Wyoming
California
Hawaii
Idaho
Utah
Arizona
New Mexico

** - Based on institutional capacity, legal authority, public involvement, and protected streams as judged by survey participants in 2008; ranking may differ now*

So What?

- Avoid rhetoric – Focus on realistic issues.
- Be specific – Water in the creek? Water rights? Water management?
- Talk flow regimes – not minimum flows.
- Define the goal – protection or restoration?

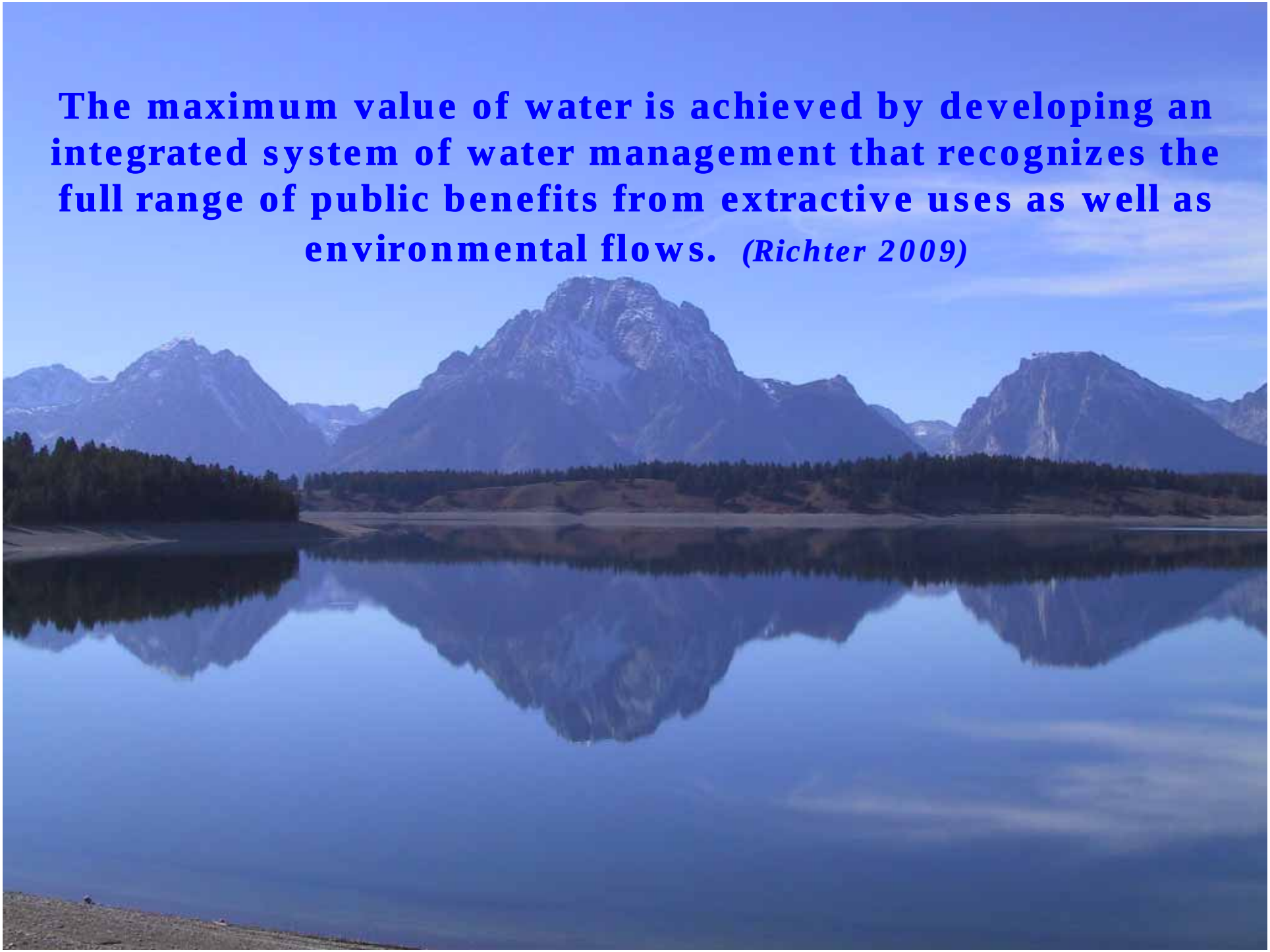
Use the Right Tool(s)



Long-term persistence of organisms comes from long-term persistence of habitat

Instream Flow Laws are an Important State Tool

- Affirm state rights & control over water
  - Manage water for ESA, TMDL, Hydro, and Wild and Scenic Rivers with state law versus federal law
- Maximize ecosystem services / public benefits
  - Maintain important fisheries, recreation, water quality
  - Mitigate aquatic impacts from new dams
- Add flexibility & value to private water rights
  - Allow temporary change of use / encourage conservation


The maximum value of water is achieved by developing an integrated system of water management that recognizes the full range of public benefits from extractive uses as well as environmental flows. *(Richter 2009)*