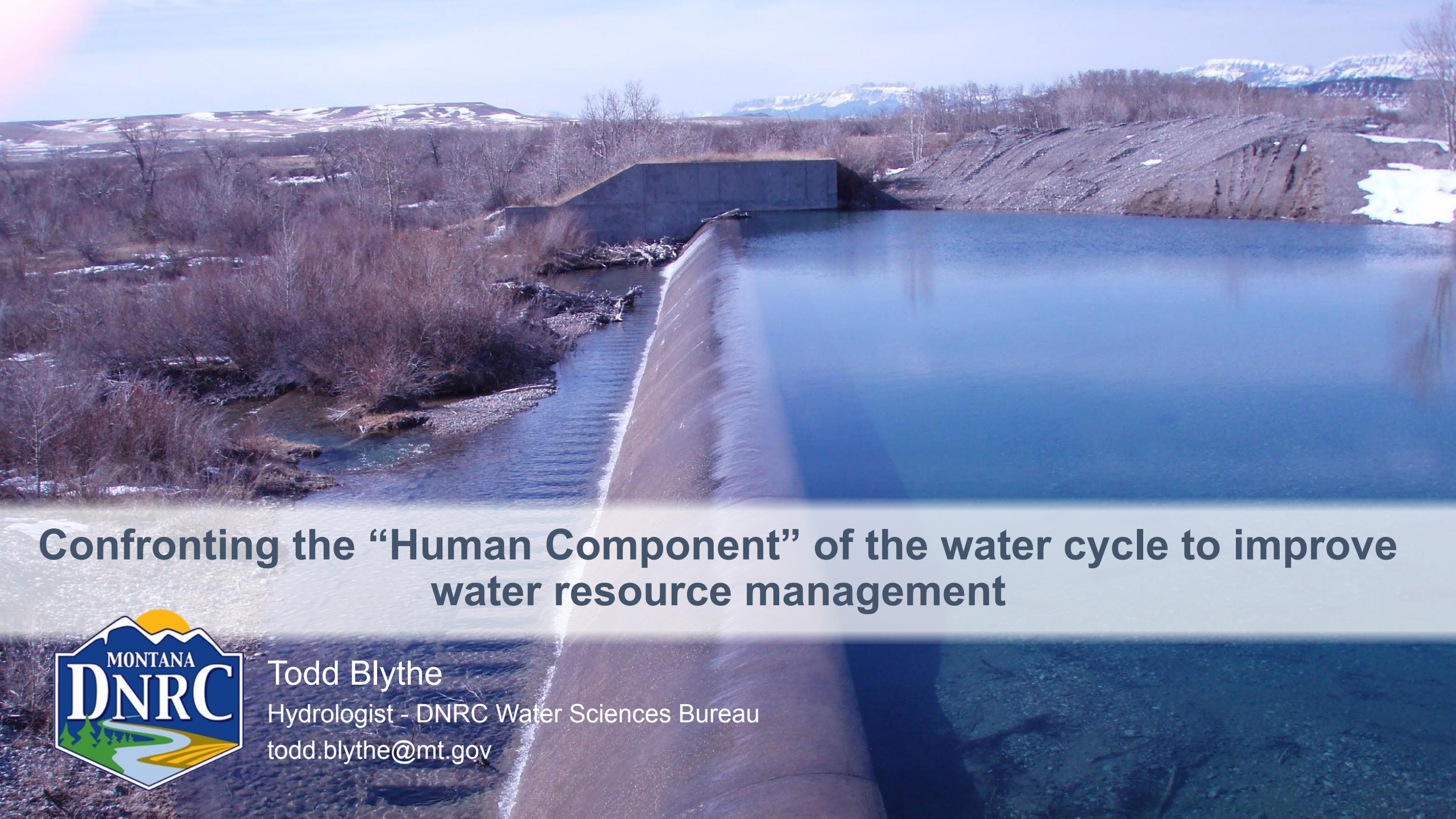
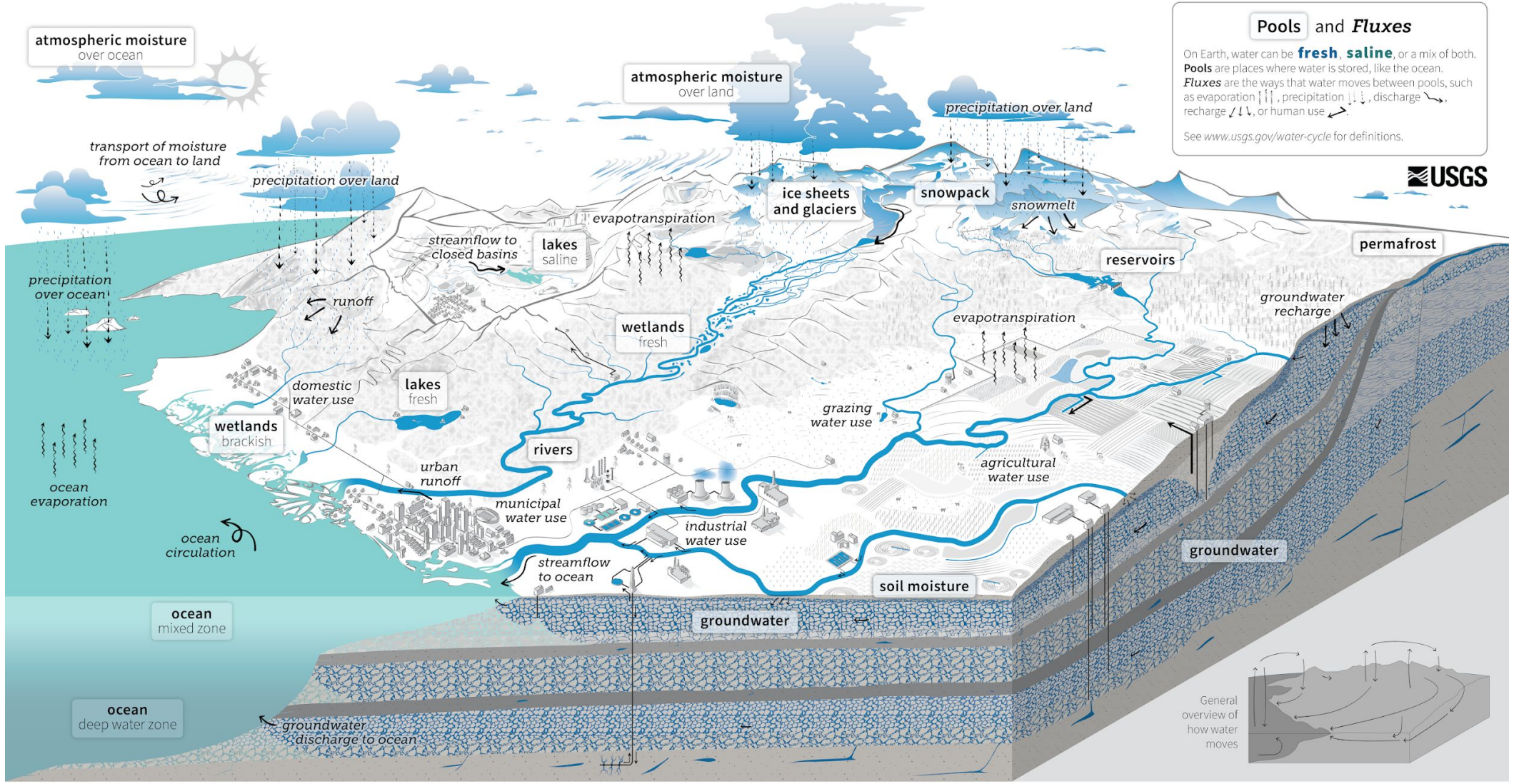


Confronting the “Human Component” of the water cycle to improve water resource management

Todd Blythe
Hydrologist - DNRC Water Sciences Bureau
todd.blythe@mt.gov

What information do we need to manage water resources?



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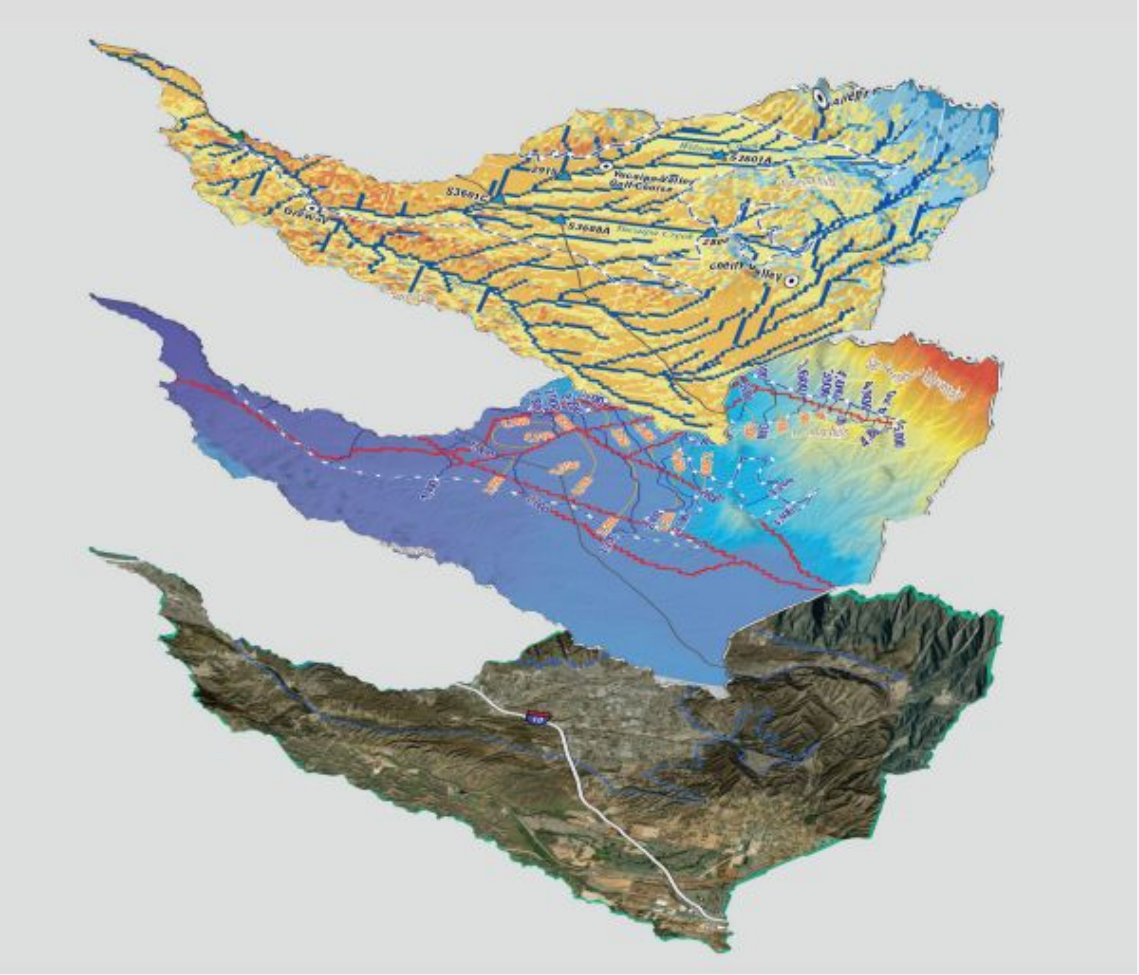
The Spatial Conundrum of a “Single Point”

- Hydrologic Processes are:
  - Complex
  - Vary a lot across the landscape
  - Expensive to measure

…but they can be modeled.

A Model for Success…

- Academia and Scientists have put in the time to solve this problem
- Can achieve usable results (across a whole landscape) from sophisticated models that simulate hydrologic processes.



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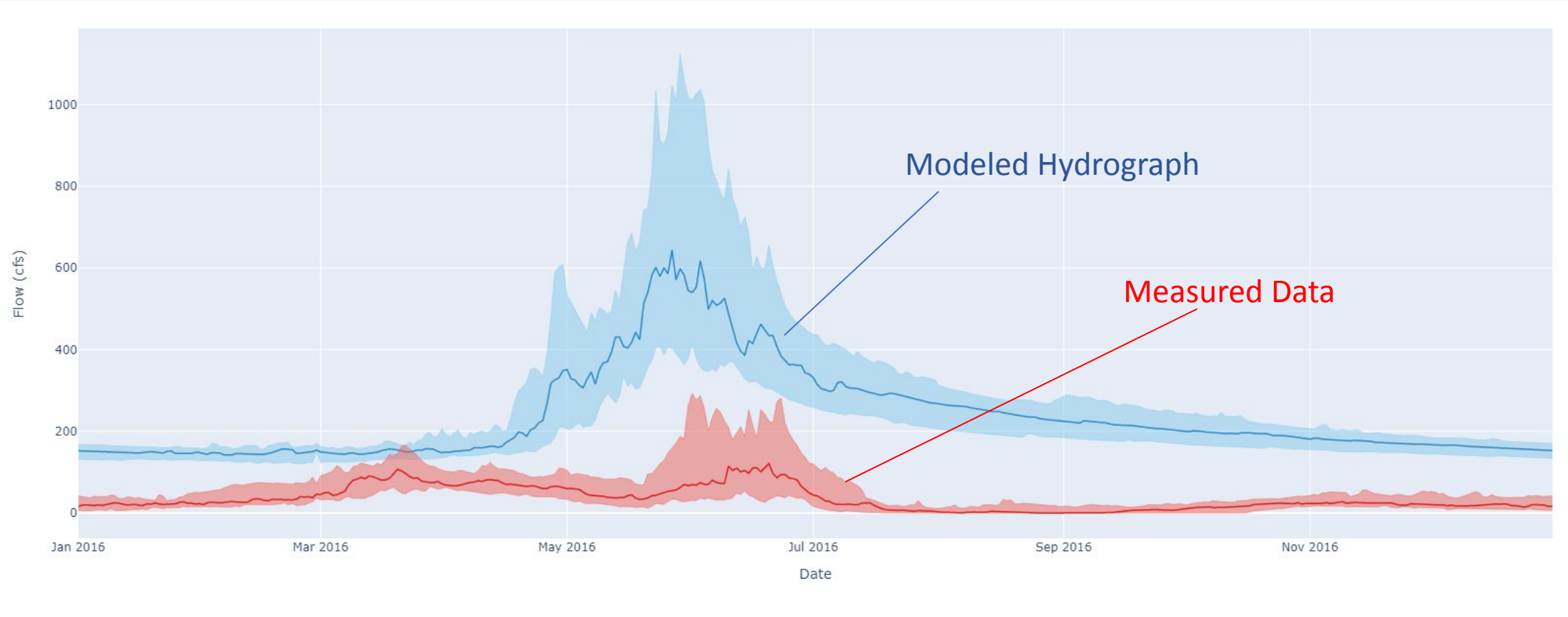
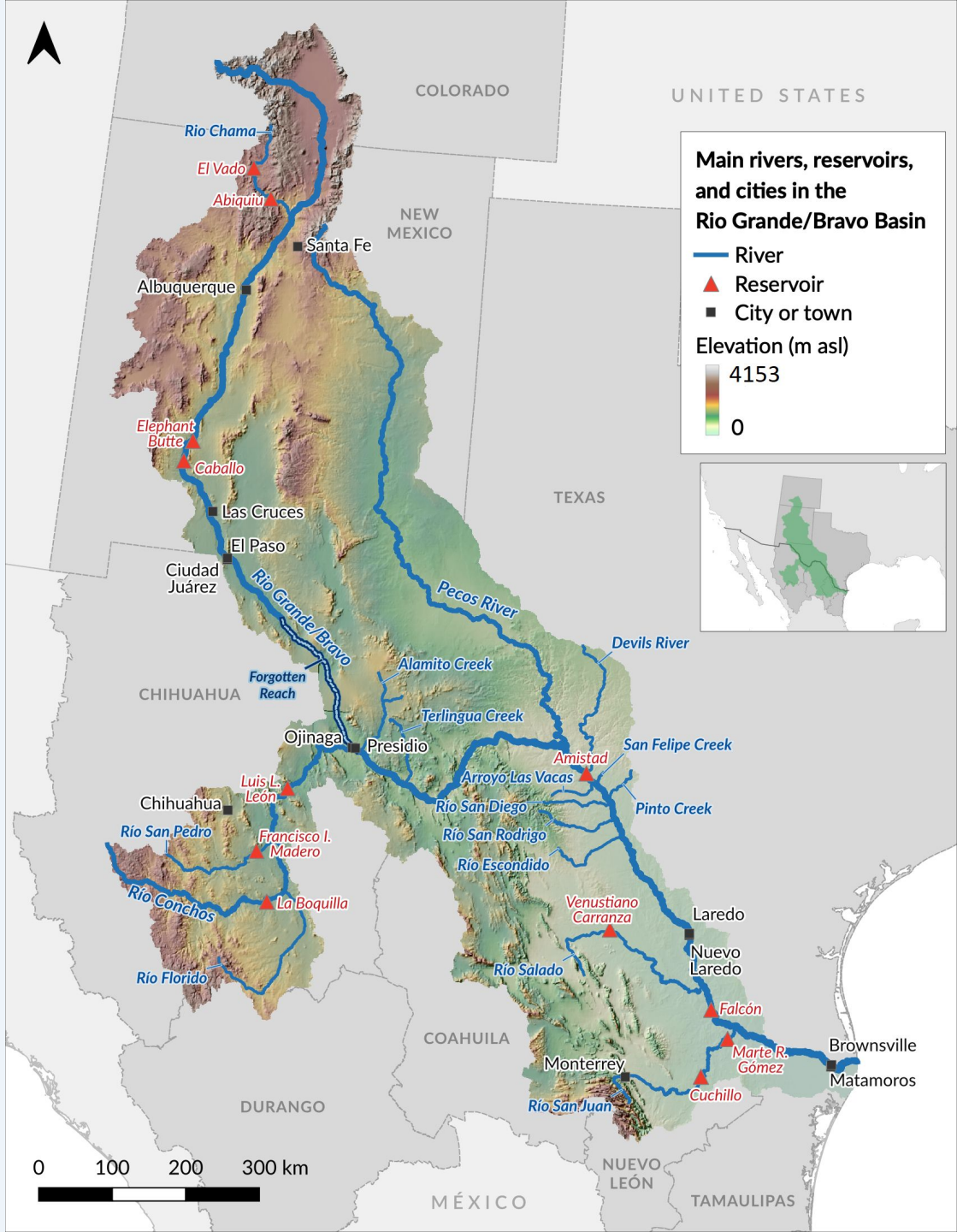


The Rio Grande

The Rio Grande

- Major Drainage Basin
- Forms most of the US-MX border
- Inhabited for looooong time…
- First Anglo settlements in the US
- Where water measurement in the US began…



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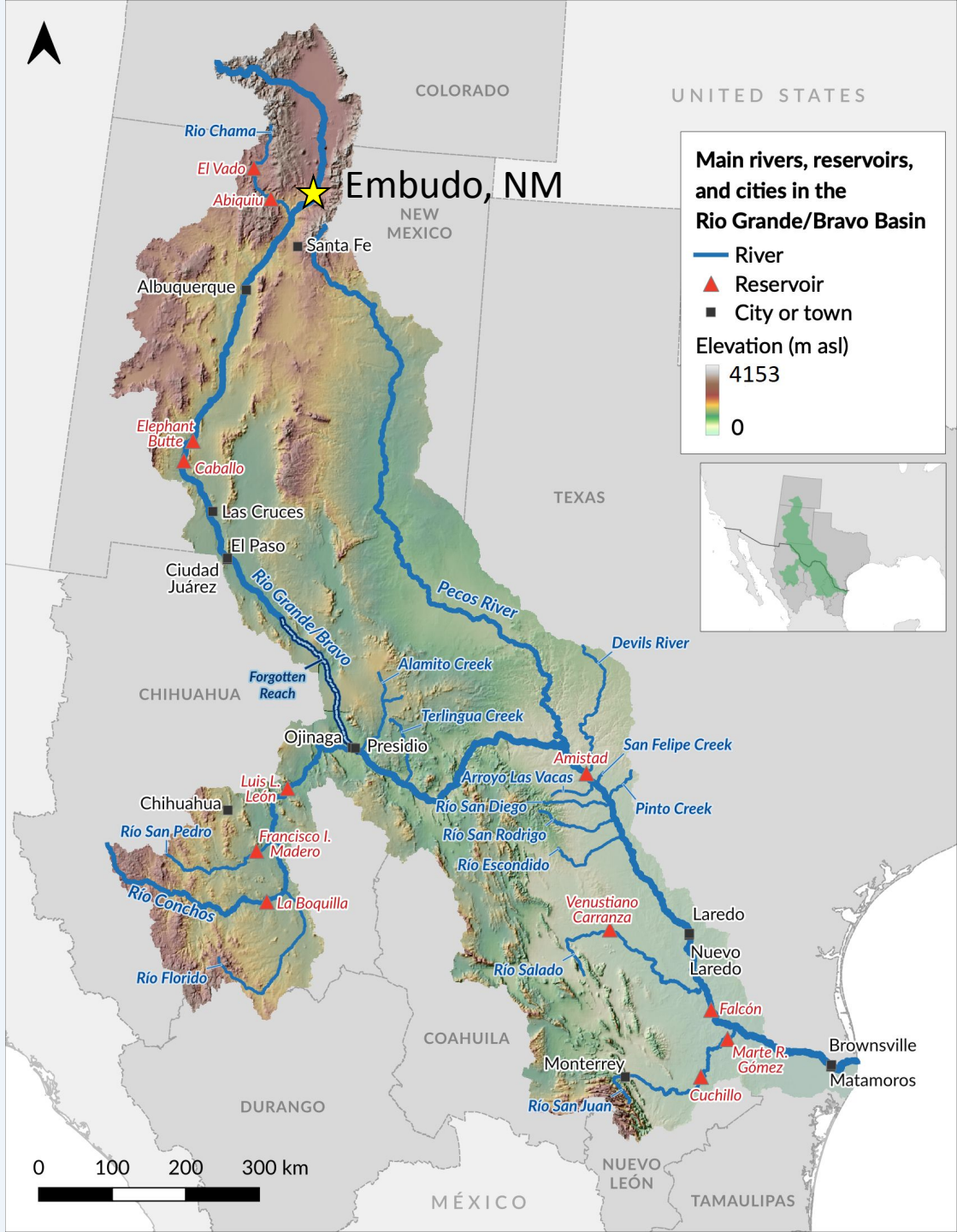

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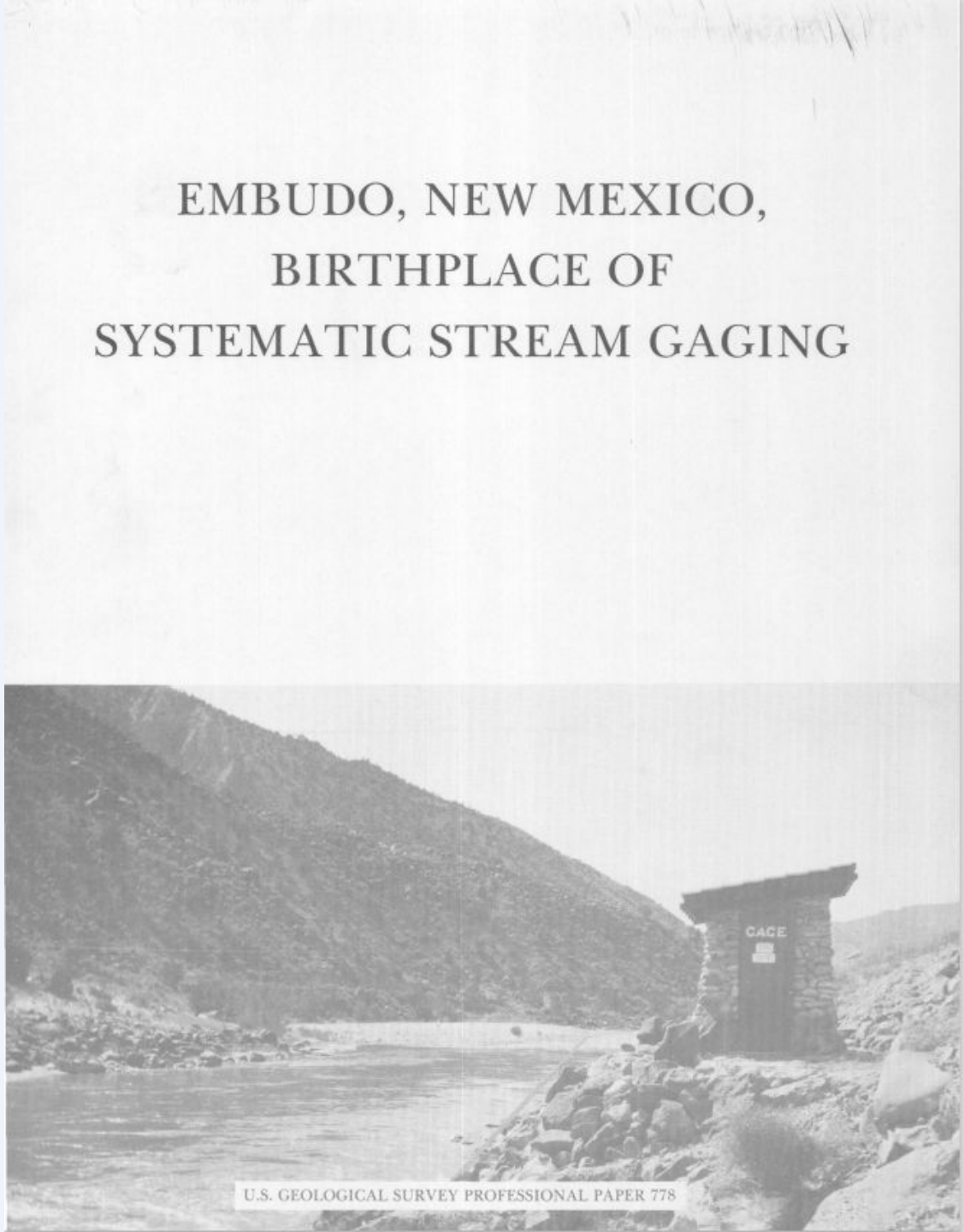

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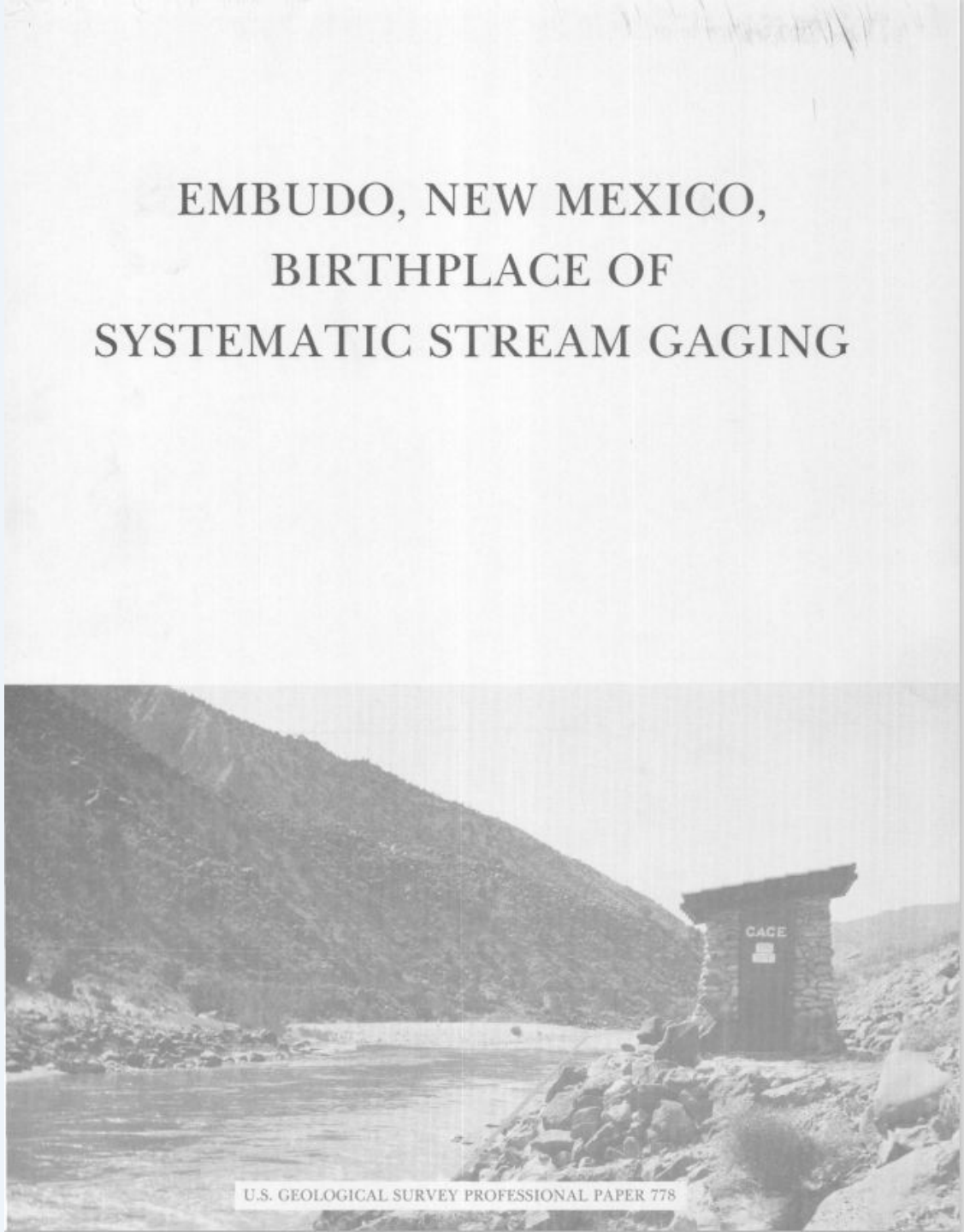
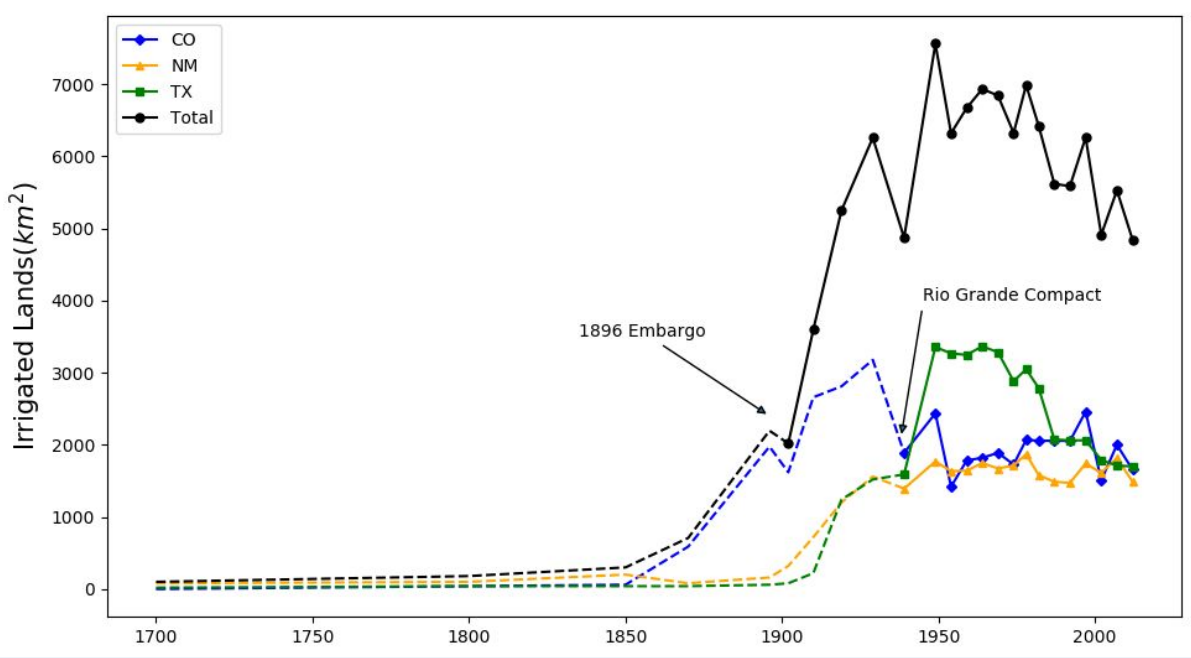
LOTS O’ DATA



The Rio Grande

- The nation's first "battleground" for water…
- Created a need for immediate water management and policy decisions.
- When Measurements began, flow regime was already changed…
- Decisions were made without fully understanding the natural flow regime.

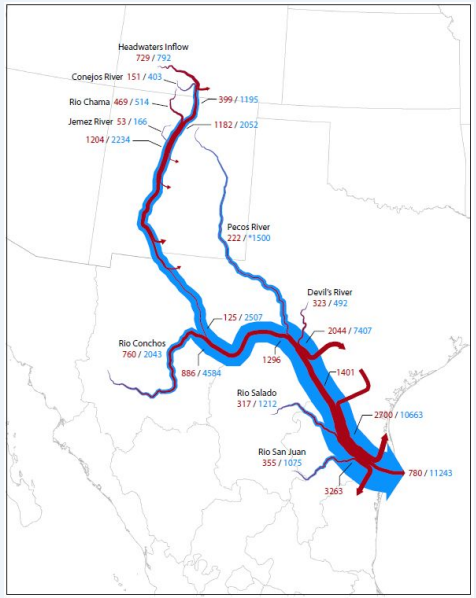


Leads to this kind of management

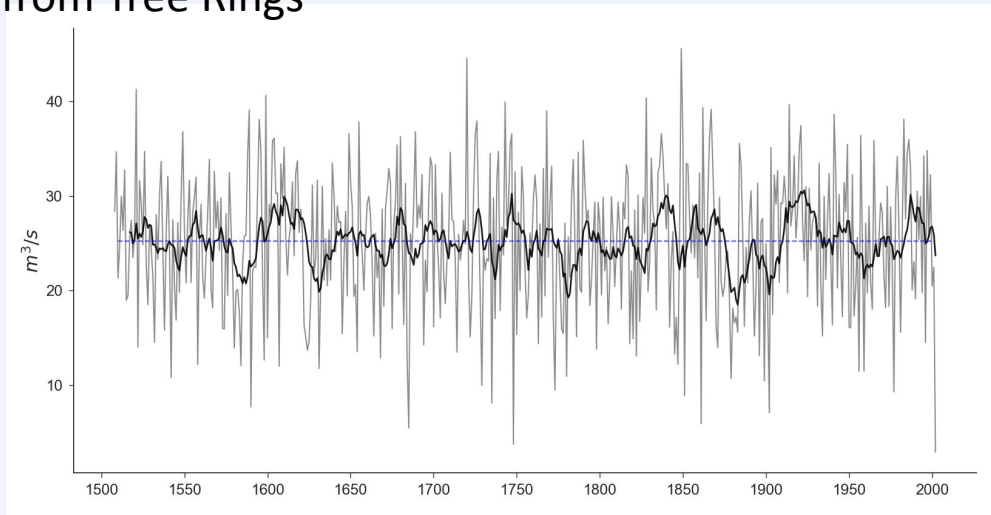
What information do we need to manage water resources?

The Natural Flow Regime…

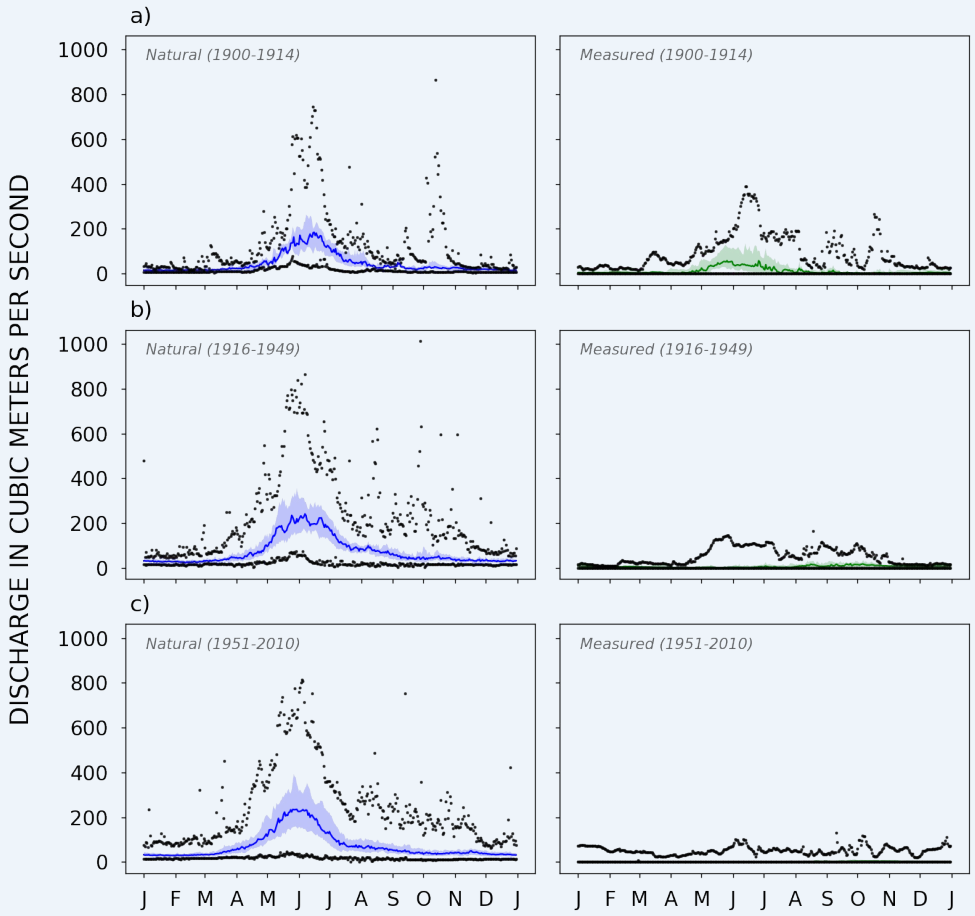
Basin-Wide Annual Water Budget Comparison



500 years of reconstructed Flow from Tree Rings

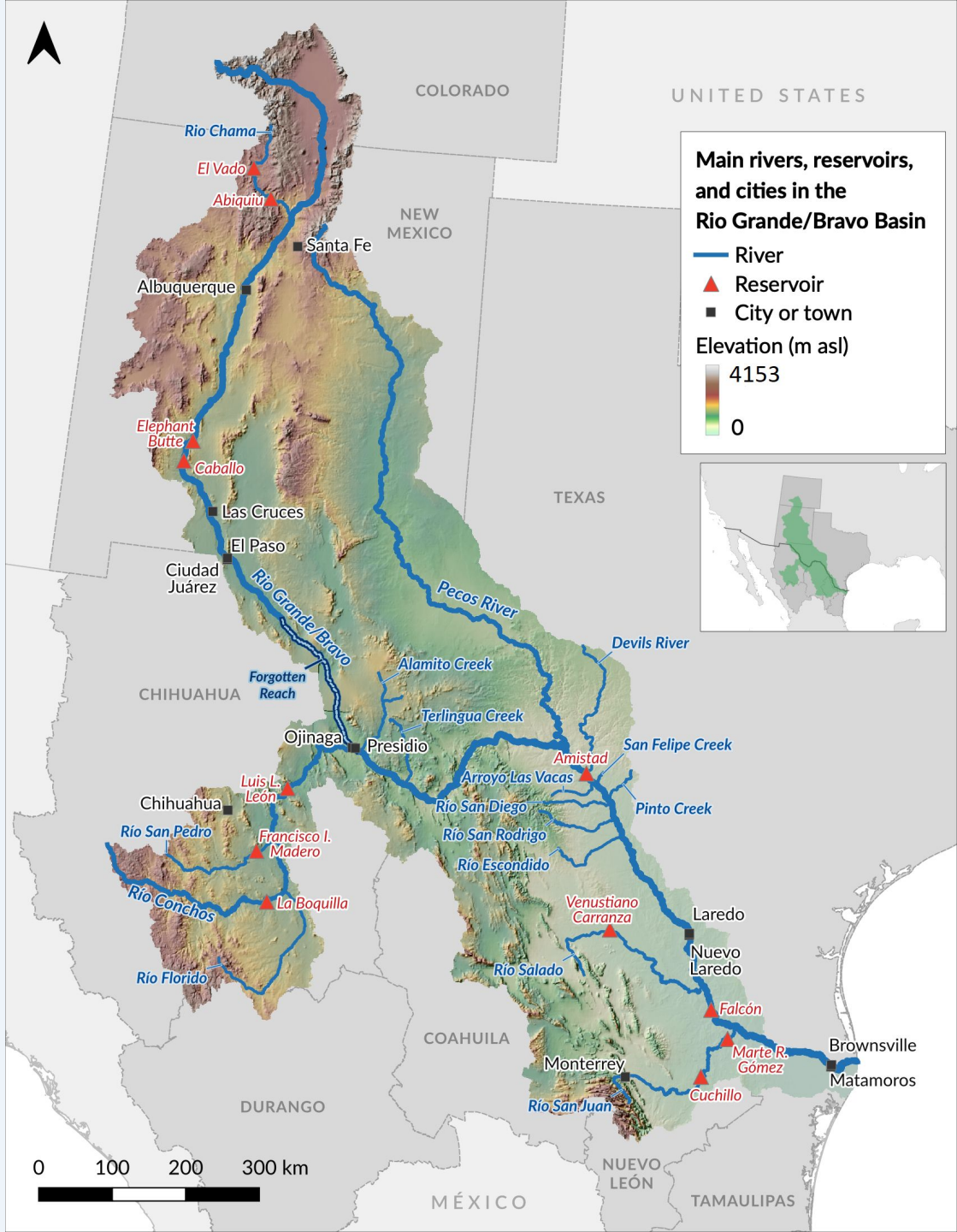


Characteristic Daily Hydrograph Comparisons



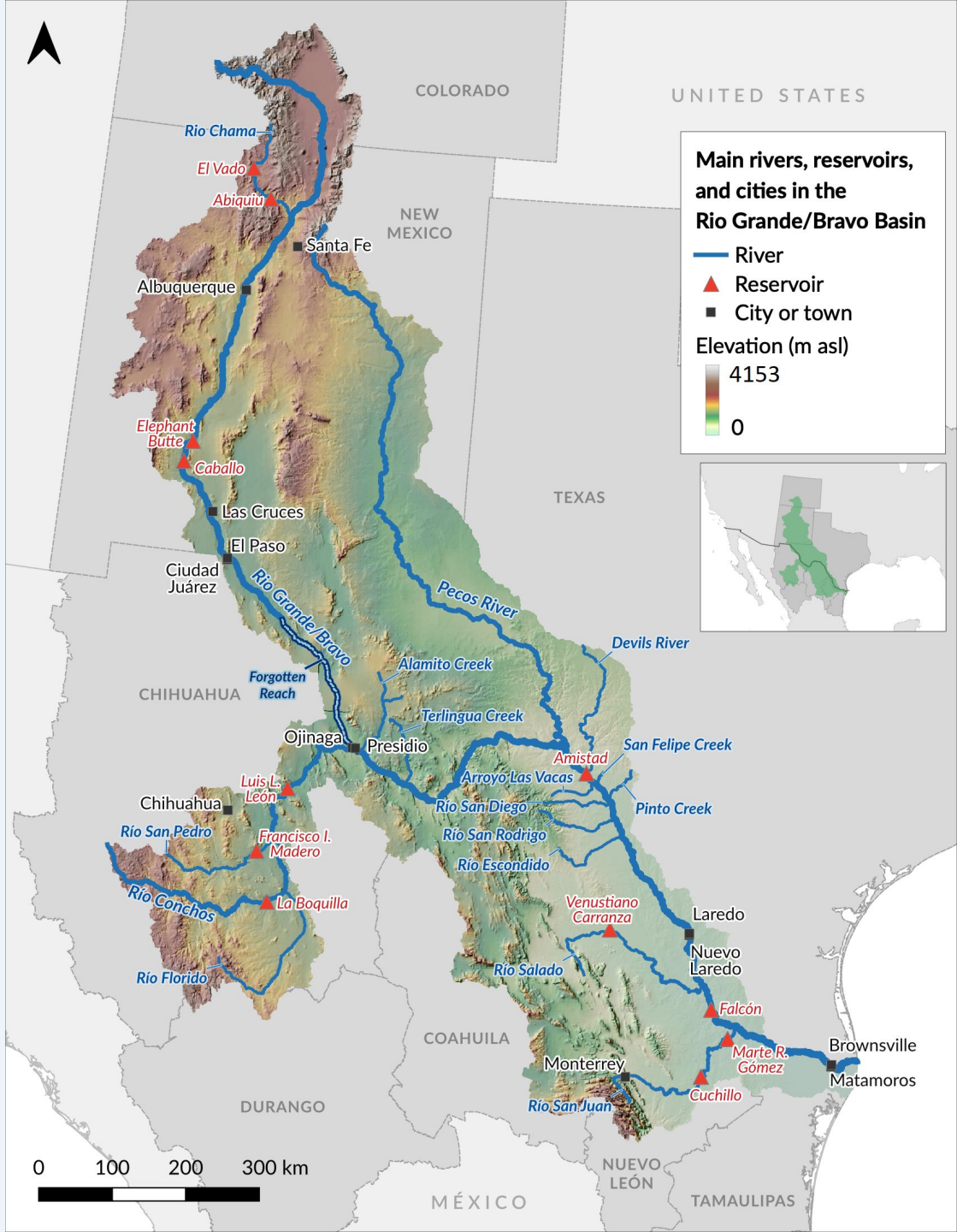
The Rio Grande

- The “Human Component”
  - 14 Major Reservoirs
  - Interstate Compact (CO, NM, TX)
  - 2 International Treaties (US-MX)
  - Trans-basin Diversion from Colorado River Basin
  - > 1,000,000 irrigated acres (US only)
  - ~6,000,000 people



The Rio Grande

- The “Human Component” Recap:
  - It is driven more by human behavior, economics, etc. than nature
  - It’s been around longer than measurement
  - It is usually not well measured in most places



Different Rivers, Same Story

Officials fear 'complete doomsday scenario' for drought-stricken Colorado River

Federal report recommends removing four Lower Snake River dams to protect salmon

Growing fears of 'dead pool' on Colorado River as drought threatens Hoover Dam water

Different Rivers, Same Story

It is estimated that only 38% of the World's major river systems maintain a natural flow regime…

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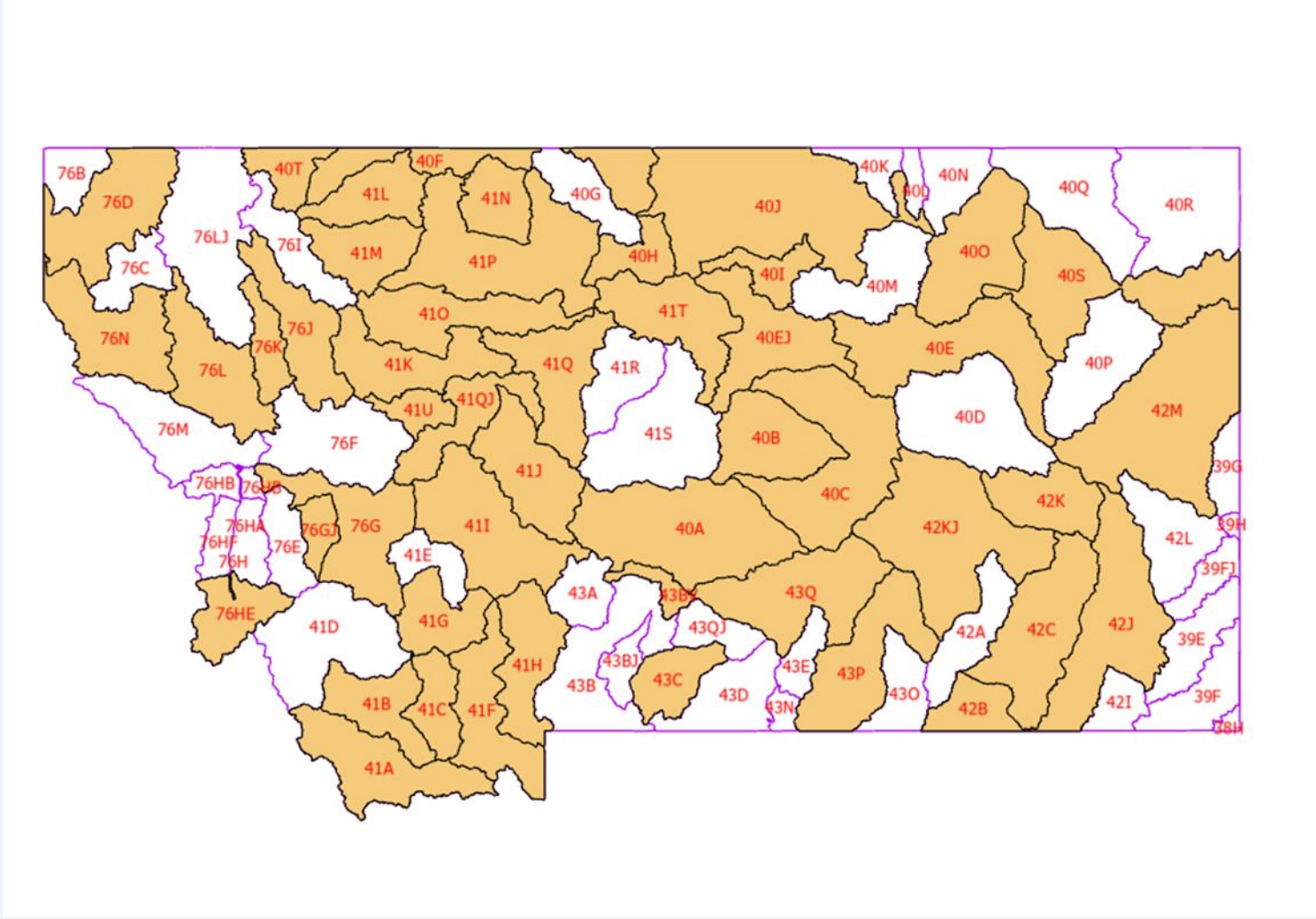

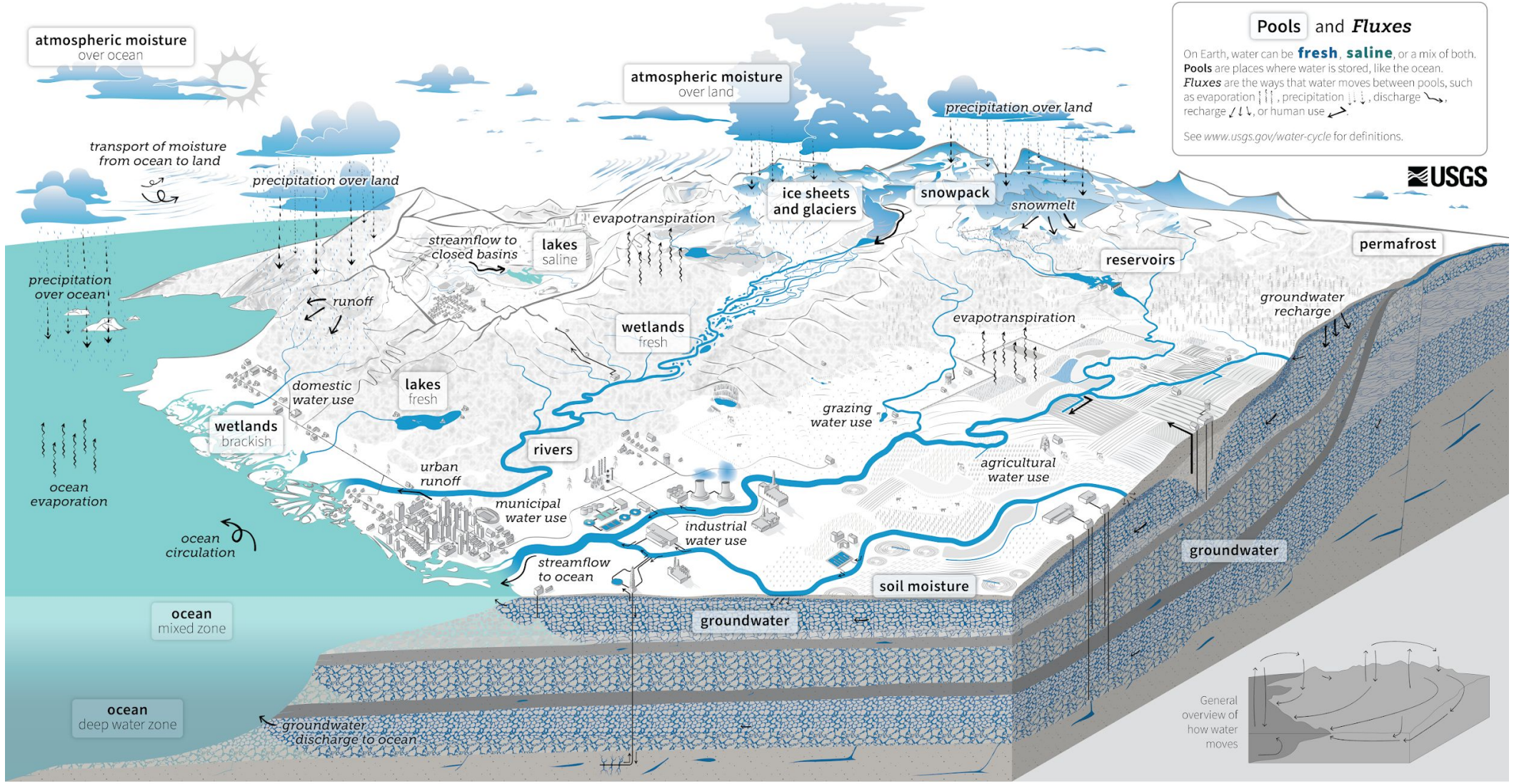

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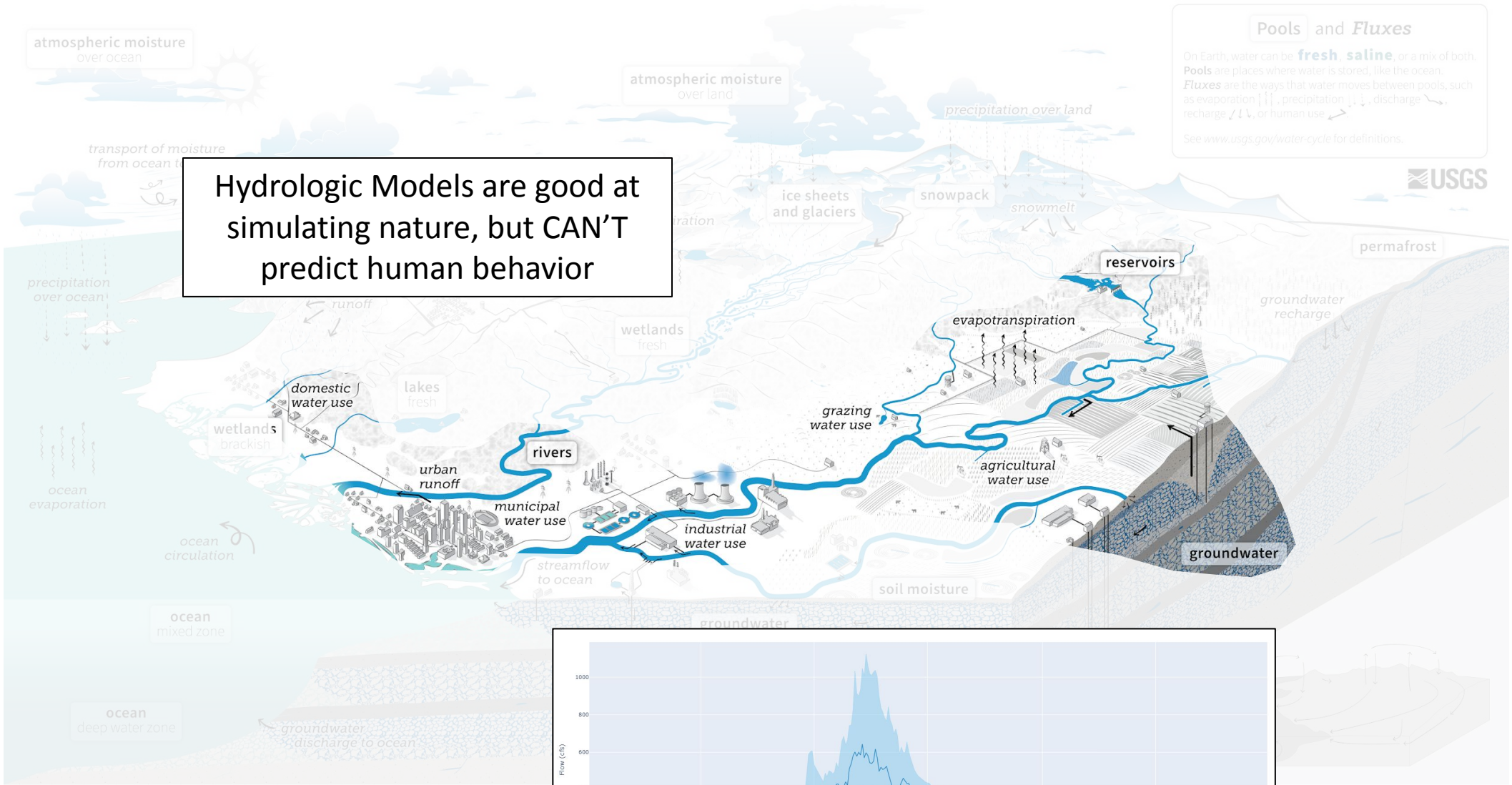
Hydrologic Models are good at simulating nature, but CAN'T predict human behavior



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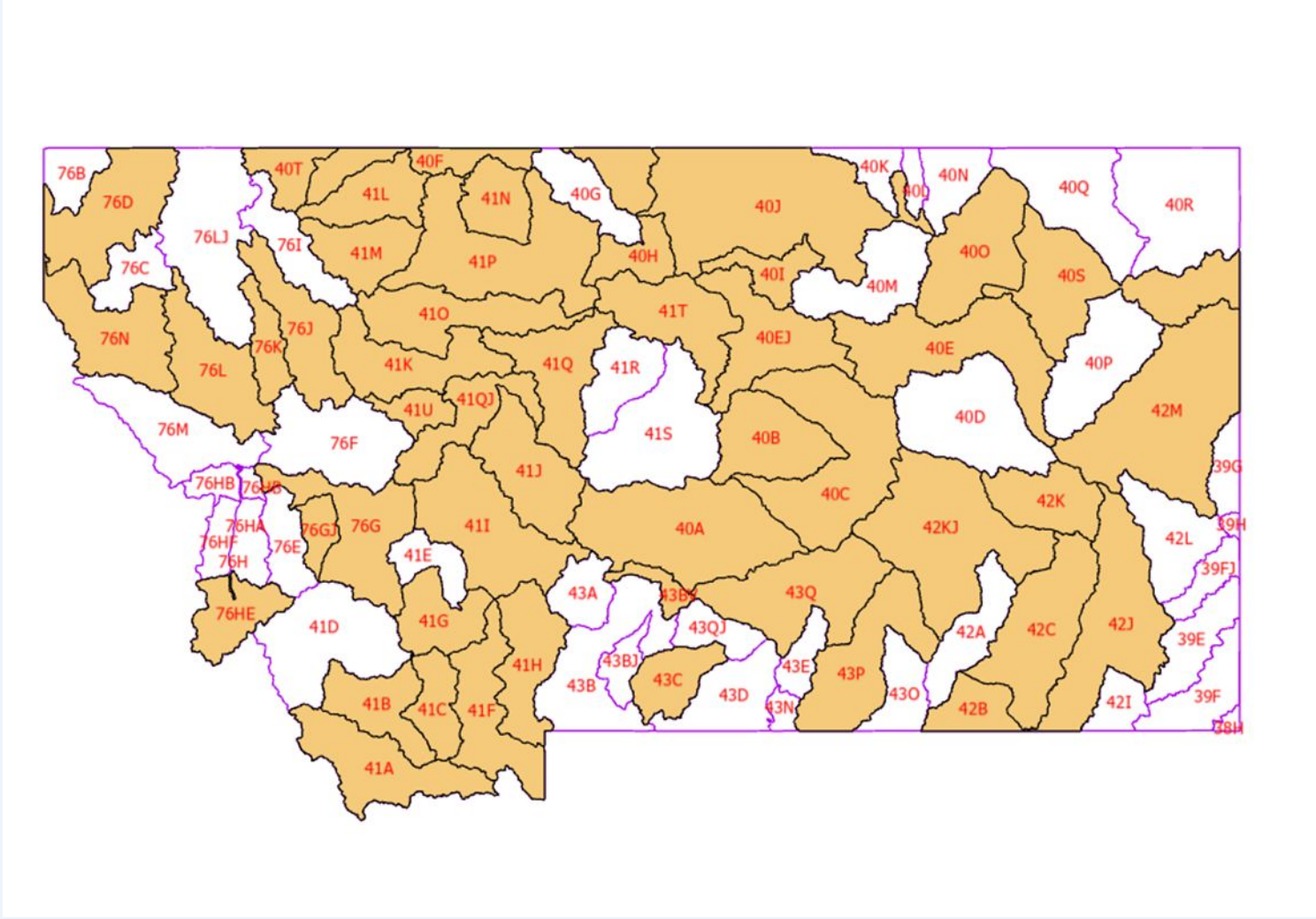
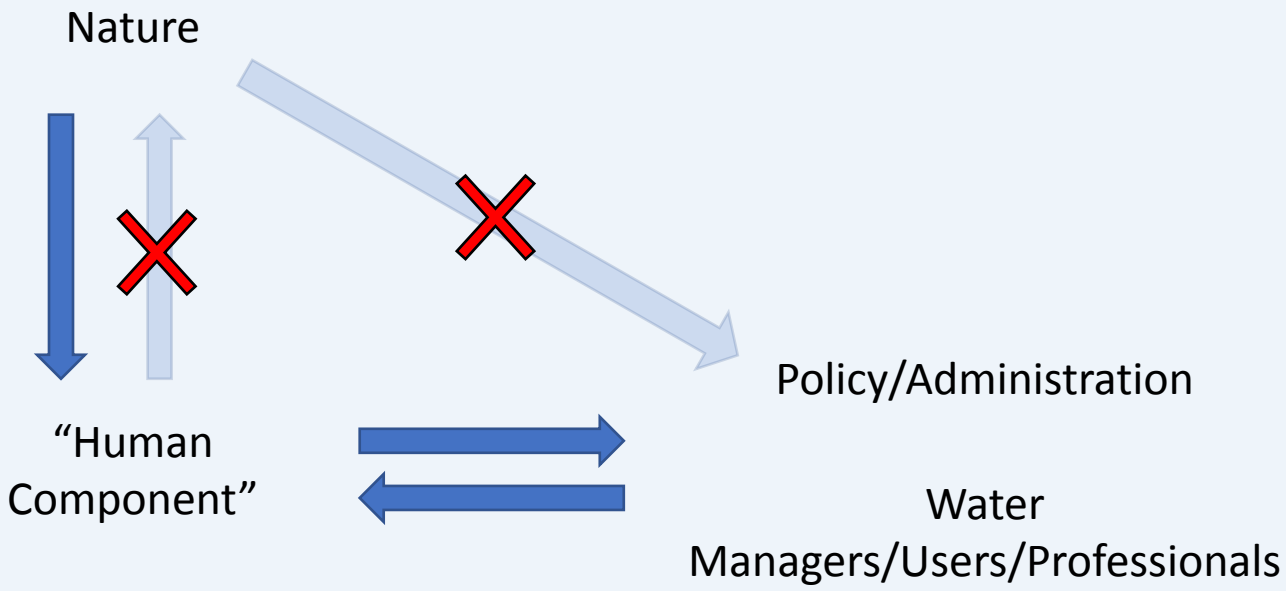


How “it” has historically worked…



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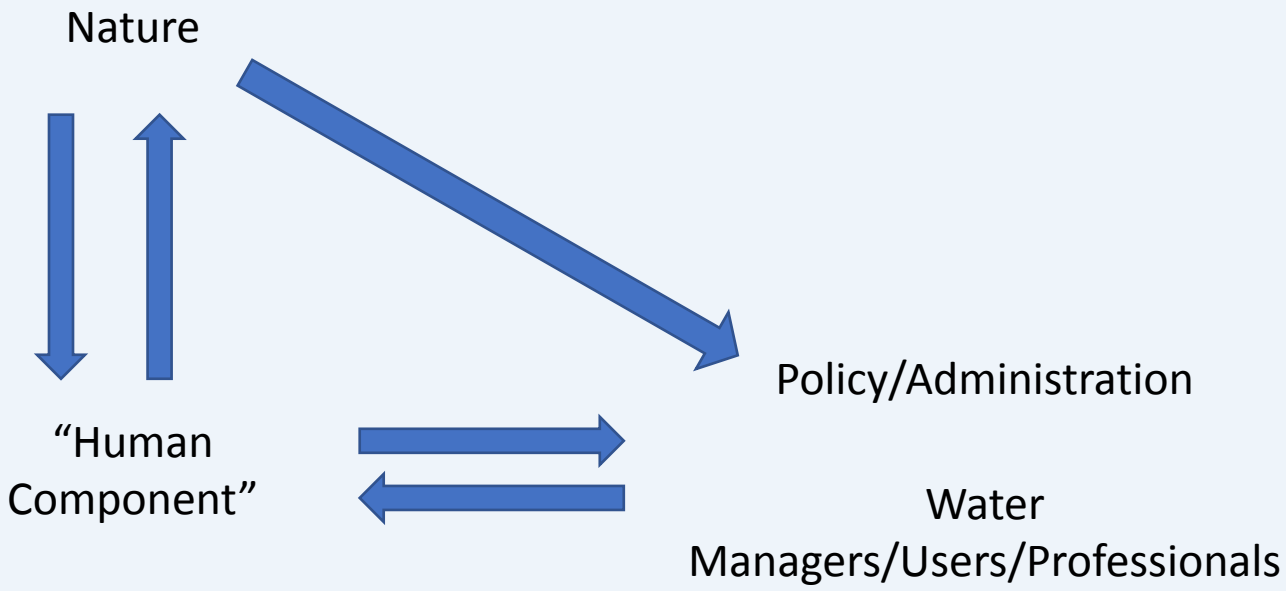

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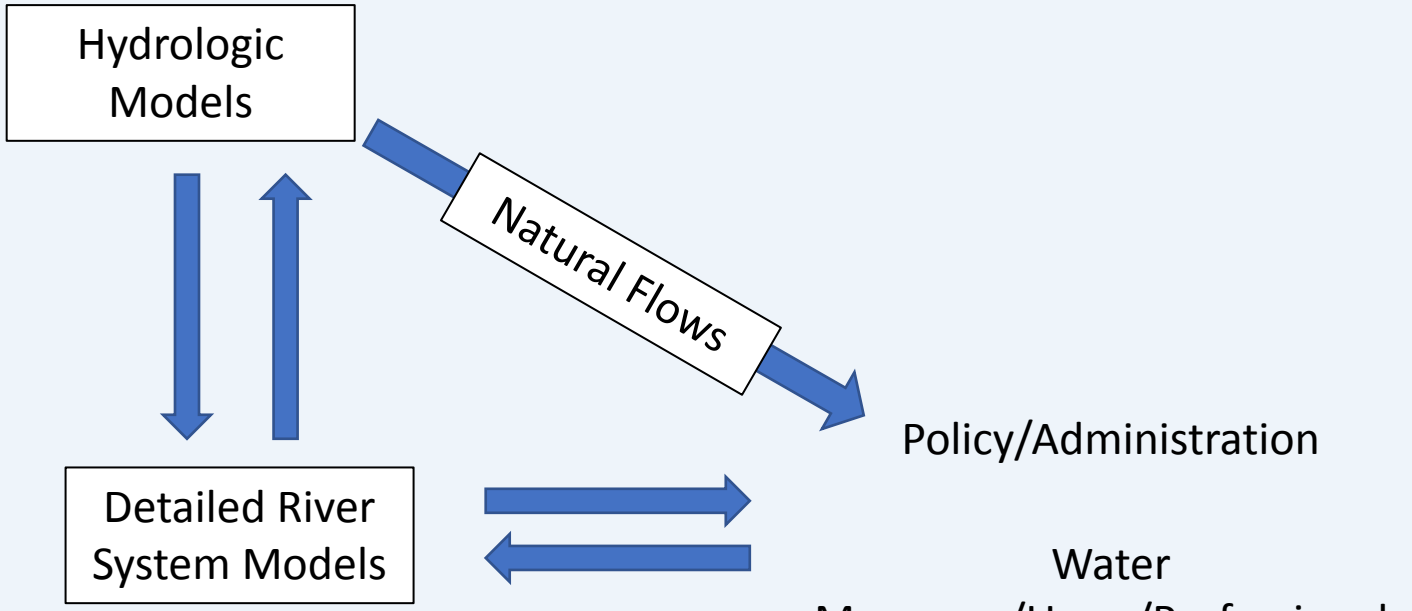
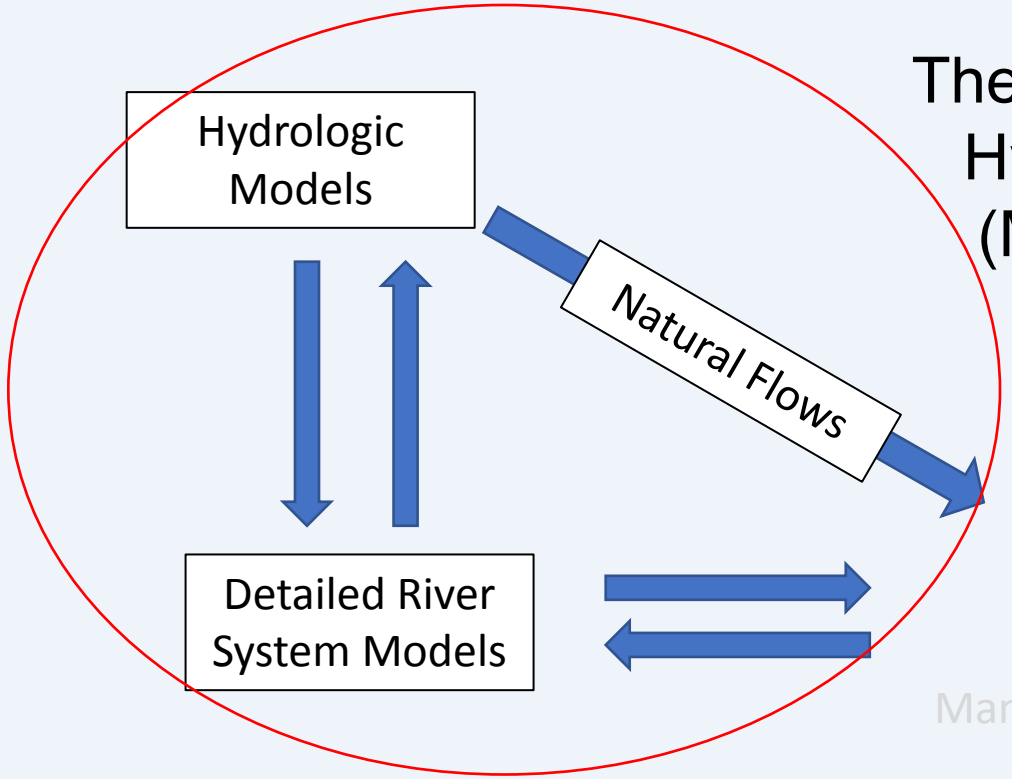


Used to account for human actions, policy, and agreements that govern a river system…

DNRC's Attempt to use Futuristic Tools



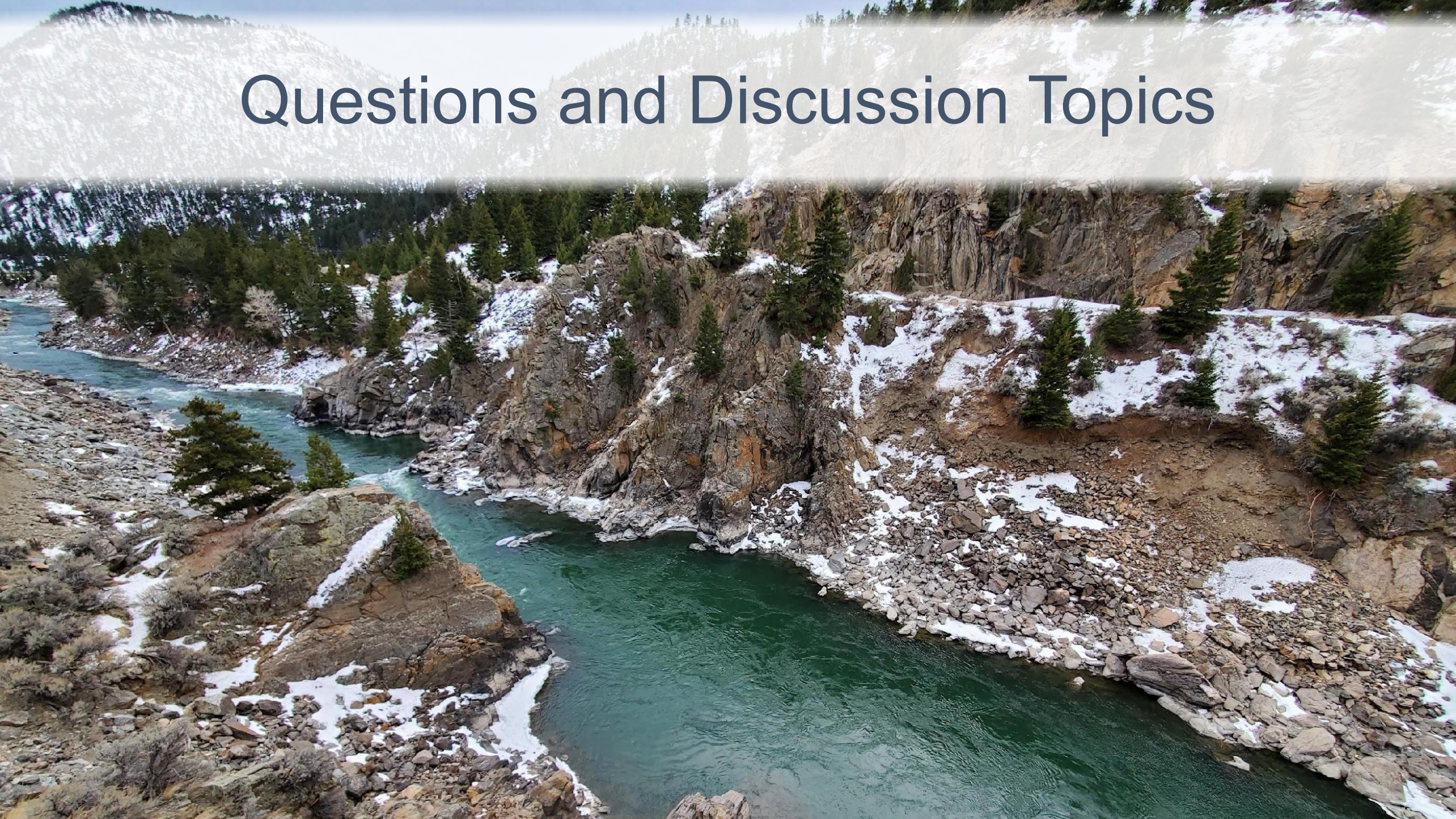
The Montana Integrated Hydrologic Modeling (MIHM) Framework

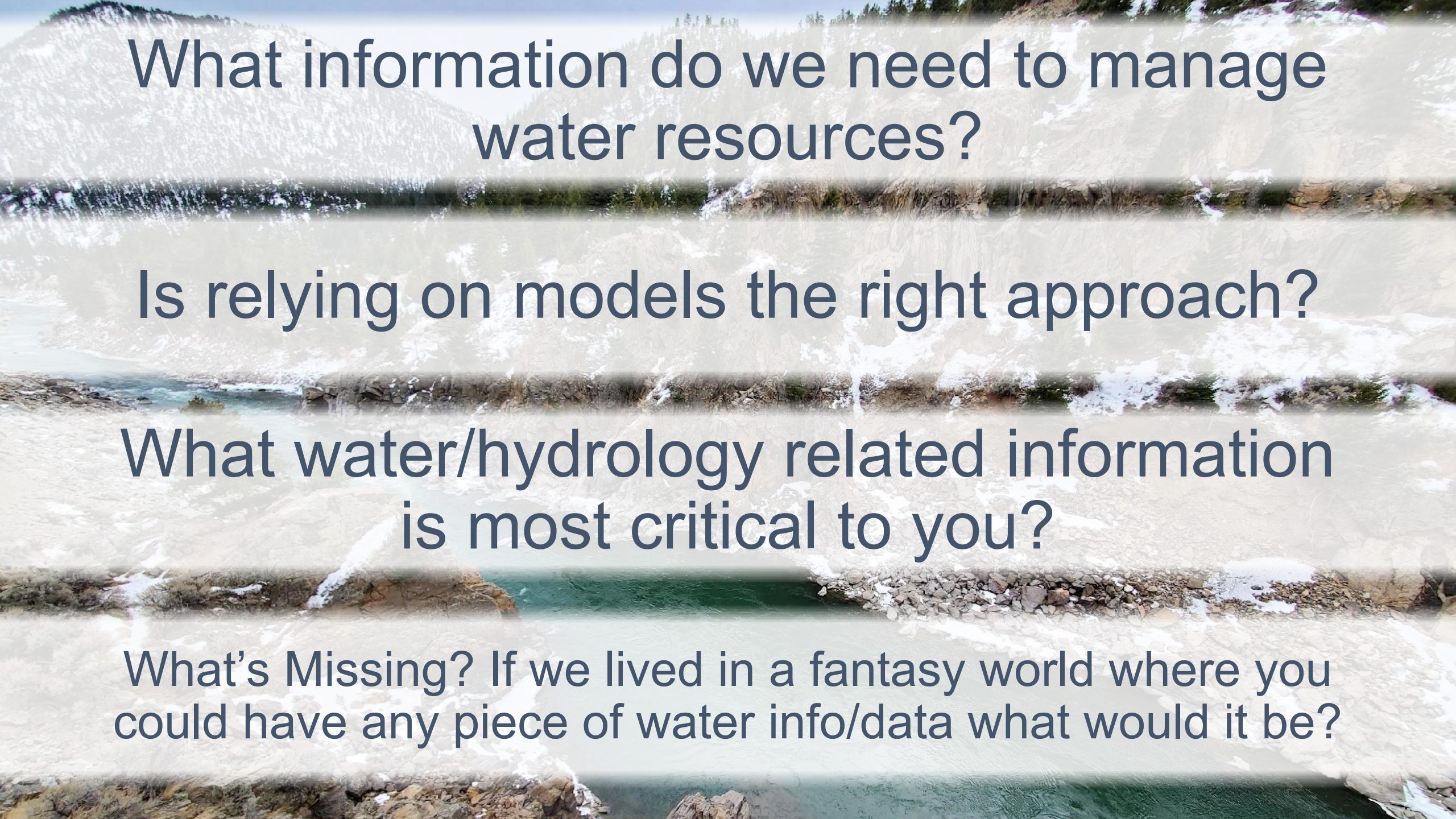
Policy/Administration

Water Managers/Users/Professionals

Depends on collaborative relationships, trust, and new avenues for sharing and acquiring data

Questions and Discussion Topics





What information do we need to manage water resources?

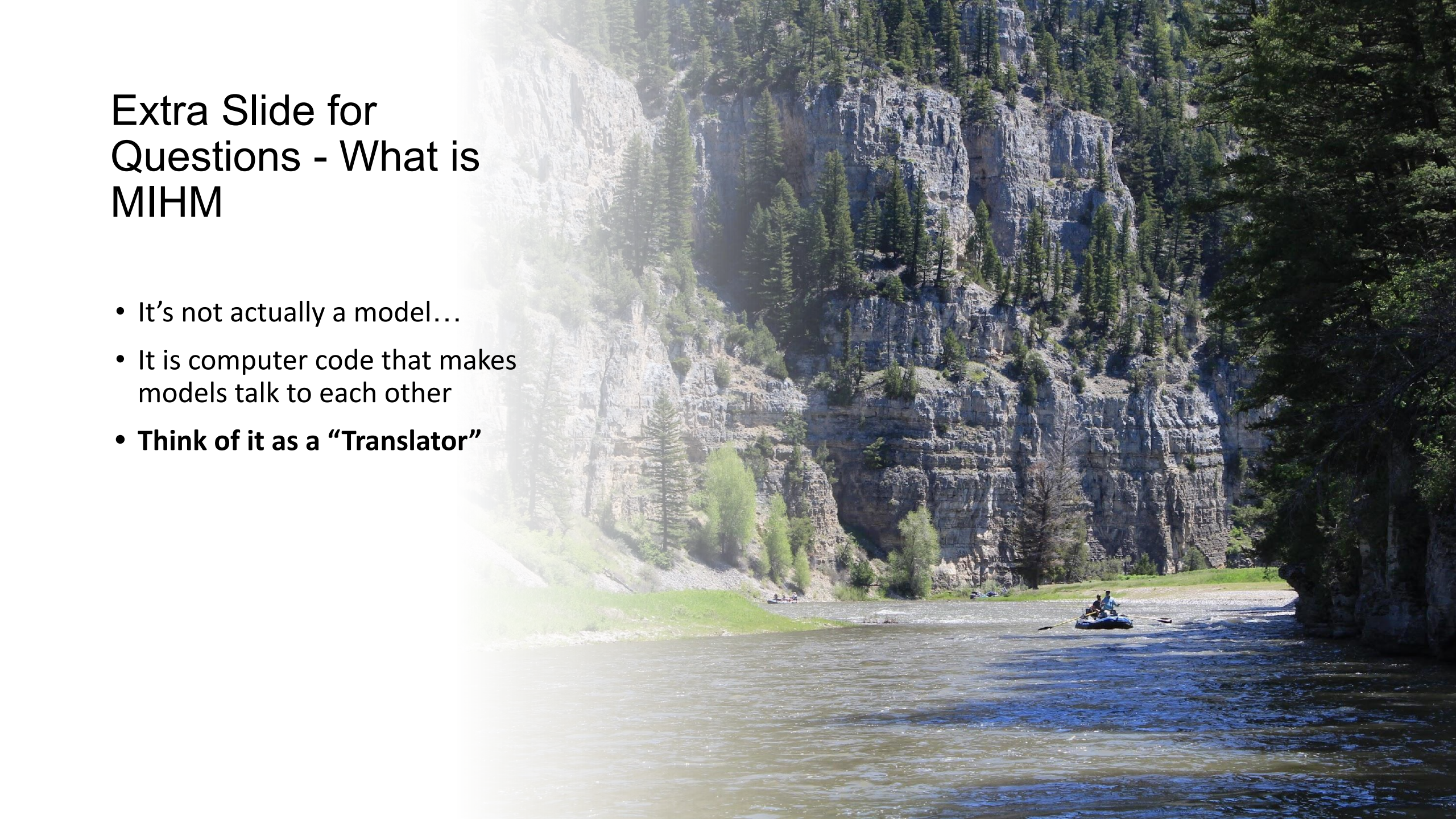
Is relying on models the right approach?

What water/hydrology related information is most critical to you?

What's Missing? If we lived in a fantasy world where you could have any piece of water info/data what would it be?

Extra Slide for Questions - What is MIHM

- It’s not actually a model…
- It is computer code that makes models talk to each other
- **Think of it as a “Translator”**



Extra Slide for Questions - The MIHM Framework