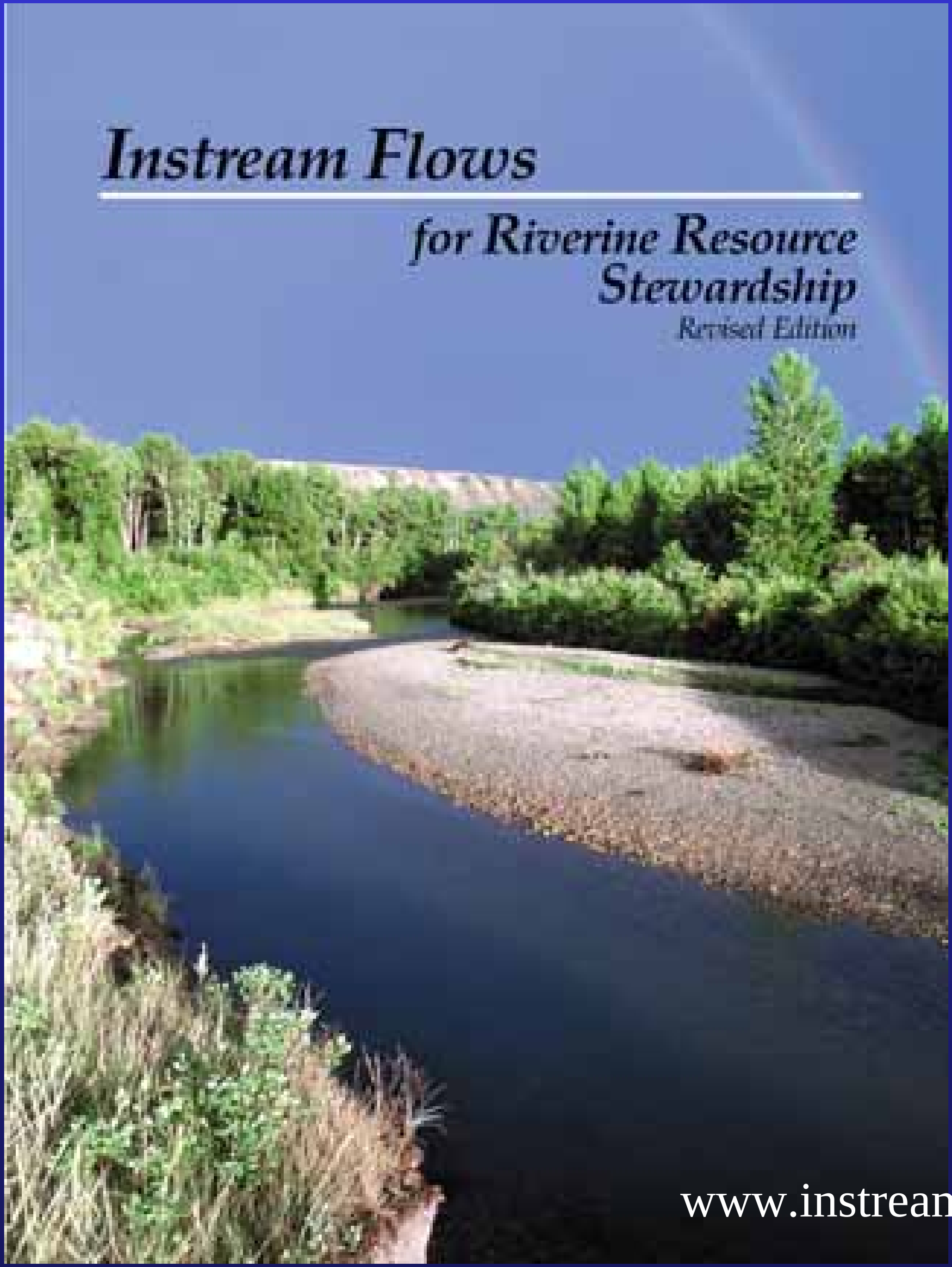
Environmental Flow Concepts and Principles

Instream Flow Council

- 501(c)6 non-profit network, created in 1998
- State (U.S.) & Province/Territory (Canada) Fish and Wildlife Agency Members
- Offers information sharing, technical assistance, advocacy, resources, training, peer review, collaborative projects.
- www.instreamflowcouncil.org



www.instreamflowcouncil.org

People value flowing water

We settle next to it in great numbers

We put our waste in it

When it’s gone we want it back

Terminology

Environmental Flow

Conservation Flow

Instream Flow

Definitions Matter

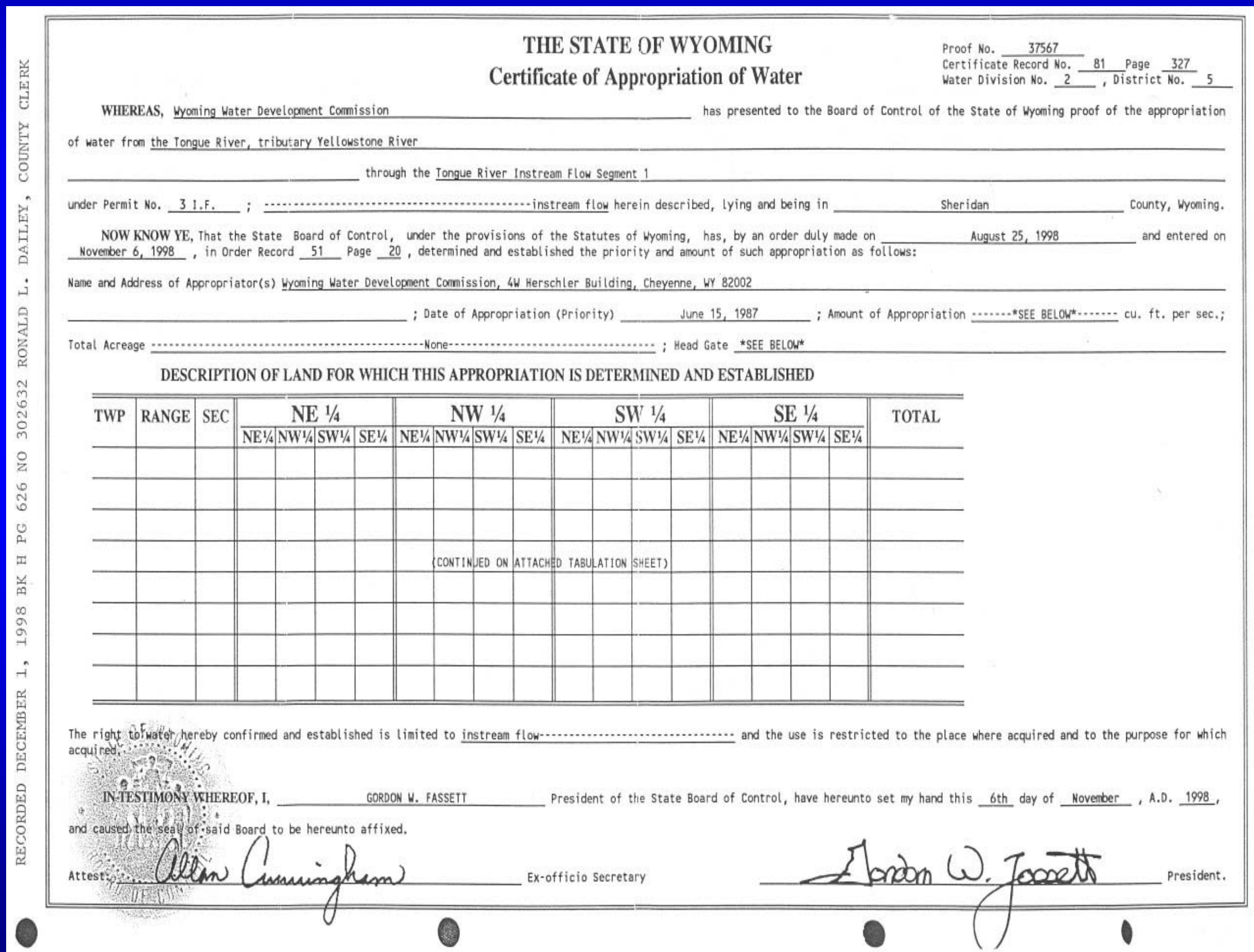
What is an environmental flow?

A little water, some of the time?

All the water, all the time?

A seasonally adjusted flow regime?

An agreement, policy, or law?



RECORDED DECEMBER 1, 1998 BK H PG 626 NO 302632 RONALD L. DAILEY, COUNTY CLERK

THE STATE OF WYOMING

Certificate of Appropriation of Water

Proof No. 37567
Certificate Record No. 81 Page 327
Water Division No. 2 , District No. 5

WHEREAS, Wyoming Water Development Commission has presented to the Board of Control of the State of Wyoming proof of the appropriation of water from the Tongue River, tributary Yellowstone River through the Tongue River Instream Flow Segment 1 under Permit No. 3 I.F. ; ---instream flow herein described, lying and being in Sheridan County, Wyoming.

NOW KNOW YE, That the State Board of Control, under the provisions of the Statutes of Wyoming, has, by an order duly made on August 25, 1998 and entered on November 6, 1998 , in Order Record 51 Page 20 , determined and established the priority and amount of such appropriation as follows:

Name and Address of Appropriator(s) Wyoming Water Development Commission, 4W Herschler Building, Cheyenne, WY 82002

; Date of Appropriation (Priority) June 15, 1987 ; Amount of Appropriation -------*SEE BELOW*------- cu. ft. per sec.;

Total Acreage ---None---------------------------------- ; Head Gate *SEE BELOW*

DESCRIPTION OF LAND FOR WHICH THIS APPROPRIATION IS DETERMINED AND ESTABLISHED

TWP	RANGE	SEC	NE ¼				NW ¼				SW ¼				SE ¼				TOTAL
			NE¼	NW¼	SW¼	SE¼	NE¼	NW¼	SW¼	SE¼	NE¼	NW¼	SW¼	SE¼	NE¼	NW¼	SW¼	SE¼	
							(CONTINUED ON ATTACHED TABULATION SHEET)												

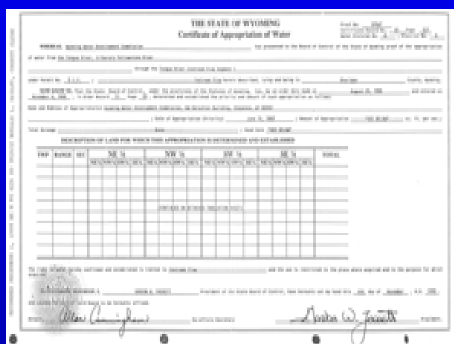
The right to water hereby confirmed and established is limited to instream flow-------------------------------- and the use is restricted to the place where acquired and to the purpose for which acquired.

IN TESTIMONY WHEREOF, I, GORDON W. FASSETT President of the State Board of Control, have hereunto set my hand this 6th day of November , A.D. 1998 , and caused the seal of said Board to be hereunto affixed.

Attest: Allan Cunningham Ex-officio Secretary

Gordon W. Fassett President.

Environmental Flow Can Mean:

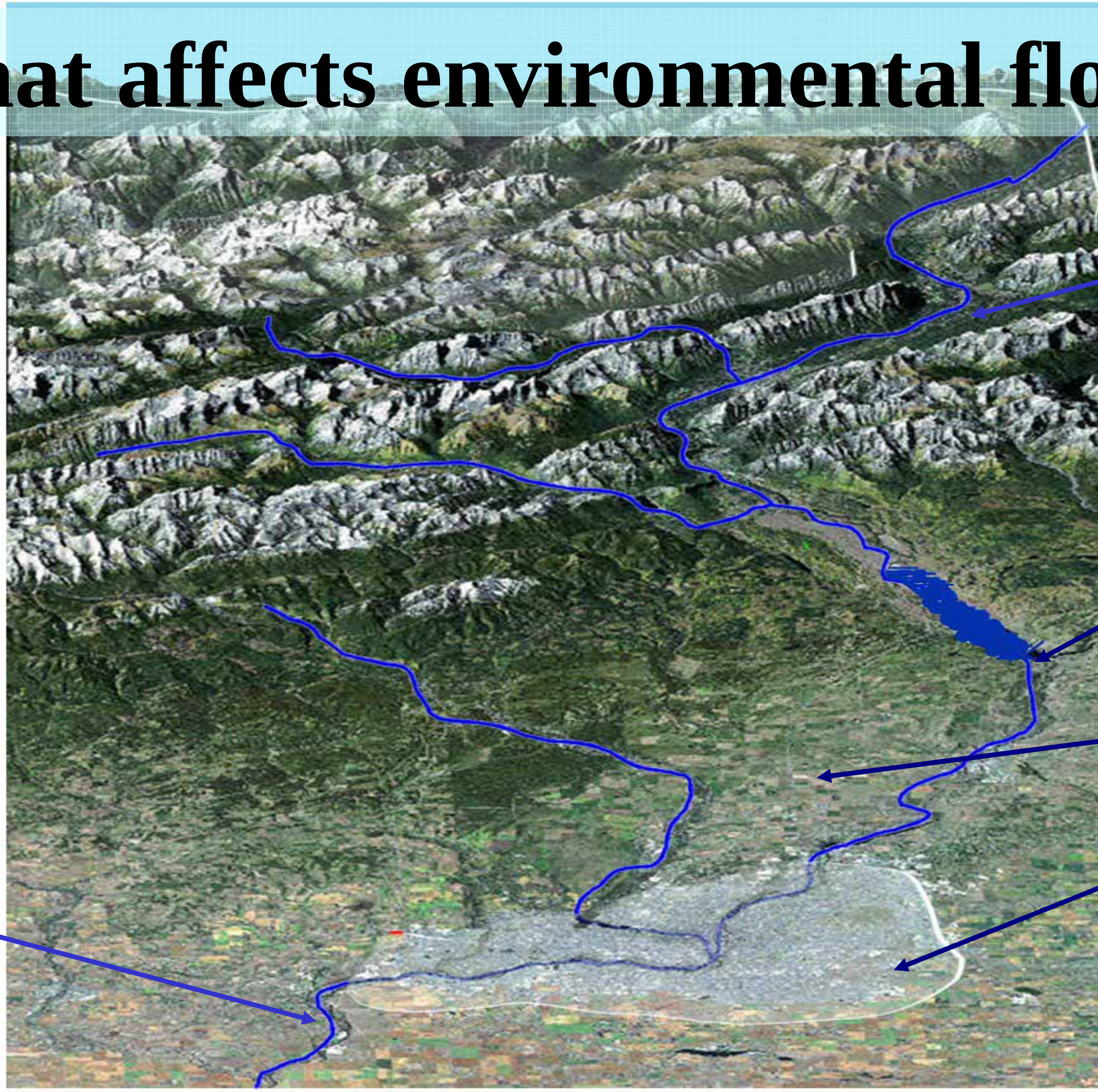


- Enforceable regulatory mechanism but no water
- Water in the creek but no regulatory mechanism
- Water in the creek that's protected by an enforceable regulatory mechanism

Define flow protection

- No flow protection
- Threshold level protection
- Partial ecologically based management
- Comprehensive ecologically based management
- Full ecosystem protection

What affects environmental flows?



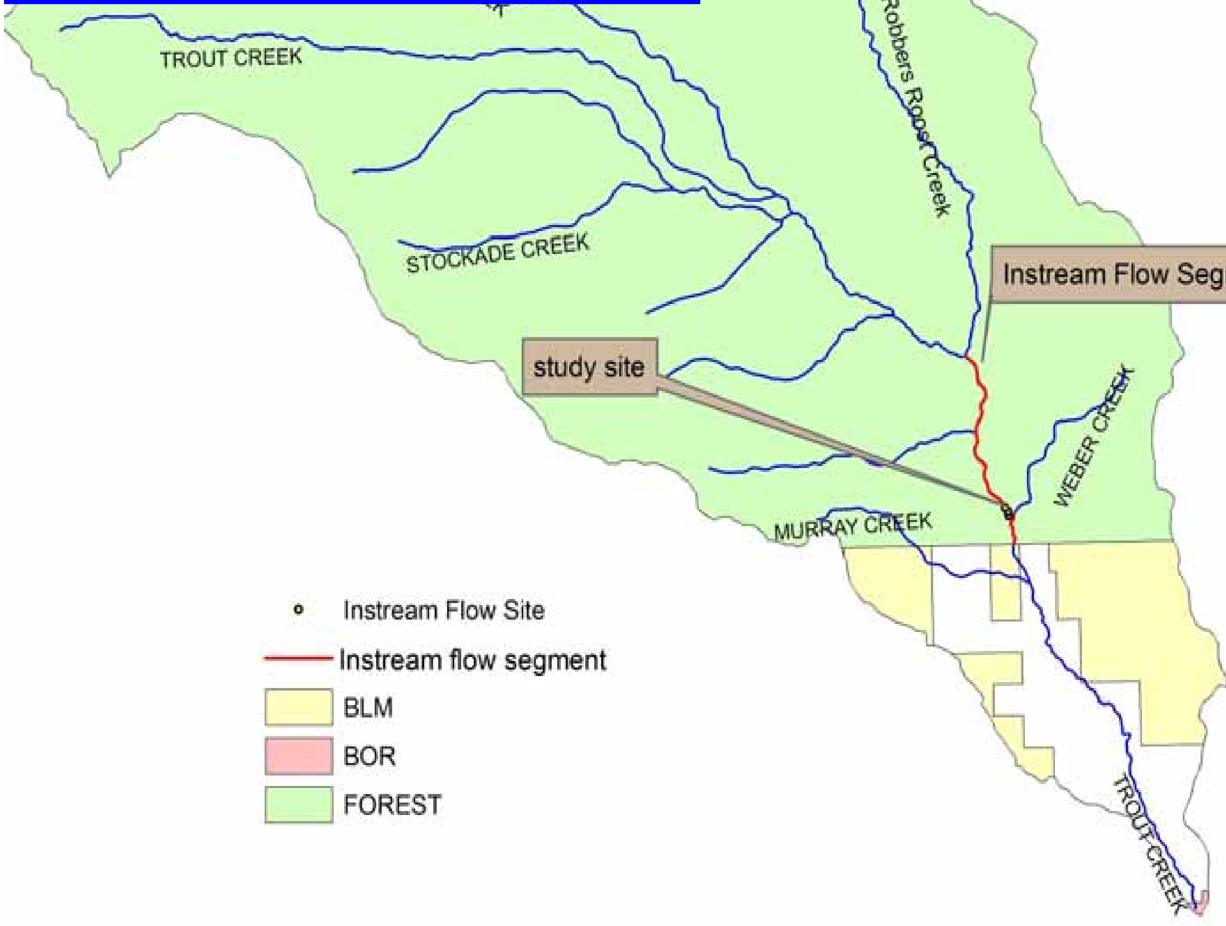
How do you get environmental flows?

- Do nothing
- Take less out (conservation)
- Cooperative agreements (share)
- Build new dams or re-operate existing ones
- Pass laws

Certainty and Control

- Certainty comes from control
- Control comes in many shapes and forms
  - Agreements
  - Watershed management plans
  - Federal, state, territorial, or local policies
  - Federal, state, territorial or local laws

Location matters



Protection vs. Restoration

Protection

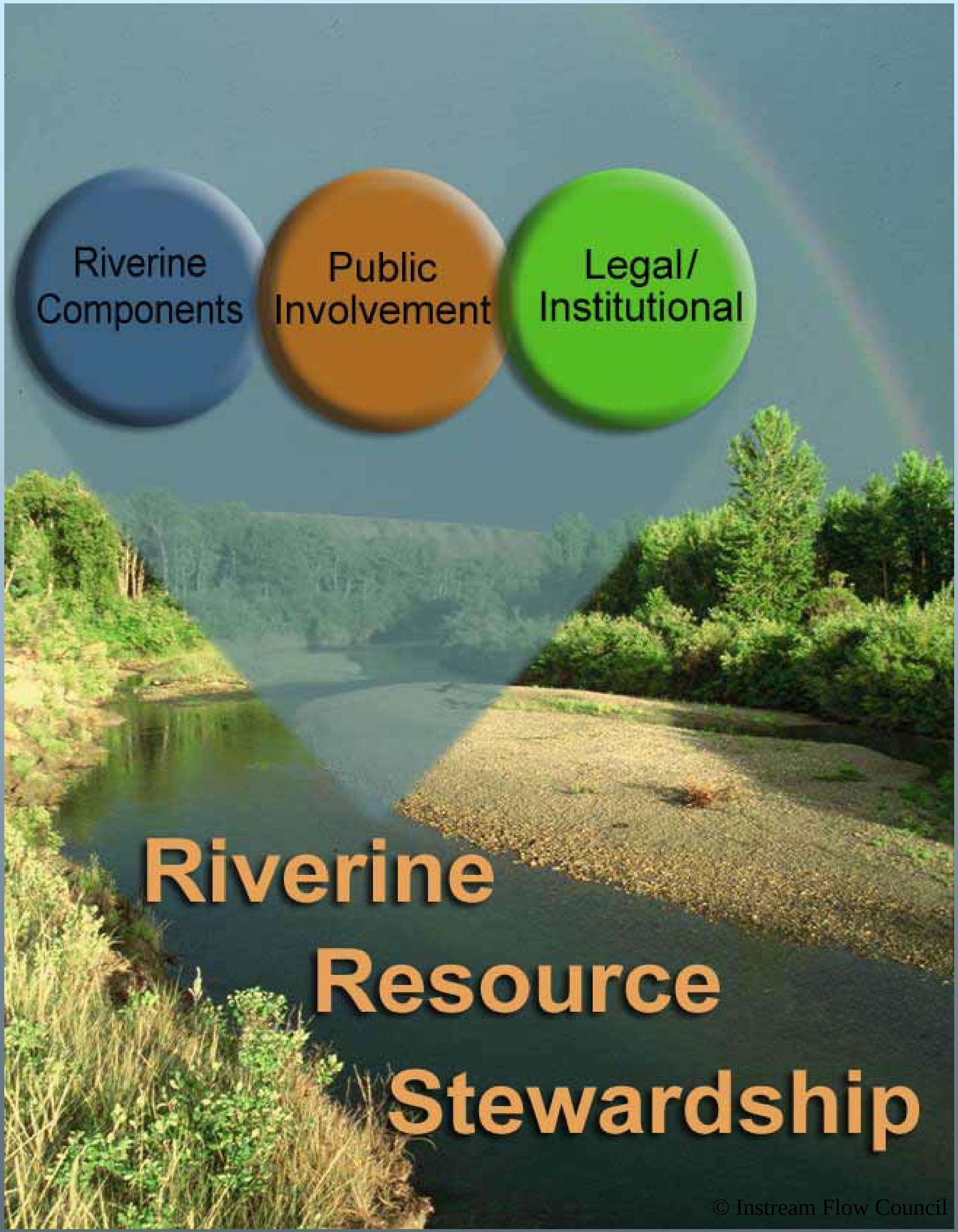
- Upside-down water management
- May not require additional water
- Public lands issue

Restoration

- Bottom-up water management
- Requires finding new water or reallocating existing supplies
- Private land issue

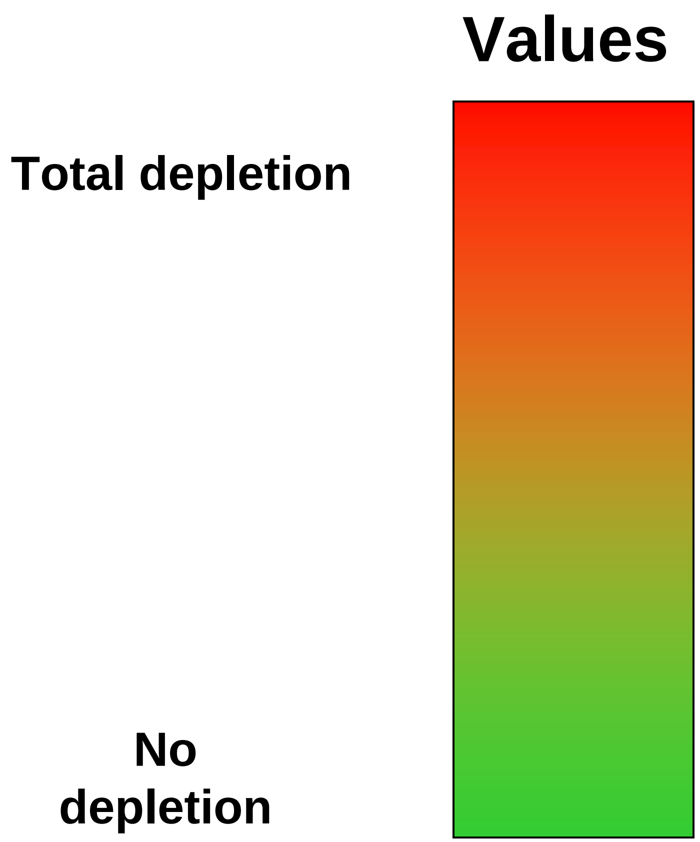
How Do You Determine Need?

Needed for what or whom?



Public need
(enough for who?)

Public need
(enough for who?)

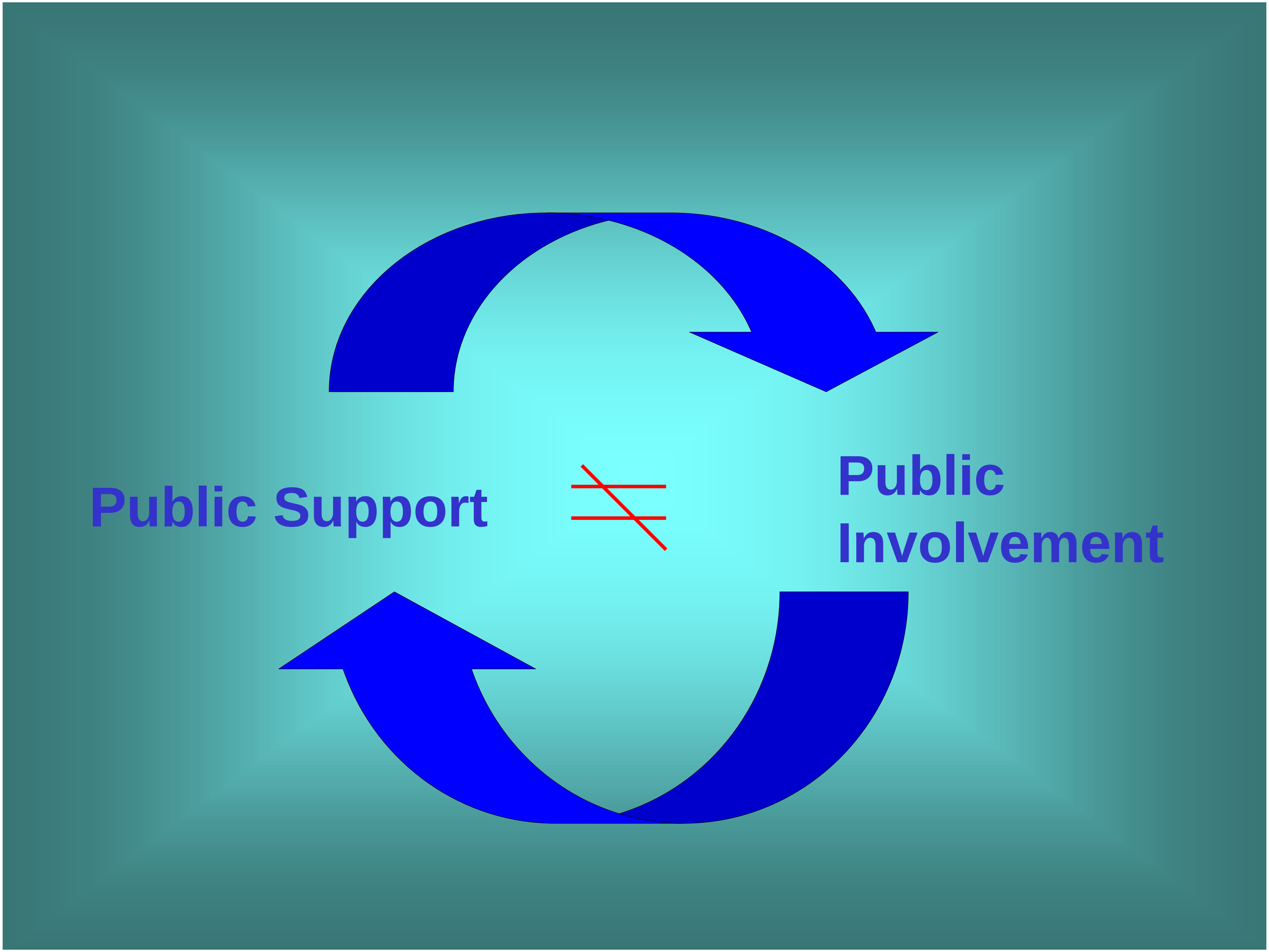


Public Involvement

Education

Input

Activism


Public Support
≠
Public
Involvement

Legal Need

(by what authority?)

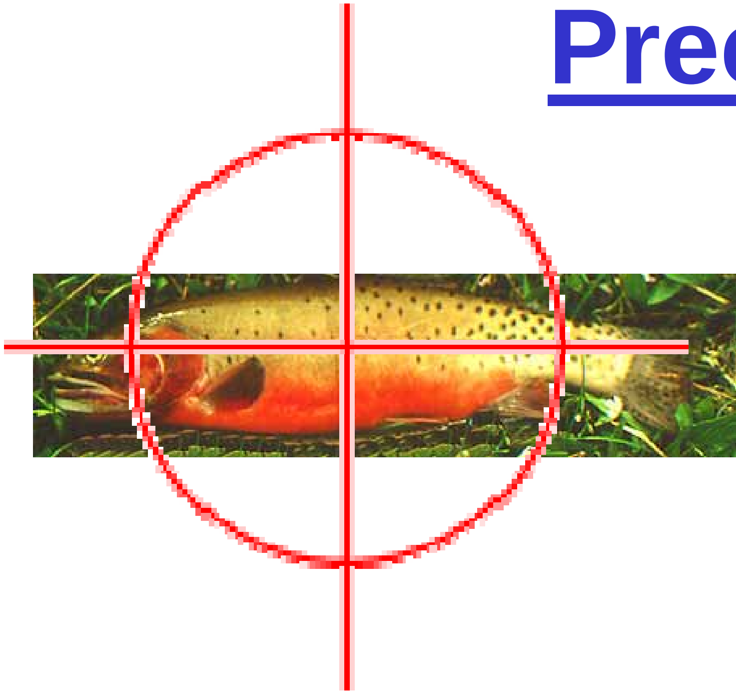
- Doctrine vs. law vs. policy
- Federal vs. state vs. local control
  - Do federal laws conflict with state laws?
  - Relationships are different in different regions

Science-Based Need

Managing Uncertainty

- How precisely can we quantify effects?
- How many fish will this grow?
- How will other resources be affected?

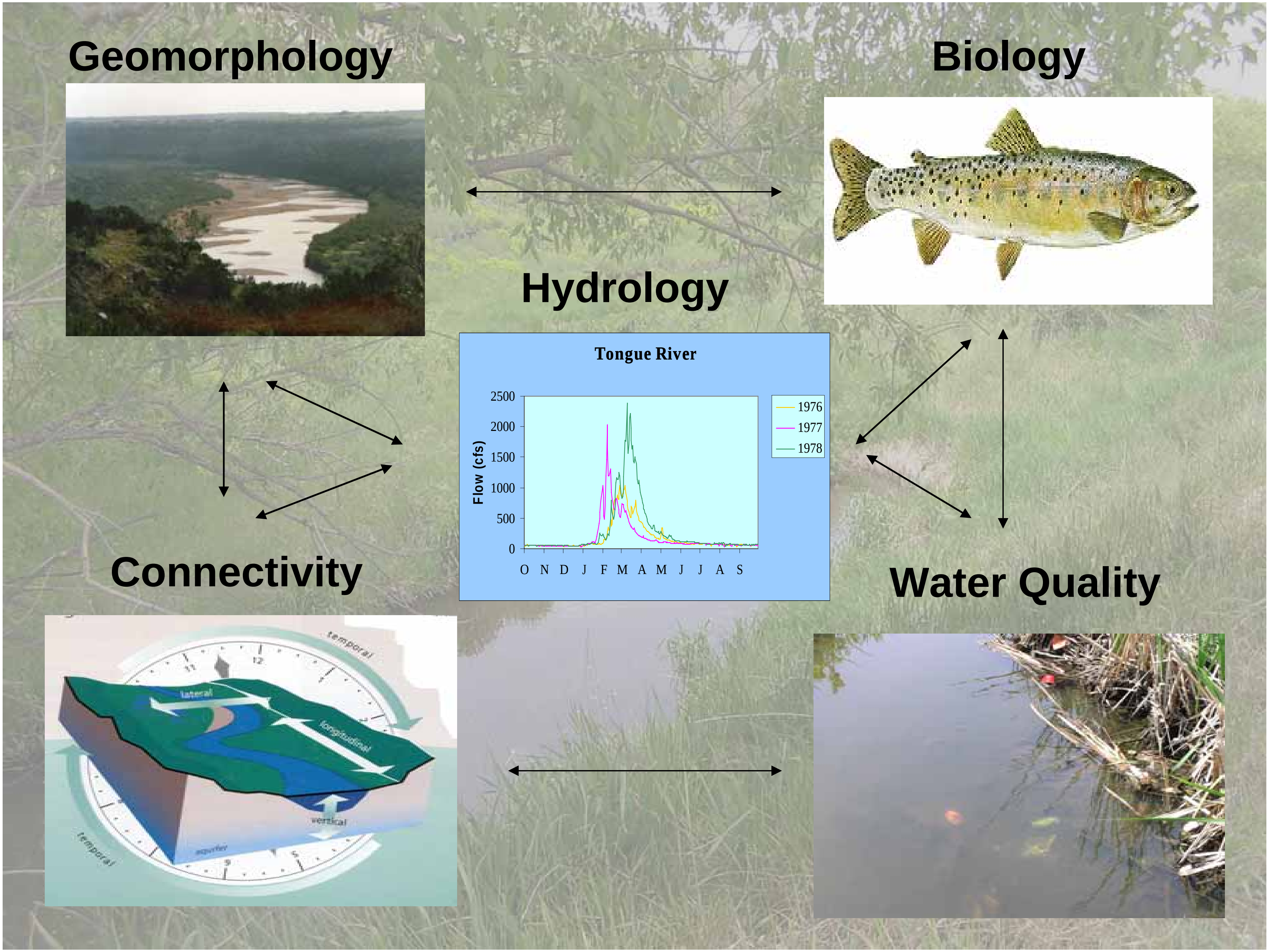
Precision vs. Accuracy



Do you need to know the exact effect or result?

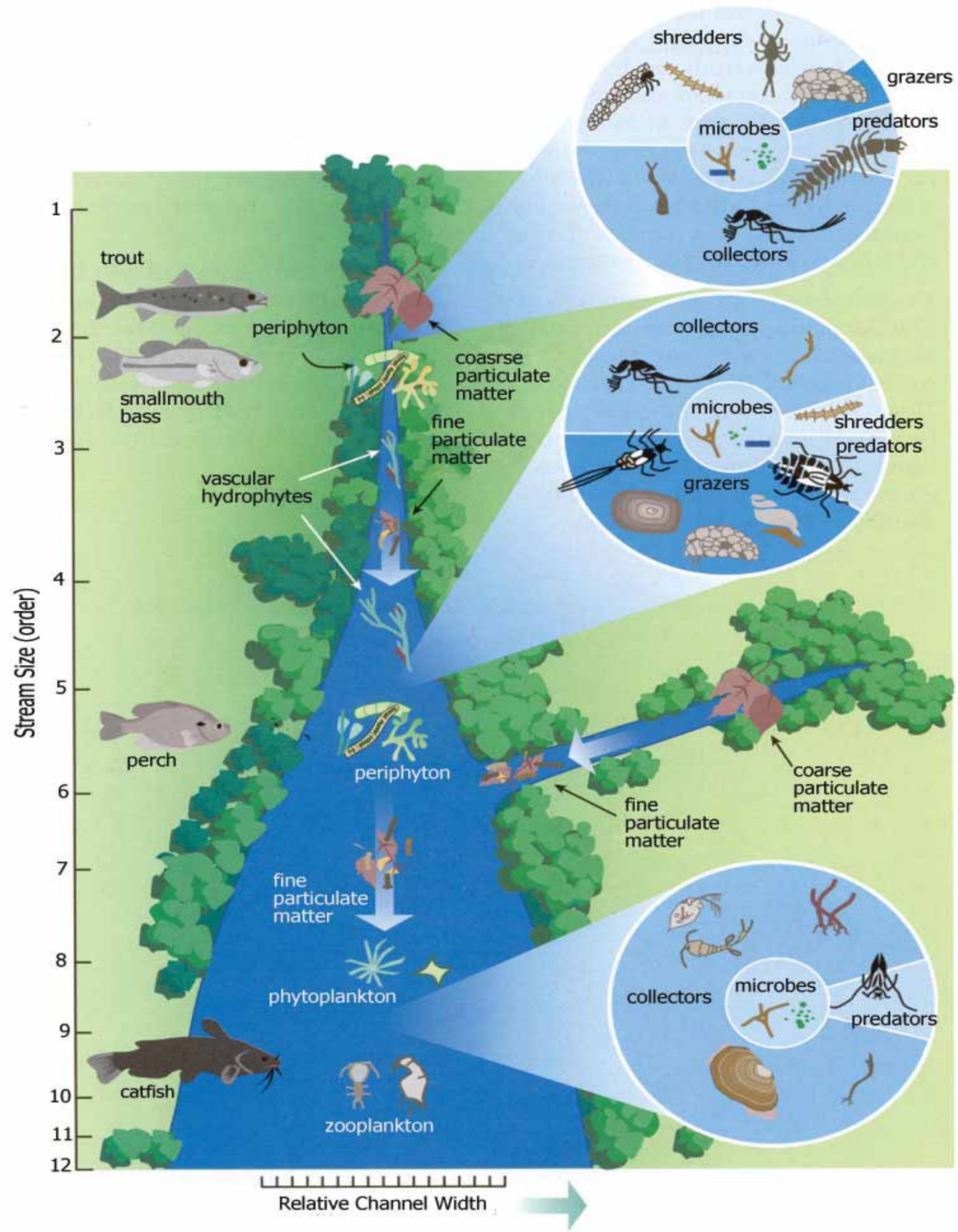
Or do you just need to come close?

<u>Science-based need</u>
(enough for what purpose?)

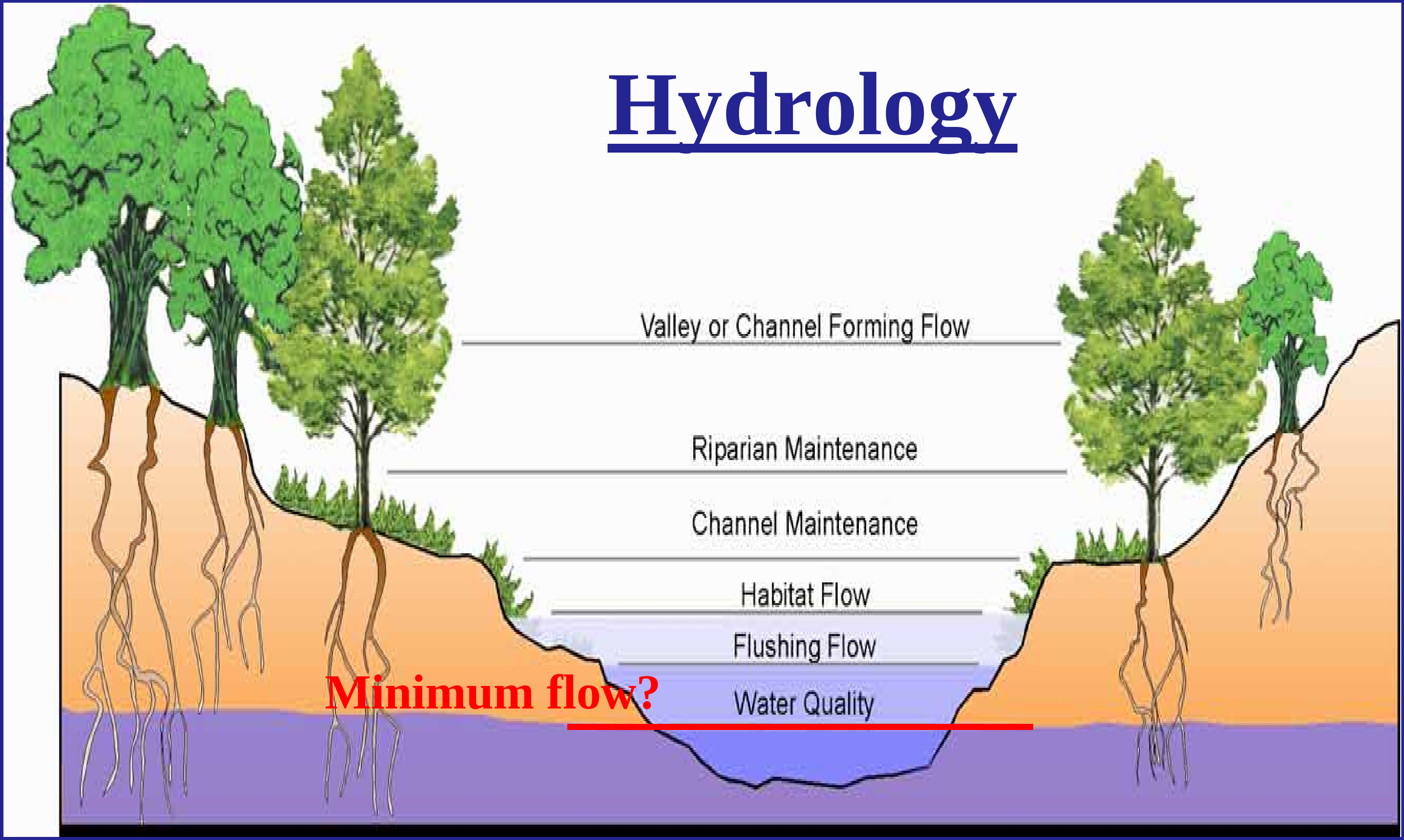


Geomorphology
Biology
Hydrology
Tongue River
Flow (cfs)
2500
2000
1500
1000
500
0
O N D J F M A M J J A S
1976
1977
1978
Connectivity
temporal
lateral
longitudinal
vertical
aquifer
temporal
Water Quality

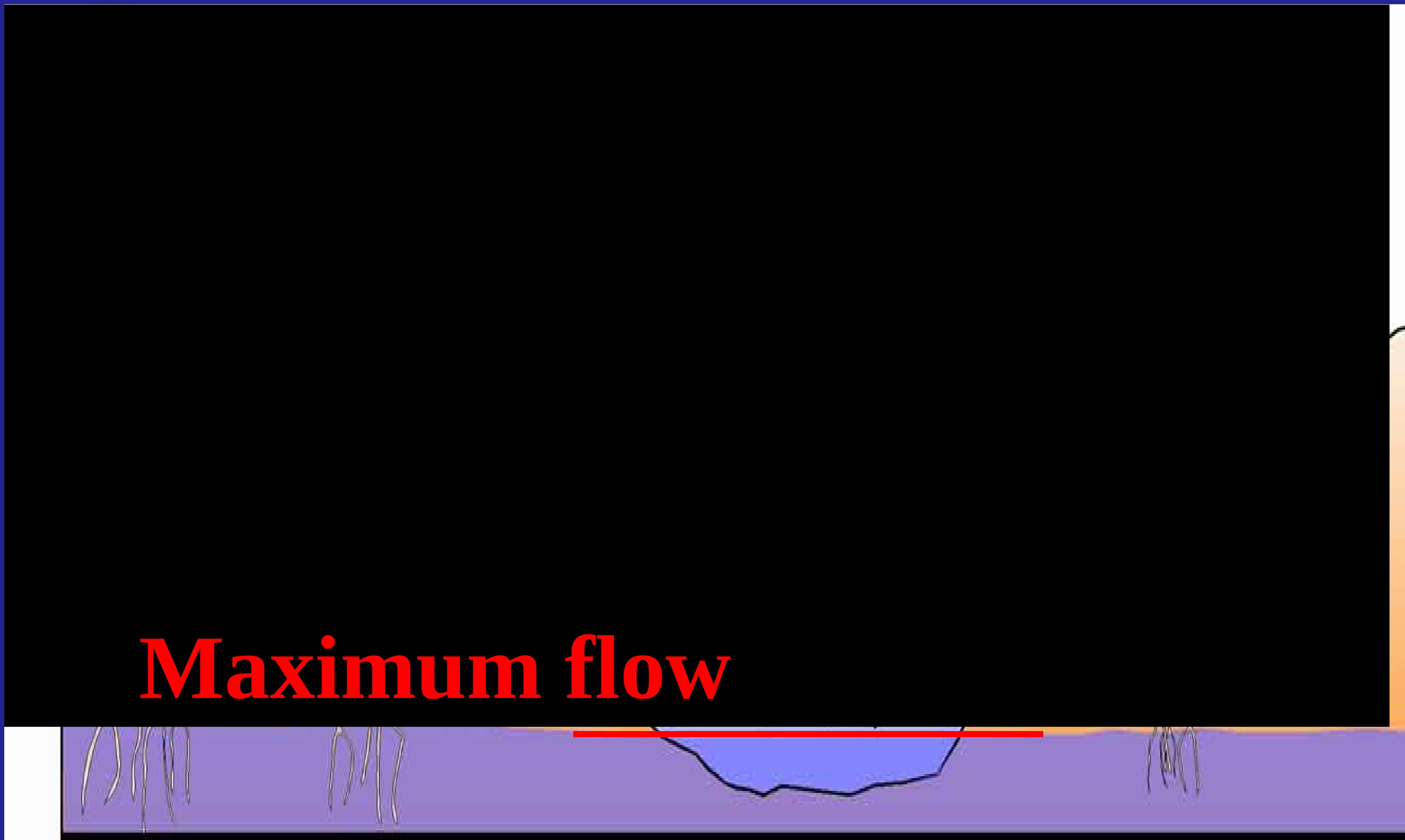
Rivers naturally change in predictable ways over their entire length.



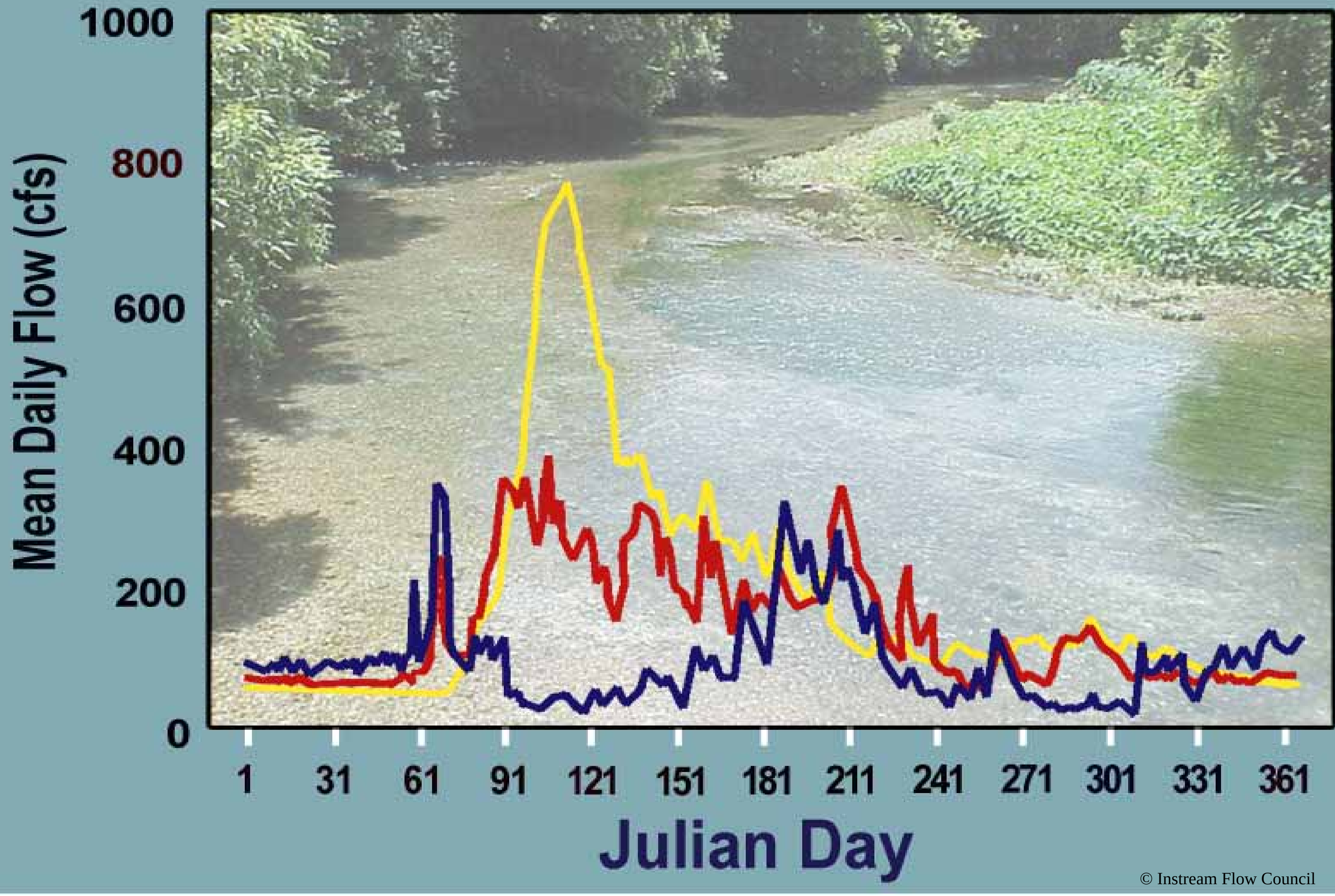
Hydrology



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

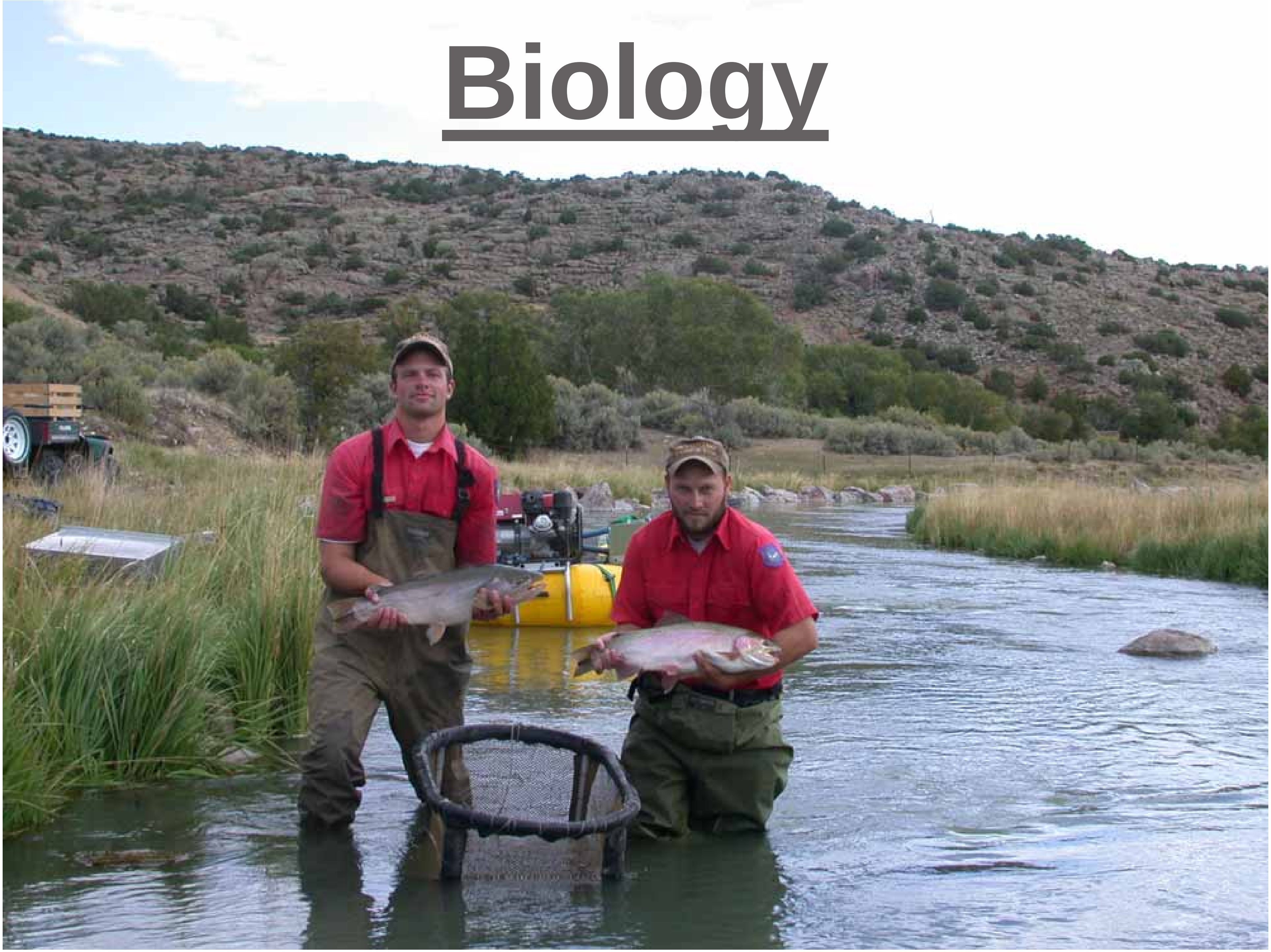


The problem with minimum flows . . .



1000
800
600
400
200
0
Mean Daily Flow (cfs)
1
31
61
91
121
151
181
211
241
271
301
331
361
Julian Day

Biology



Biology also embraces other aquatic organisms . . .

and riparian vegetation

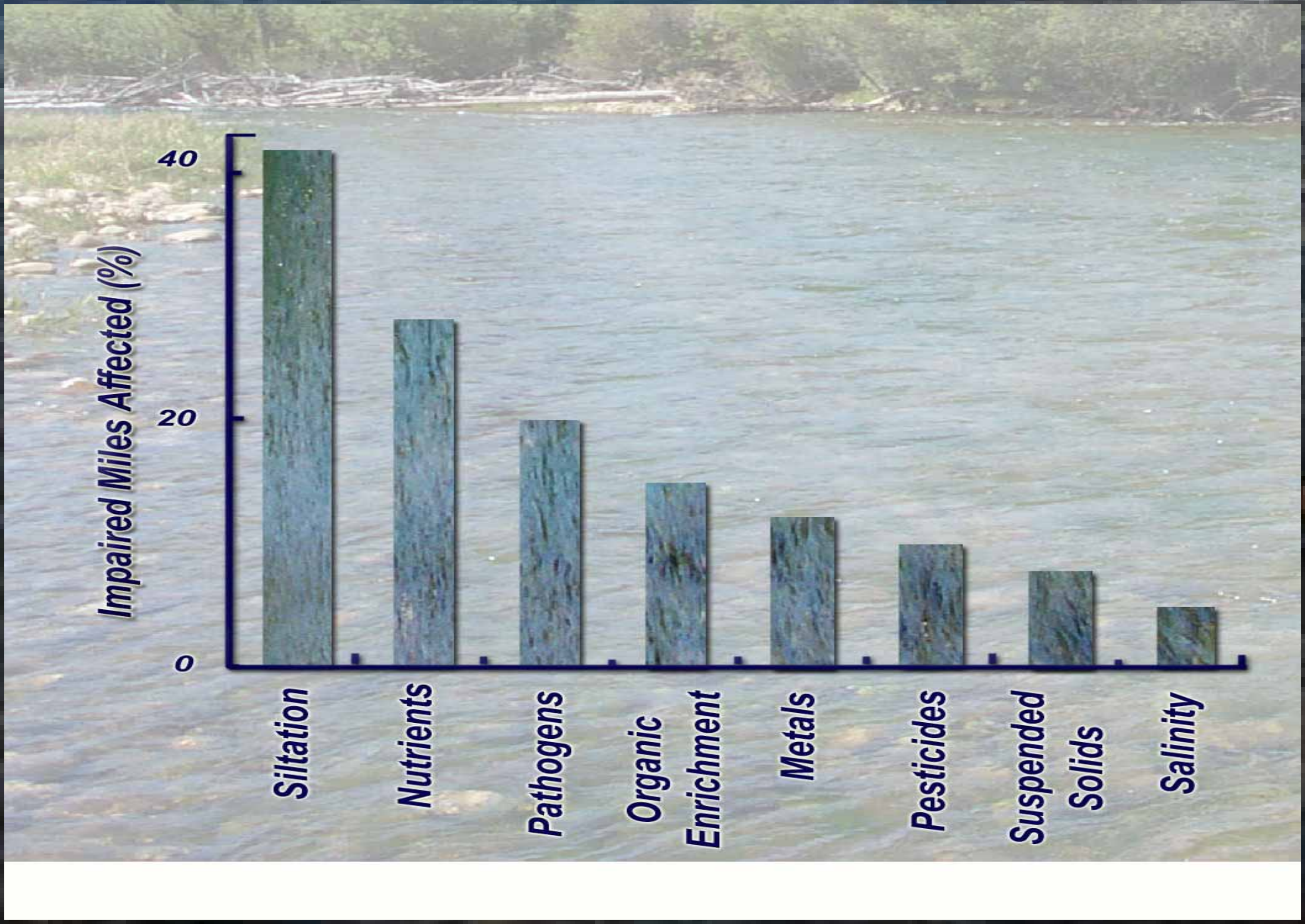
When one tugs at a single thing in nature, he finds it attached to the rest of the world - John Muir

Geomorphology

Things that affect geomorphology

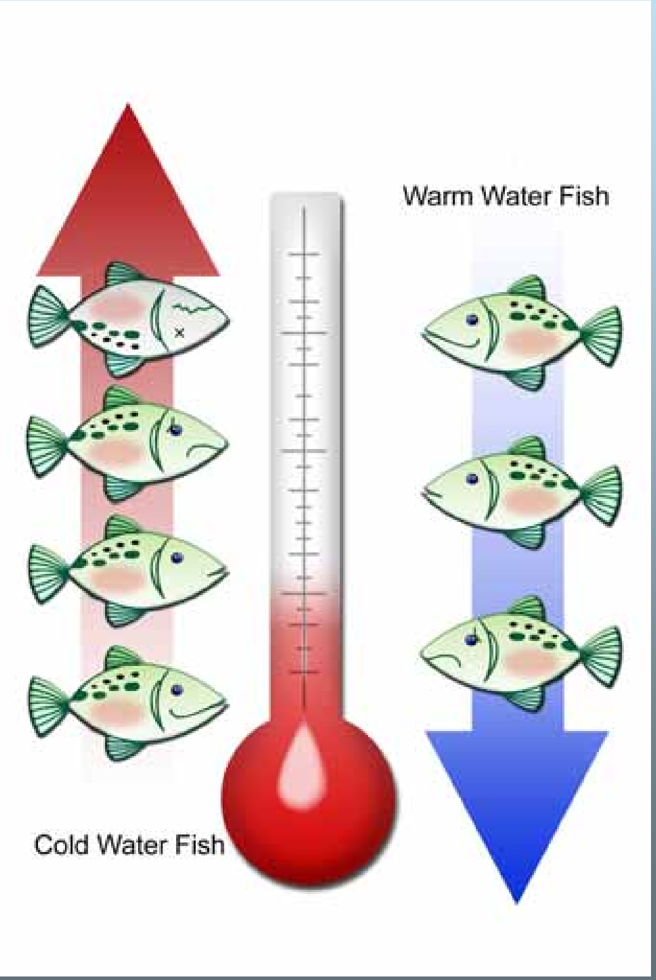
- Adding or removing sediment
- Adding or removing water
- Altering the channel

Water Quality



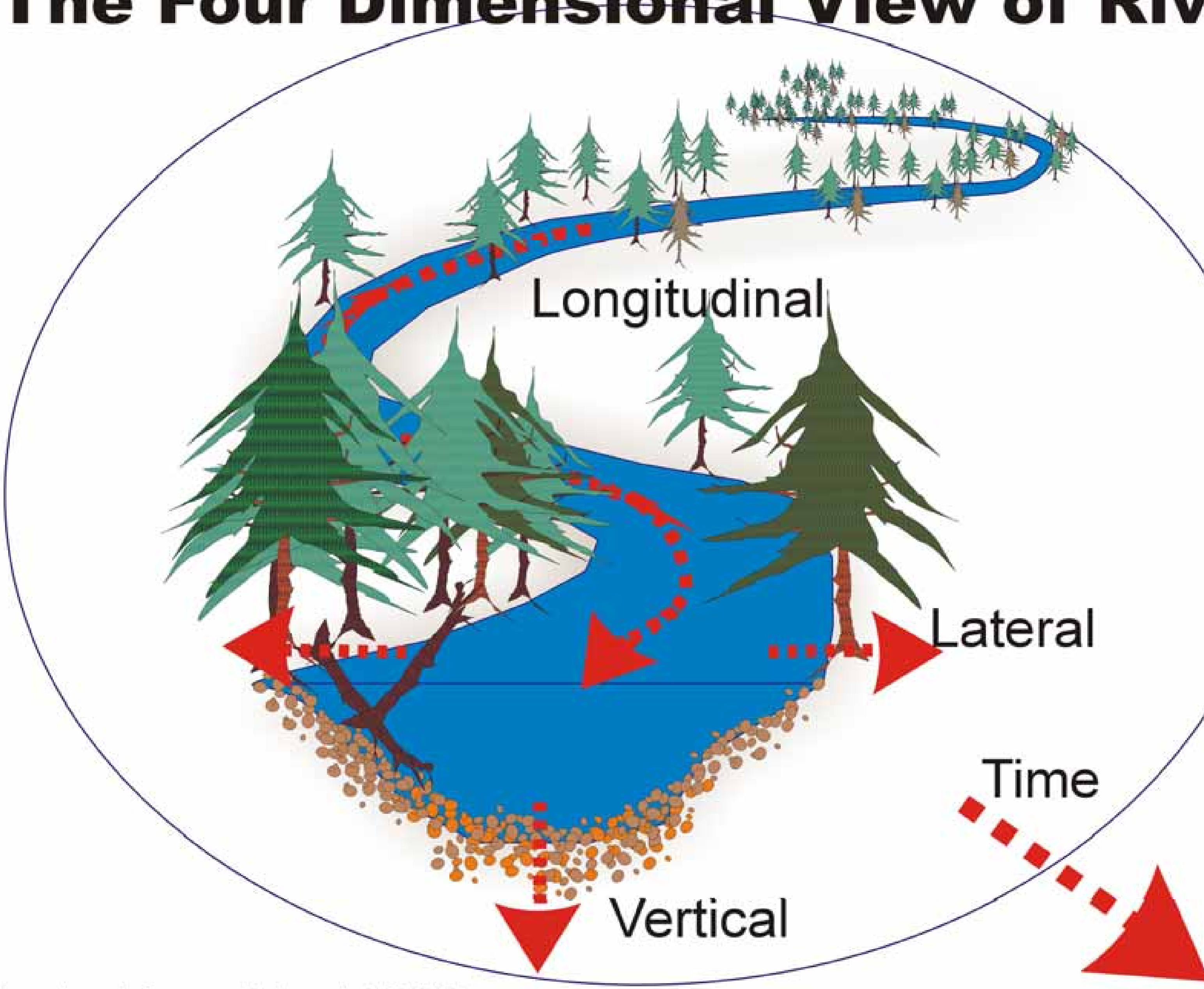
Water temperature matters any time of year

. . . and any time of day.



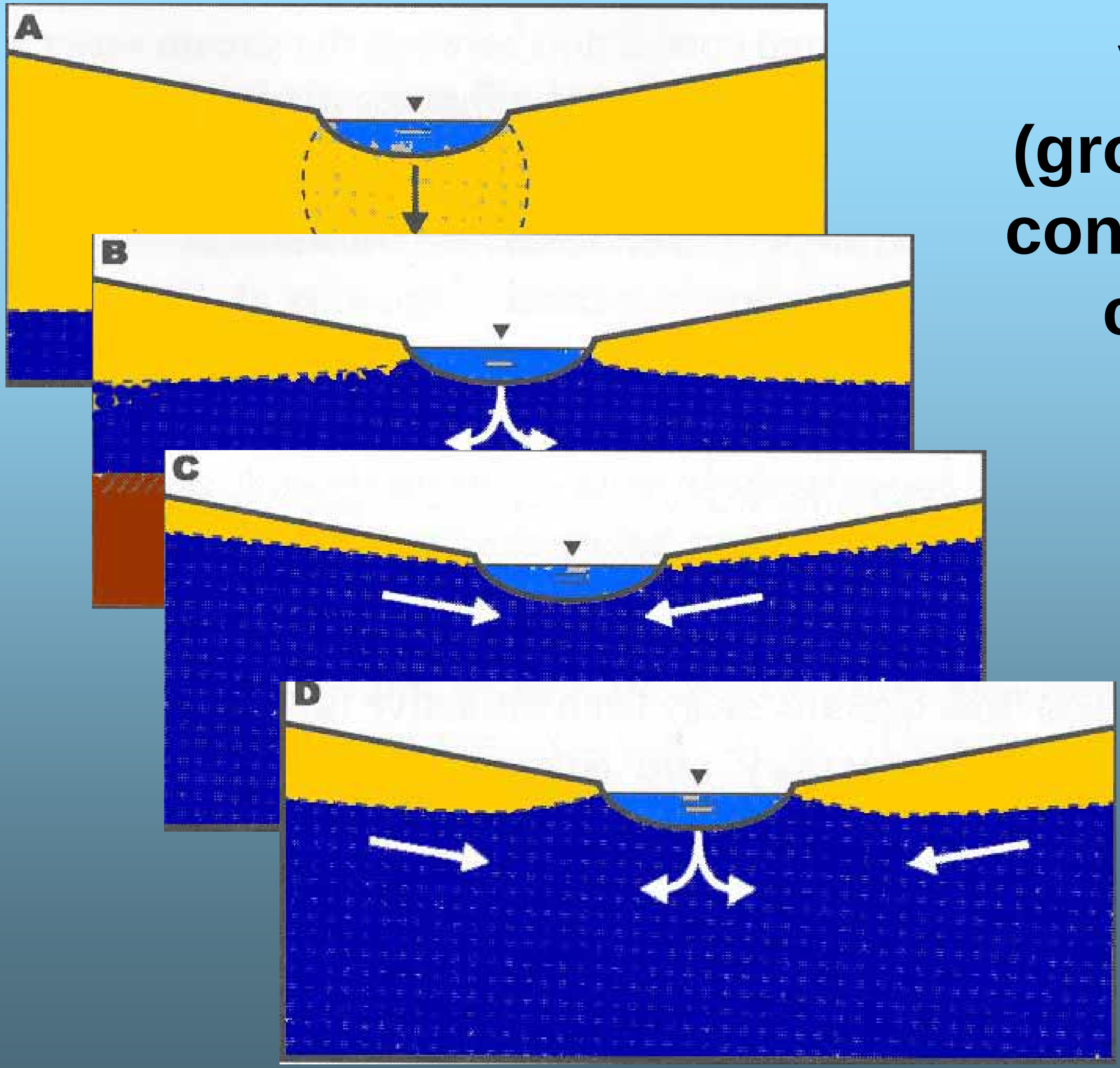
Connectivity

The Four Dimensional View of Rivers

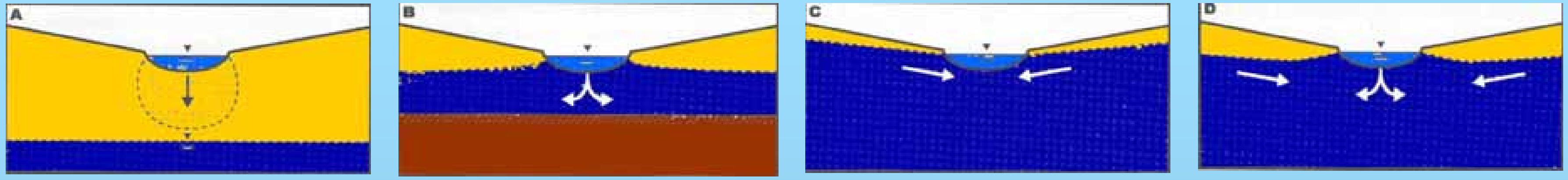


(Adapted from Ward 1989)

What’s the minimum flow to maintain lateral connectivity?

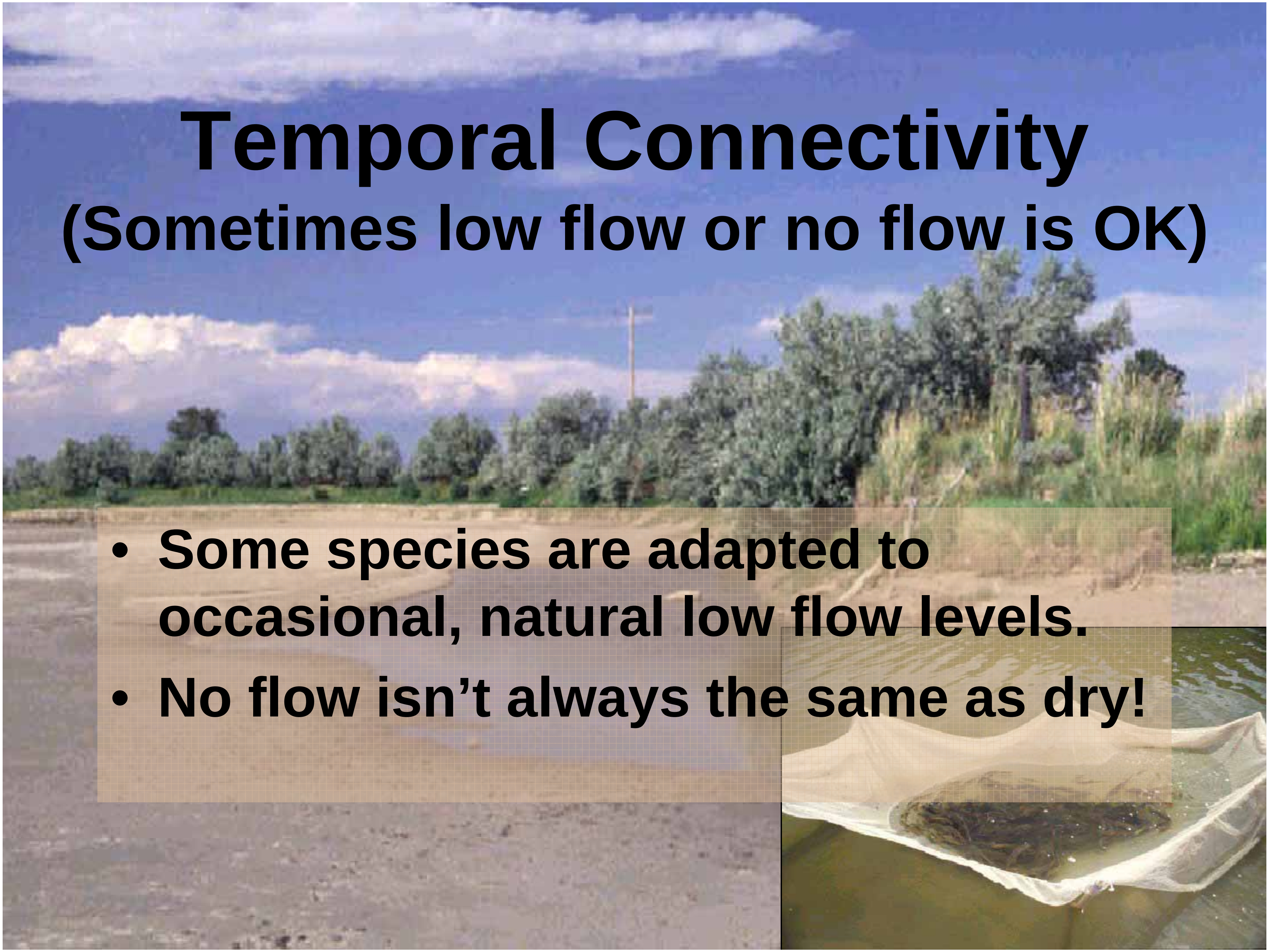


Vertical (groundwater) connectivity is complex



Groundwater Facts

- Shallow groundwater and surface water are often connected in some manner, BUT
- Relationship can change over distance
- Relationship can change over time
- Each stream and segment is unique
- Understanding the relationship should be based on data – not generalities


Temporal Connectivity
(Sometimes low flow or no flow is OK)
• Some species are adapted to occasional, natural low flow levels.
• No flow isn't always the same as dry!

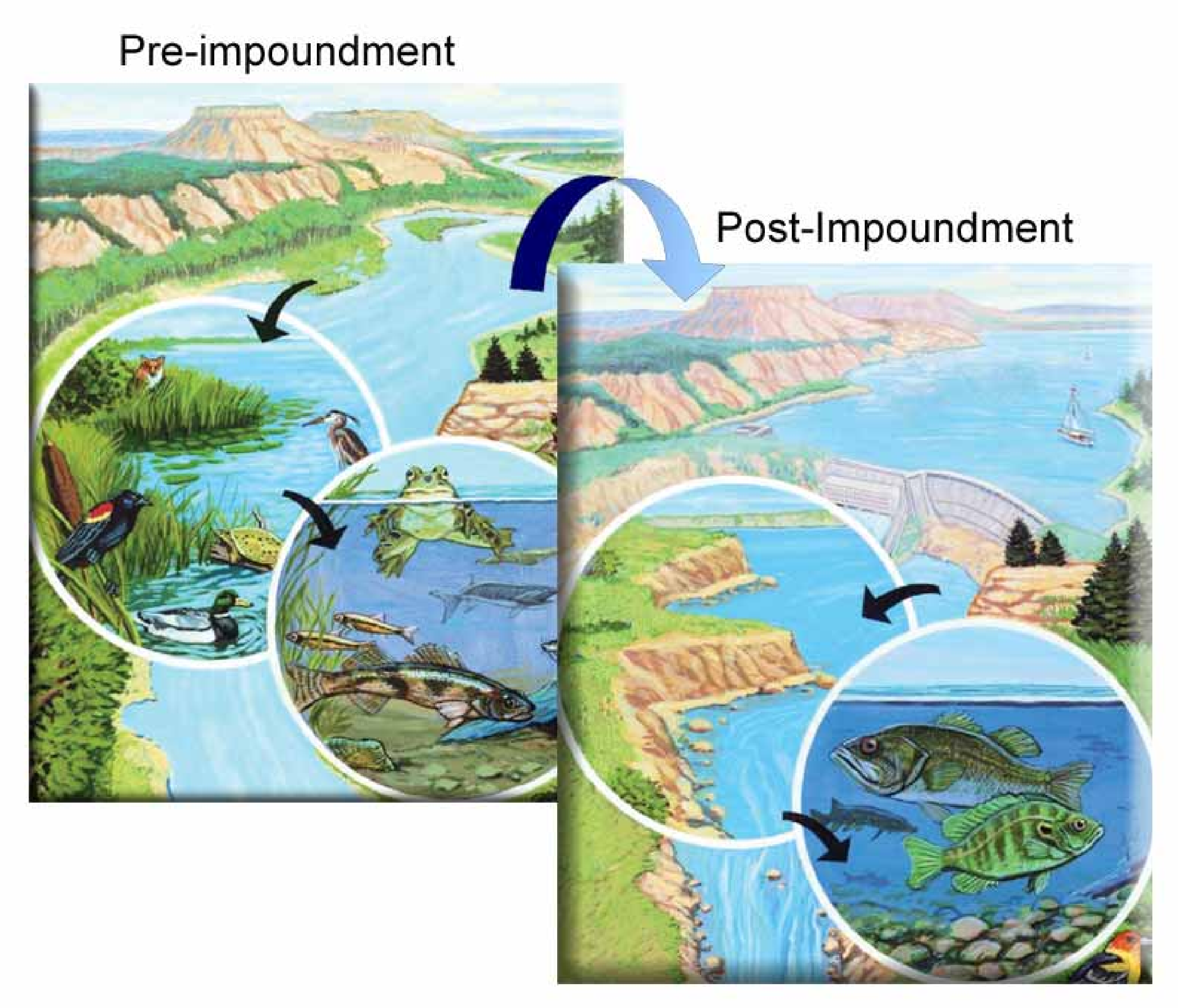
Connectivity isn’t just about fish

- Water chemistry
- Woody materials
- Nutrients
- Bedload

What about dams?

- Cost lots of money
- Take lots of time to permit and build
- Incur great uncertainty
- Create and destroy aquatic habitats

Dams don't affect one thing . . .



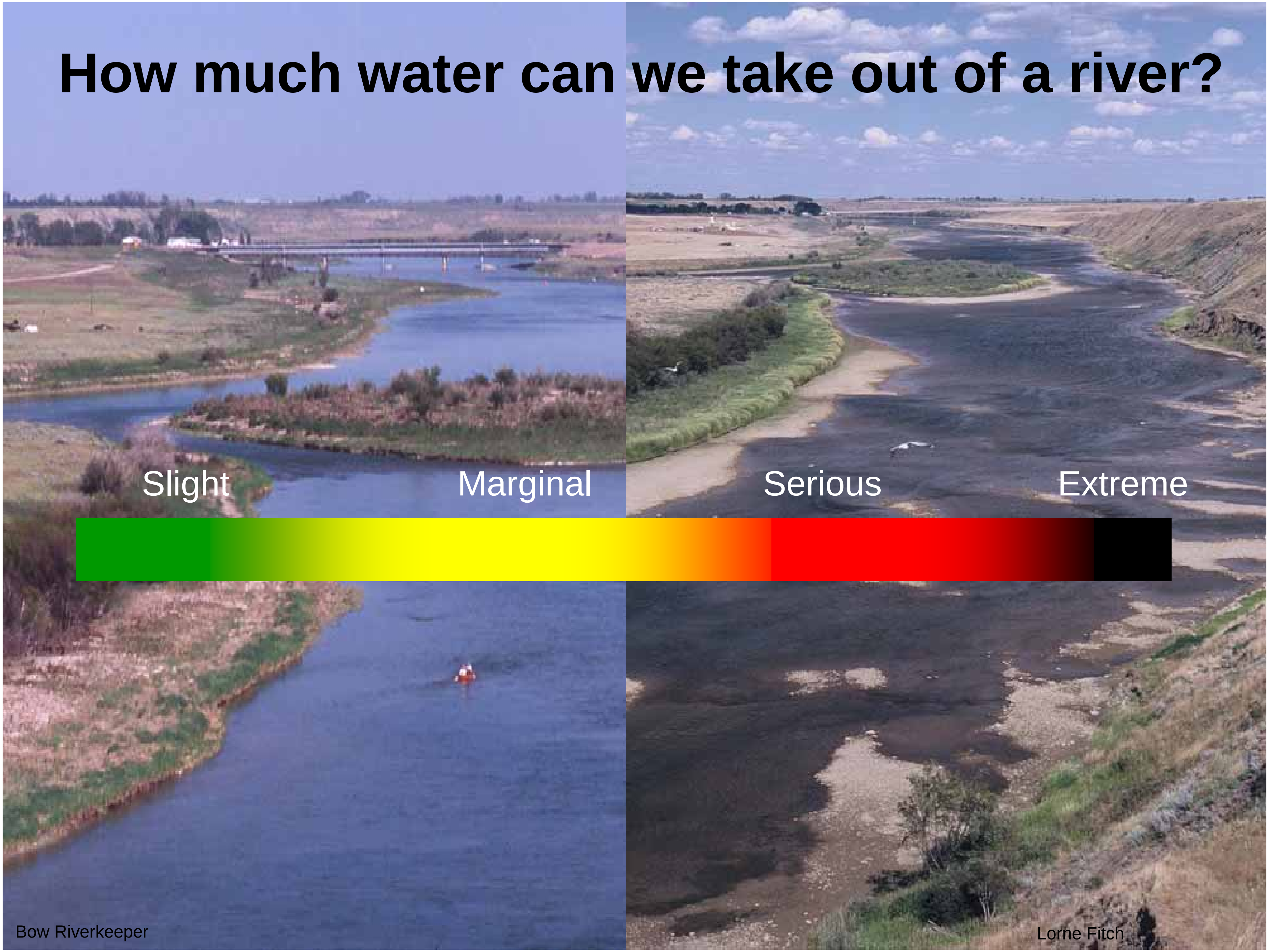
- Hydrology
- Biology
- Geomorphology
- Water quality
- Connectivity

“If nature, in the course of eons, has built something we like, but do not understand, then who but a fool discards seemingly useless parts? To keep every cog and wheel is the first precaution of intelligent tinkering.”

Aldo Leopold (Round River, 1953)

Instream Flow is OK But We Need to Use Our Water

How much water can we take out of a river?



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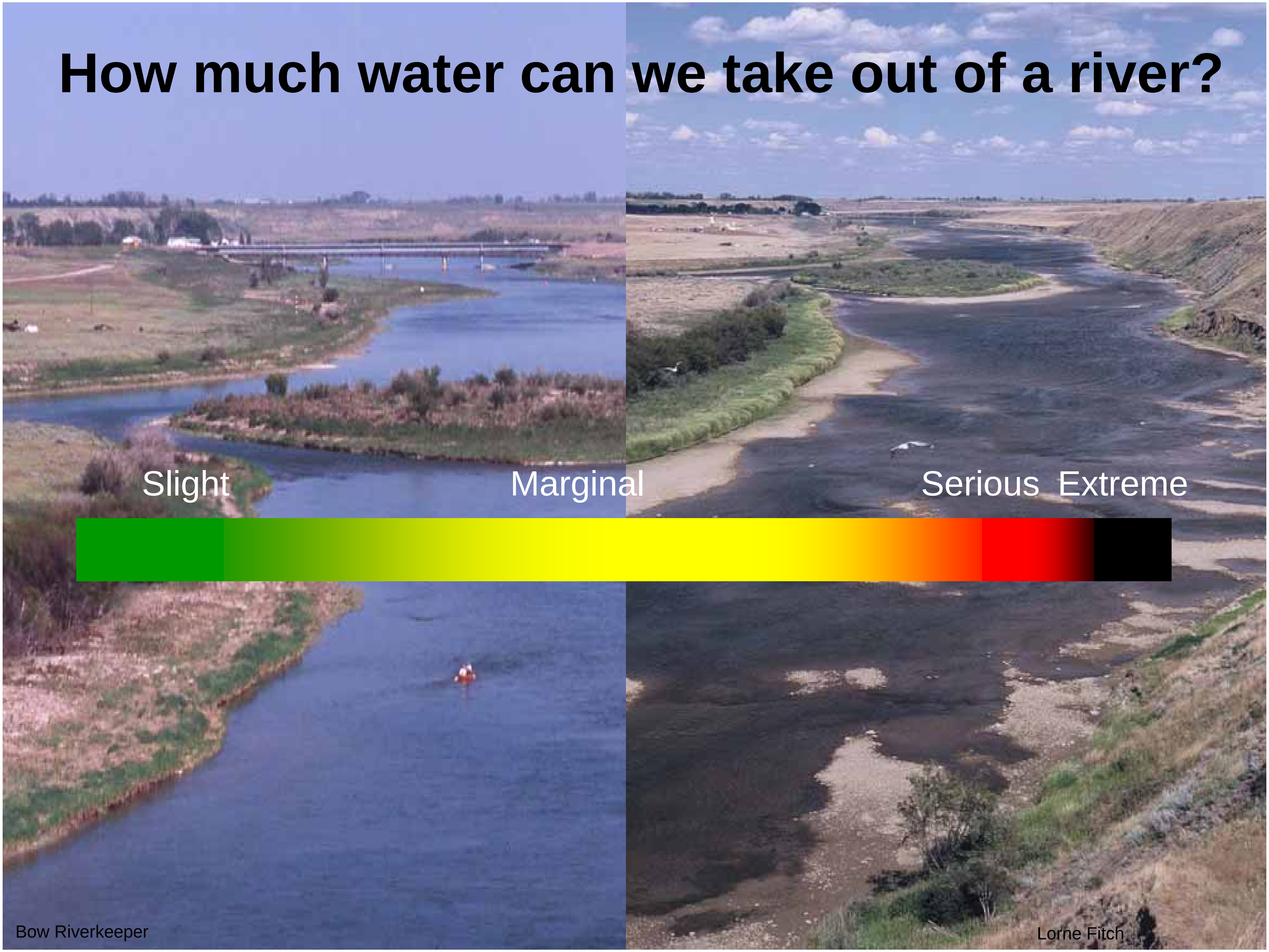

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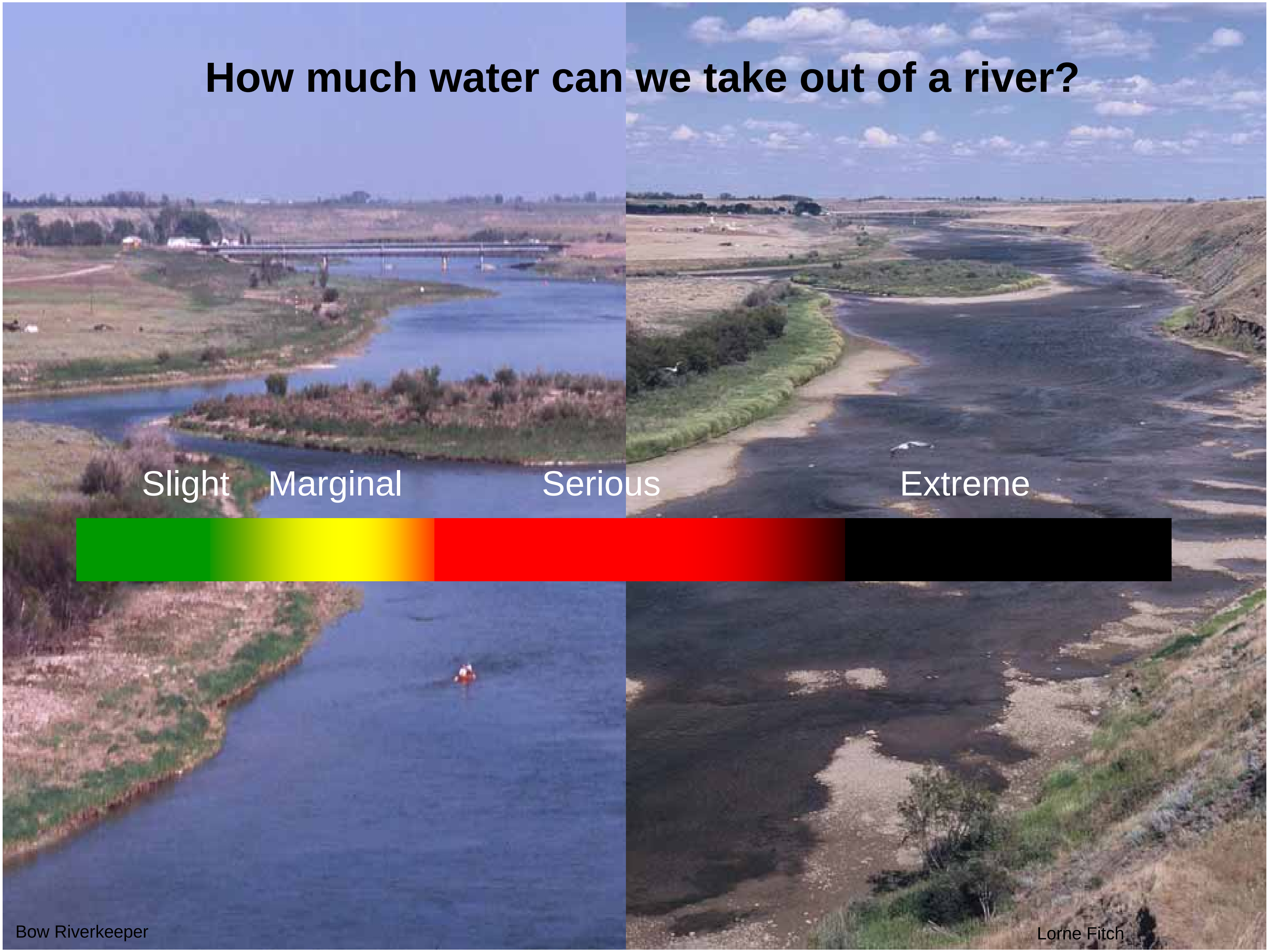

Bow Riverkeeper

Lorne Fitch

The Things We Do Affect Rivers