Focusing on hydrology and collaboration to restore a large Idaho river

River Restoration Northwest 2024

Big Scale Hydrology—Redefining Stream Power

Skamania, WA

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THE VOICE OF THE RIVER

SINCE 1984

HENRY'S FORK FOUNDATION

The Henry's Fork

- Upper Snake basin
- $10 billion agriculture industry
- 2.5 million irrigated acres
- World-famous, ~$30 million fishery for rainbow trout
- Island Park Reservoir key irrigation storage reservoir in watershed

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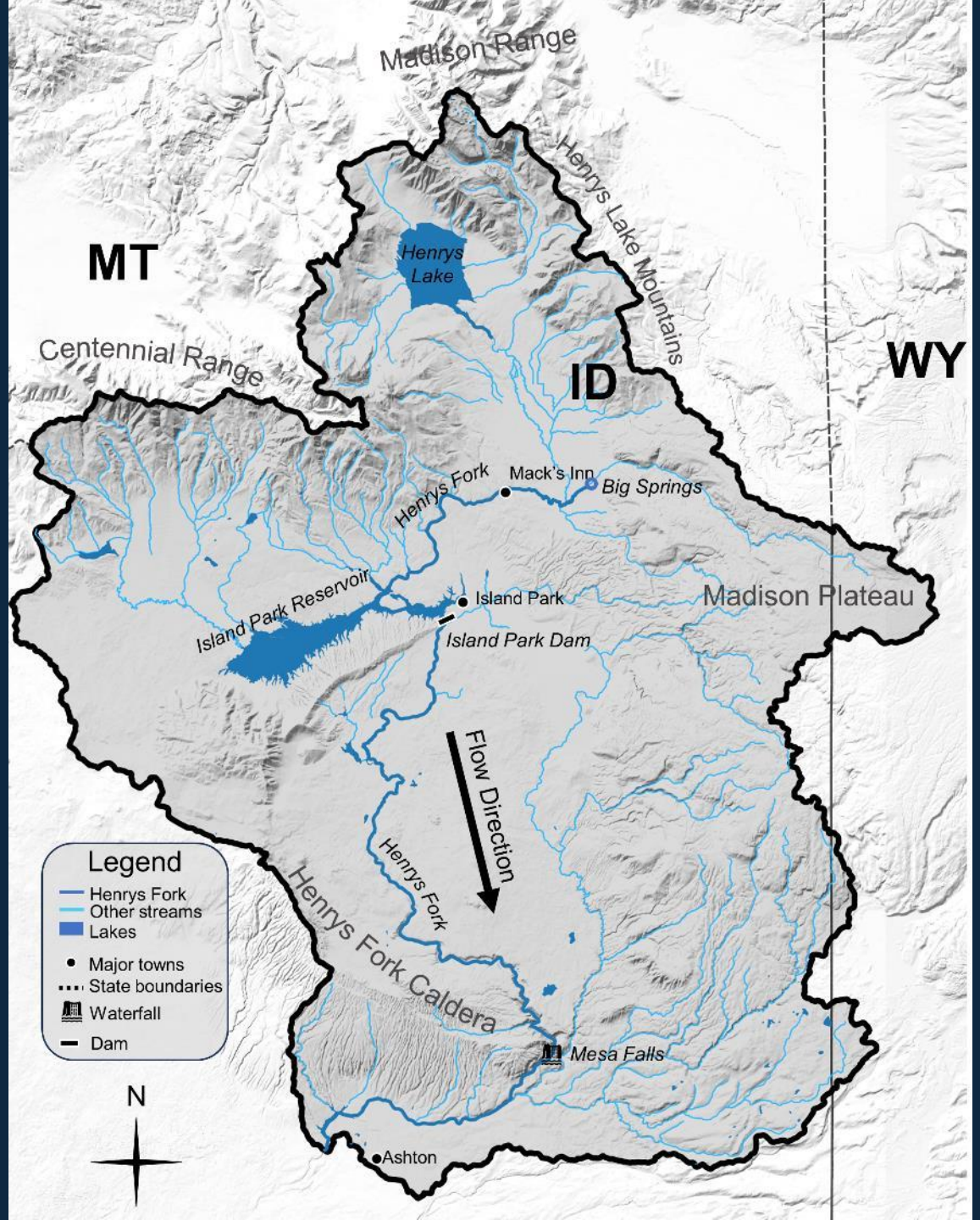
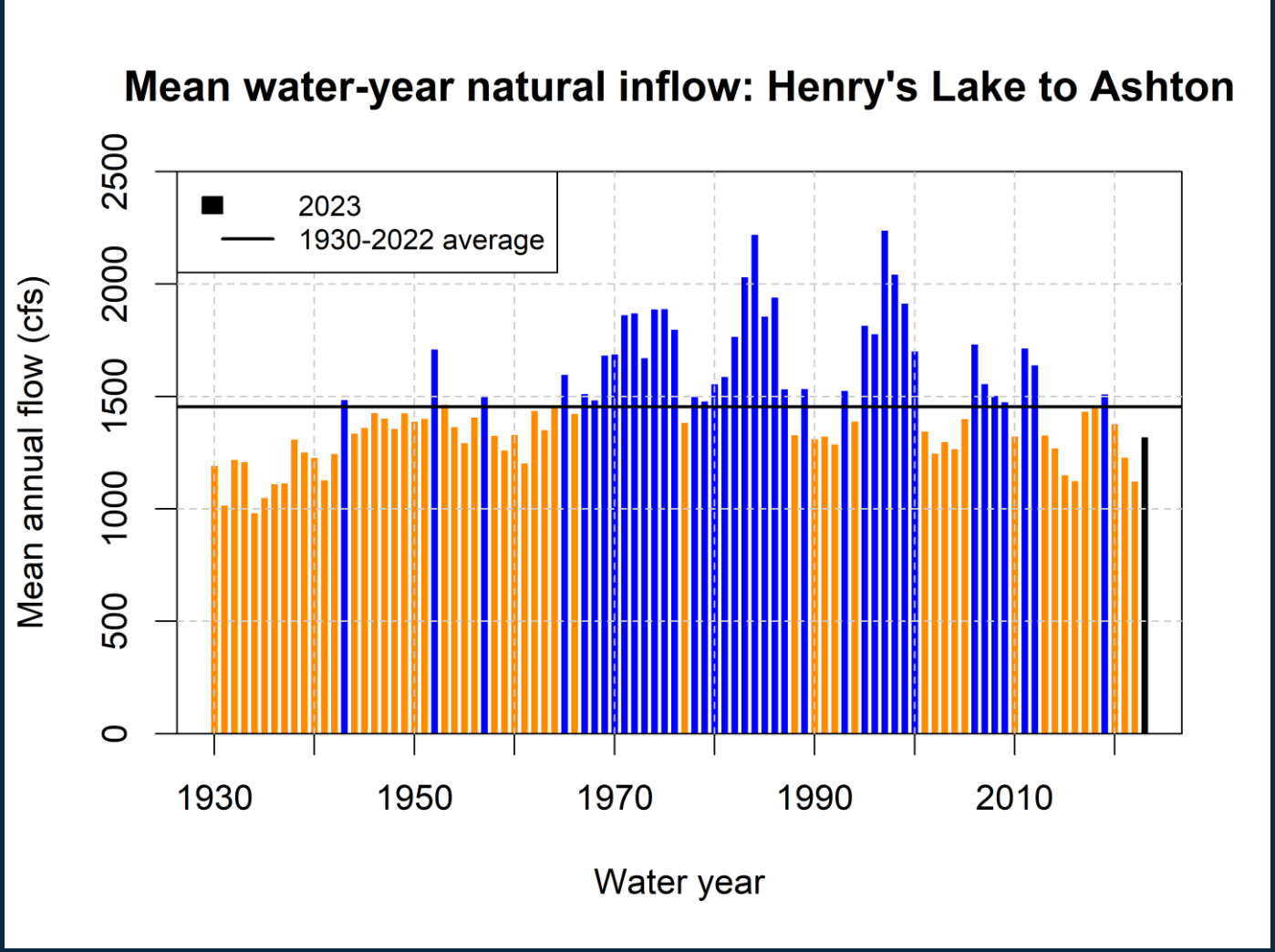


The Henry's Fork

Drought



When there's not enough water for farms and fish, how are we supposed to "conserve and protect the unique fisheries in the Henry's Fork"?

What does "**restoration**" look like in this context?

Pre-2016: Doing the things most organizations do -

- Riparian management and restoration
- Fish passage
- Natural flow paradigm
- Efficiency in agriculture will free up water for fish

The Henry's Fork Foundation

- Pre-2016: Doing the things most organizations do:
  - Riparian management and restoration
  - Fish passage
  - Natural flow paradigm
  - Efficiency in agriculture will free up water for fish

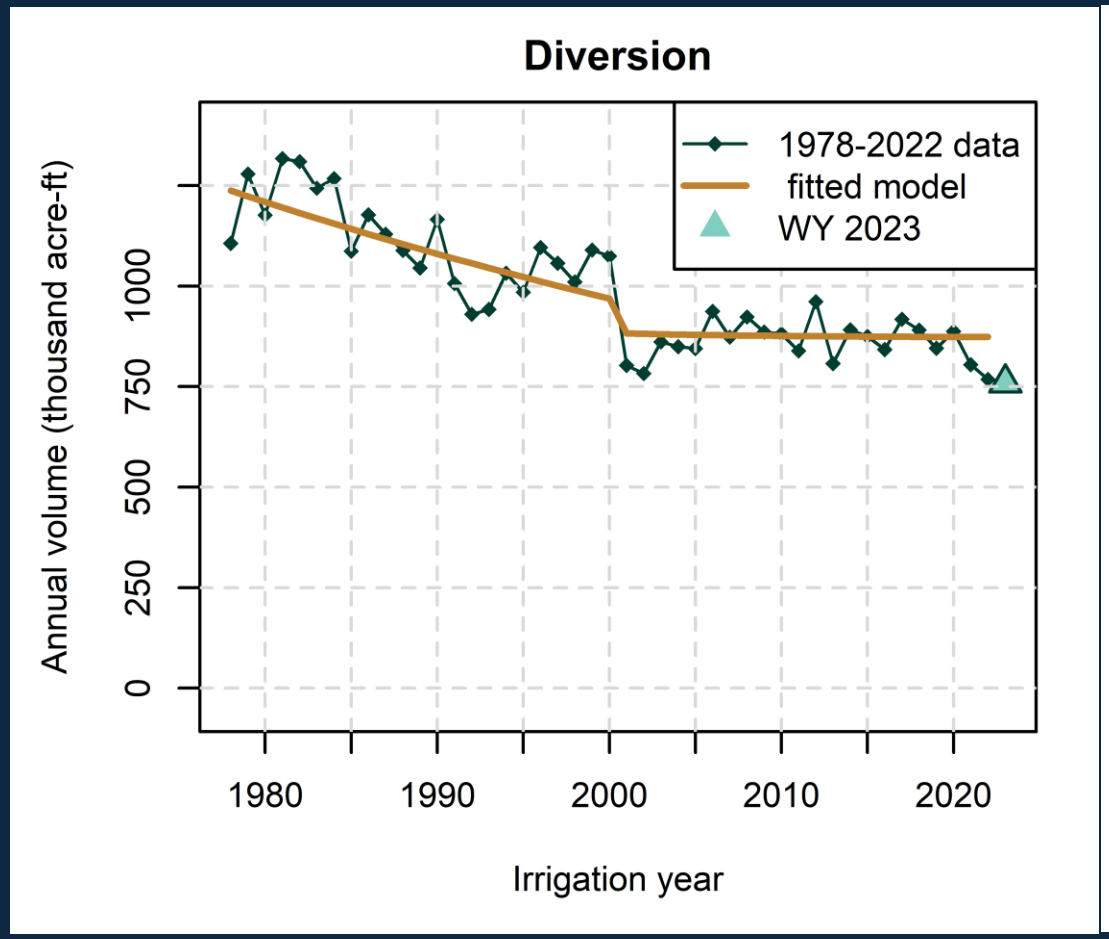
Nothing wrong with any of this!…in the right context

Pre-2016 results

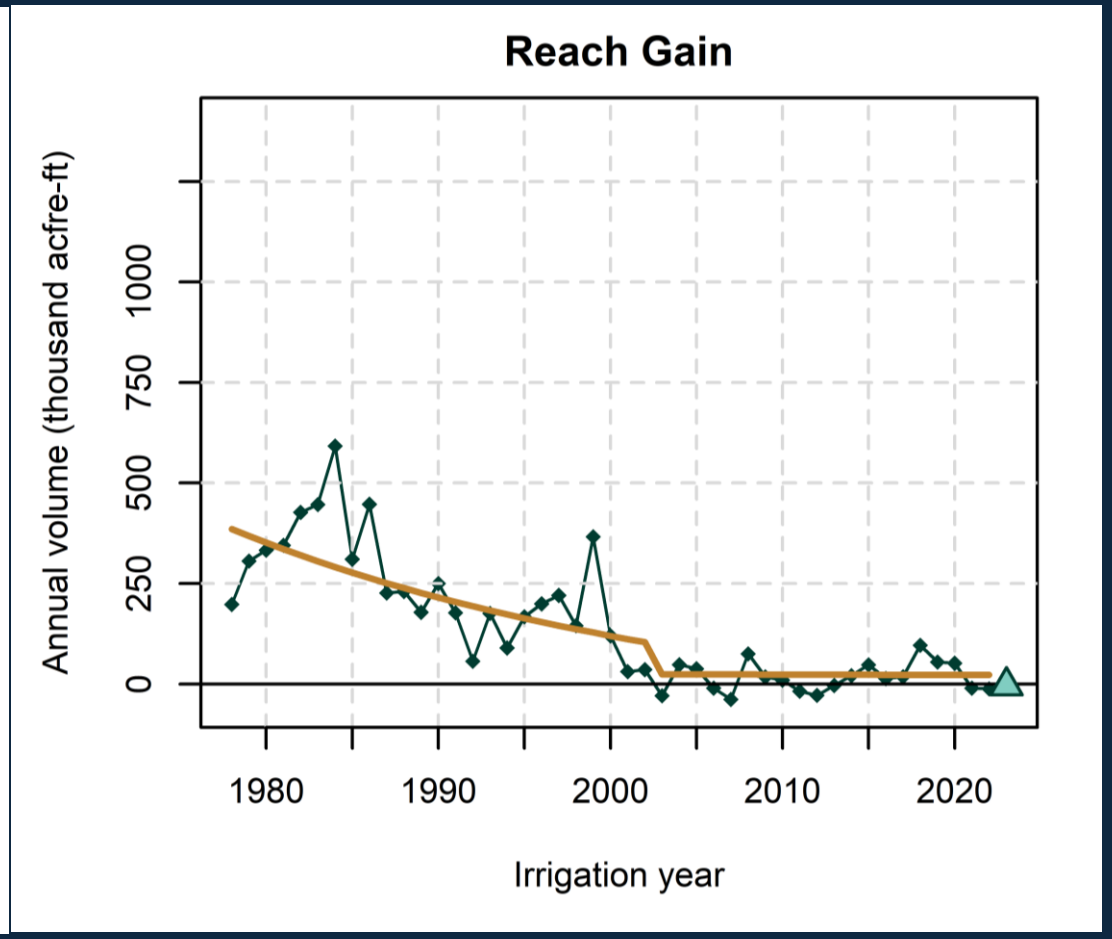
How much water are we saving?

- Conservation groups can’t buy water in Idaho
- Buffalo River (tributary) 300 cfs minimum flow water right priority 1981
- Federal protections don’t apply in most cases
- Little effect on streamflow

Pre-2016 results

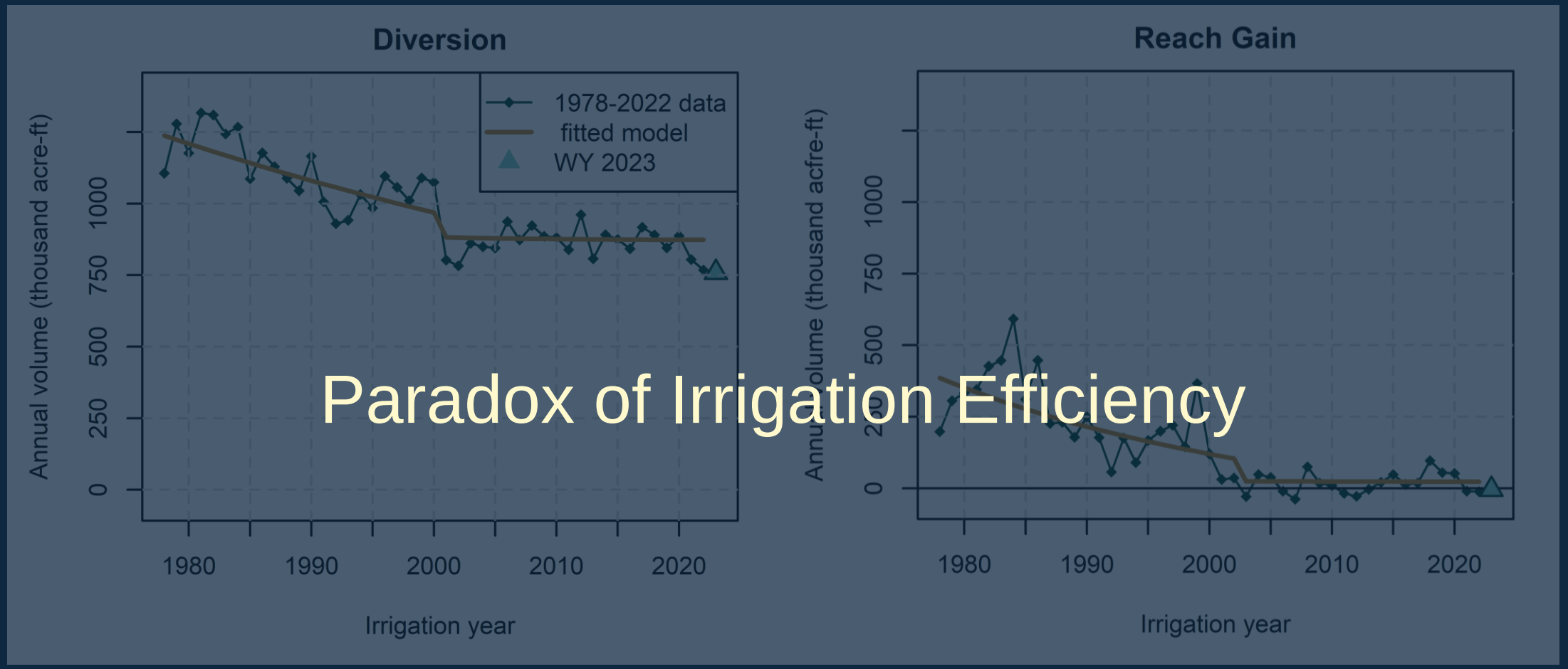


Diversion has decreased



Groundwater returns have decreased

Pre-2016 results



Paradox of Irrigation Efficiency

Diversion has decreased

Groundwater returns have decreased

Pre-2016 results

How many more fish/mile for each project/$ spent?

2-3% population-level effect

Designer Flow Paradigm

- Restore the components of the hydrograph that limit fish populations and aquatic ecosystem function, then target management flexibilities that could affect those drivers

Science Collaboration Conservation

HENRY'S FORK FOUNDATION

Henry's Fork Water Quality Data

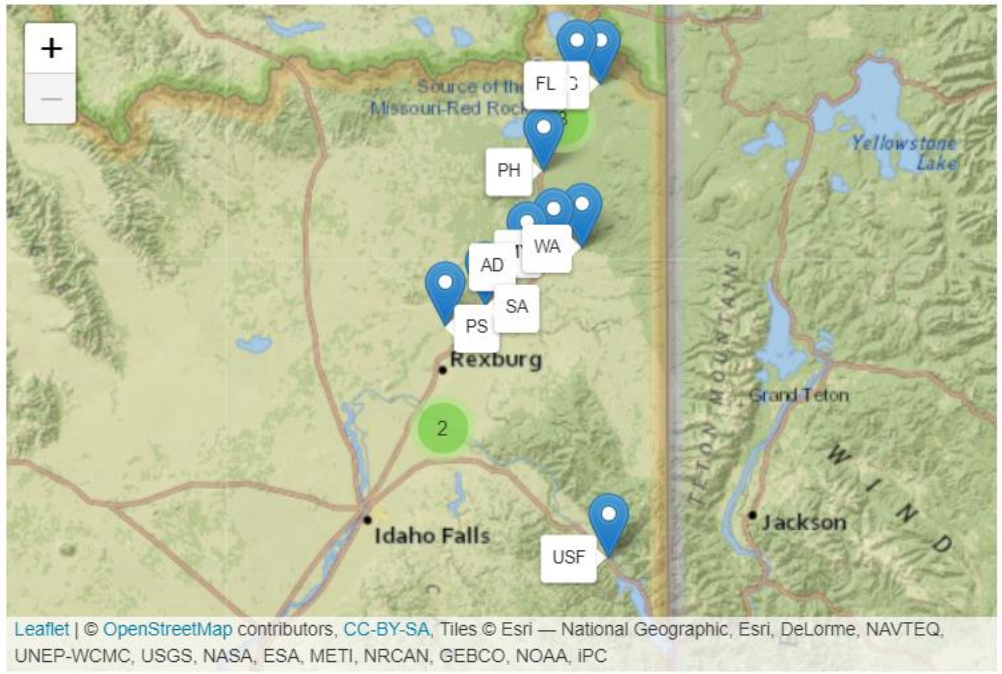
More Scientific Websites

Data dashboards

- Water Quality
- Water Quantity
- Daily Water Report
- Hatch Timing
- Harriman Ranch

Modeling tools

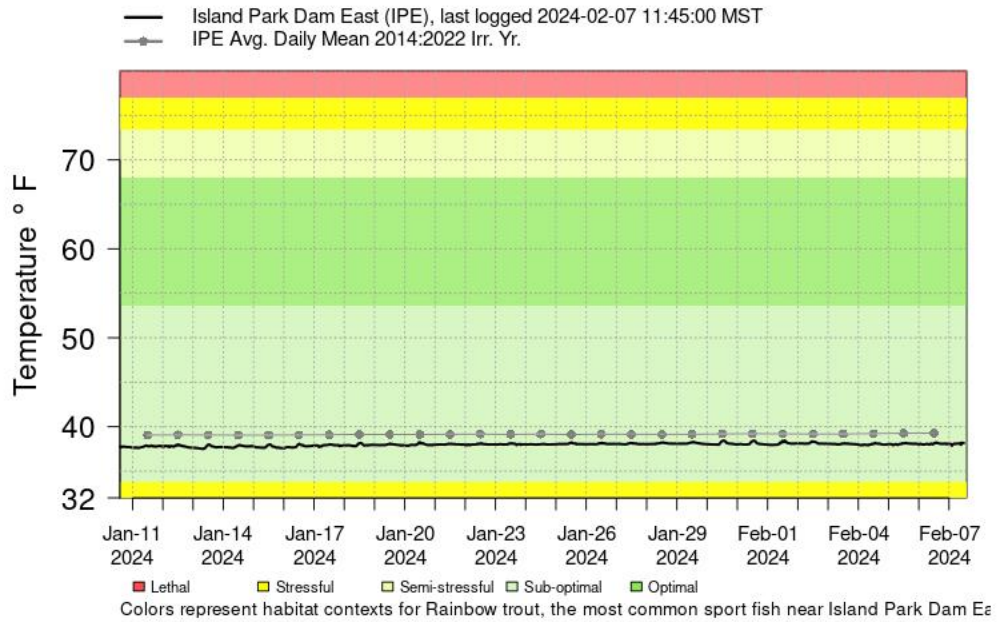
- IPR Winter Fill
- Teton Aquifer Recharge



Click a pin on the map to select a new location.

Site Selected: Island Park Dam East

Temperature | Turbidity | 2023 Freshet | Dissolved Oxygen | Conductivity | Phytoplankton | Cyanobacteria | Program | Disclaimers | Help | Macroinvertebrates



Salmonids--such as Rainbow Trout and Brown Trout--need a specific range of water temperature to thrive and this optimal range shifts depending on their life-stage. Average water temperature thresholds for either eggs/fry or juveniles/adults are shown above using intuitive colors from red to green. Bright green denotes the optimal range of oxygen concentration for growth and activity, light

HFF REPORTS AND PUBLICATIONS LIBRARY

We are currently undertaking a large project to make all reports and papers produced, co-authored, or funded by HFF and its staff--dating back to the 1980s--available online to the public. Until we are able to finish that project, numerous requests for our recent work have led us to post some of it here, organized by the four major subject areas of our science and technology work: hydrology and water management, aquatic ecology and water quality, fisheries biology and management, and social science and economics.

All documents linked fall into four categories: peer-reviewed papers, theses, editor-reviewed publications, and reports. Click on the subject below to view all related reports and papers.

Hydrology and Water Management

Aquatic Ecology and Water Quality

Fisheries Biology and Management

Social Science and Economics

Science 

- Identified components of the hydrograph that limit fish populations and aquatic ecosystem function

Management Objectives
Increase springtime freshet frequency
• Blow out fine sediment • Improve invertebrate communities

Science 

- Identified components of the hydrograph that limit fish populations and aquatic ecosystem function

Management Objectives	
Increase springtime freshet frequency	Reduce summer flow to keep Island Park Reservoir full, increase overwinter flow
• Blow out fine sediment • Improve invertebrate communities	• Increase fish/mile throughout

Science 

- Identified components of the hydrograph that limit fish populations and aquatic ecosystem function

Management Objectives		
Increase springtime freshet frequency	Reduce summer flow to keep Island Park Reservoir full, increase overwinter flow	Increase groundwater input
• Blow out fine sediment • Improve invertebrate communities	• Increase fish/mile throughout	• Improve water quality

Collaboration

- Targeted management flexibilities to accomplish objectives
- “Farms and Fish”

Work *with* Prior Appropriation

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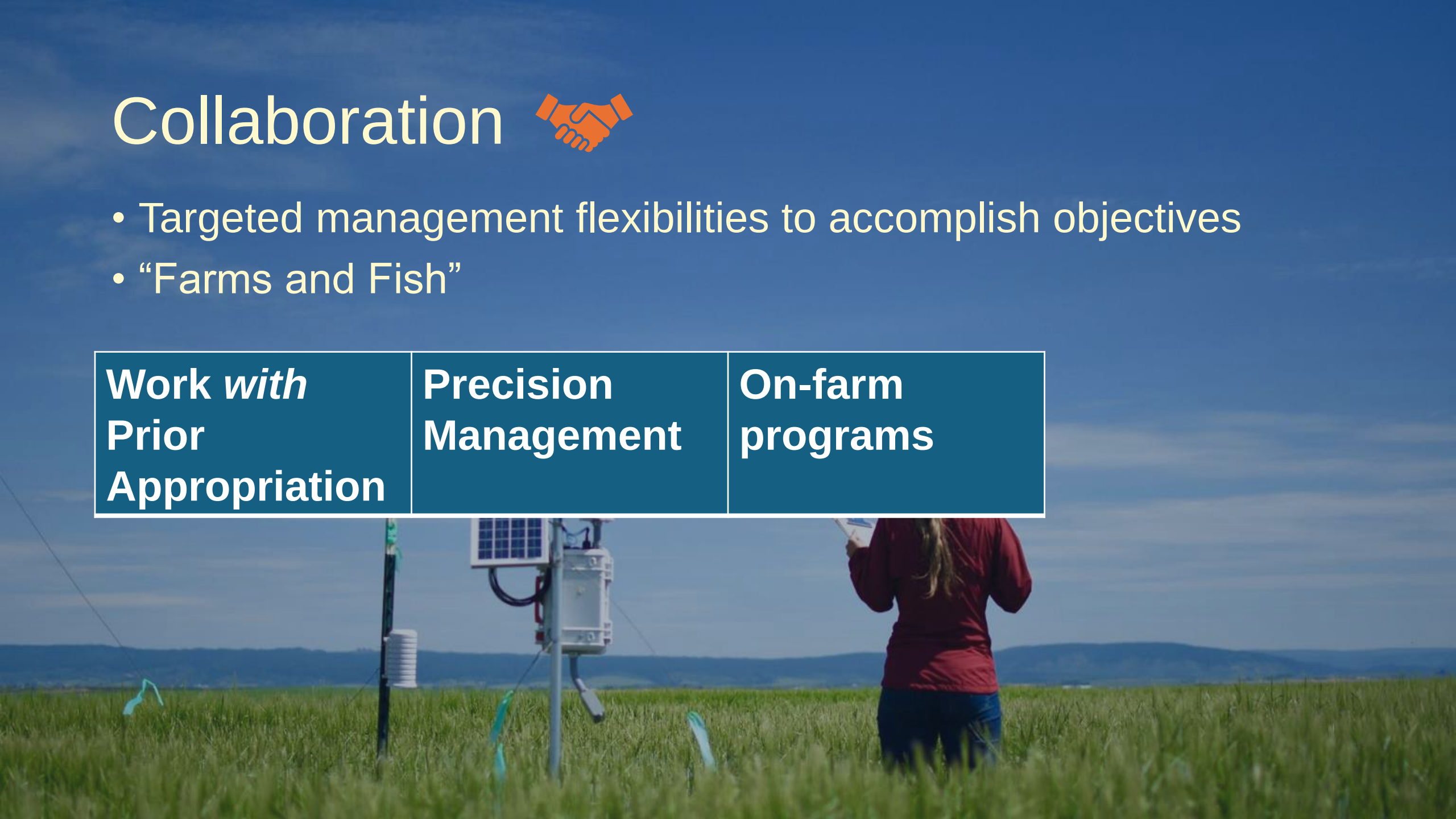
Work *with* Prior Appropriation	**Precision Management**

Collaboration

- Targeted management flexibilities to accomplish objectives
- “Farms and Fish”

Work *with* Prior Appropriation	Precision Management	On-farm programs



Collaboration

- Targeted management flexibilities to accomplish objectives
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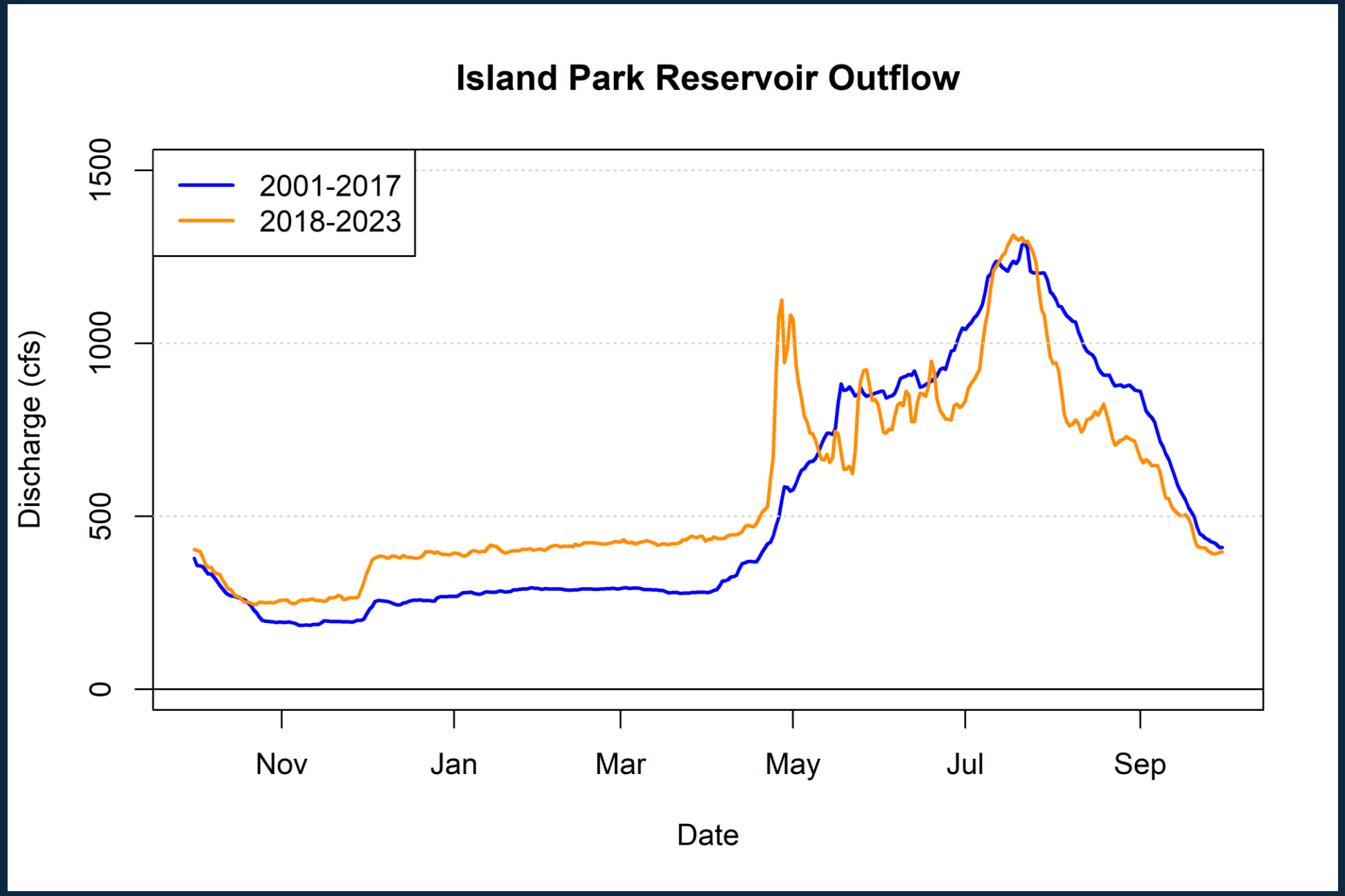
Work *with* Prior Appropriation	Precision Management	On-farm programs	Aquifer recharge

Conservation

Metric	2018-2022 average change	Percent change	$ per
Reservoir carryover	+26,333 ac-ft	+48%	$75/acre-foot
Winter reservoir outflow	+116 cfs	+44%	$17,000/cfs
Trout recruitment (downstream)	+252 fish/mile	+20%	$8,000/fish
Trout population (upstream)	+1220 fish/mile	+156%	$1,600/fish
Irrigation-season reservoir outflow	-140 cfs	-13%	$14,200/cfs
Reservoir fine sediment export	-160 tons	-15%	$12,500/ton

Conservation



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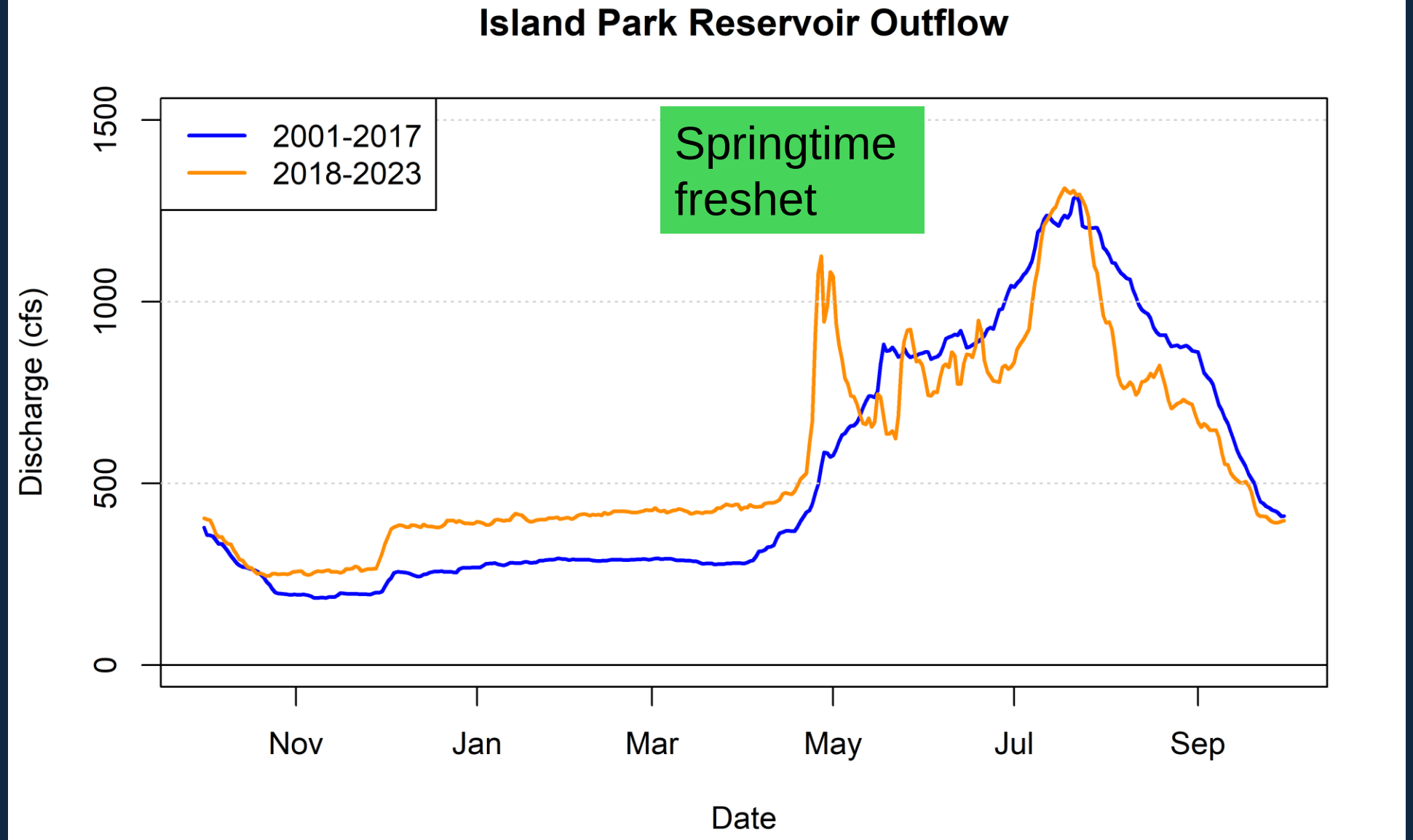

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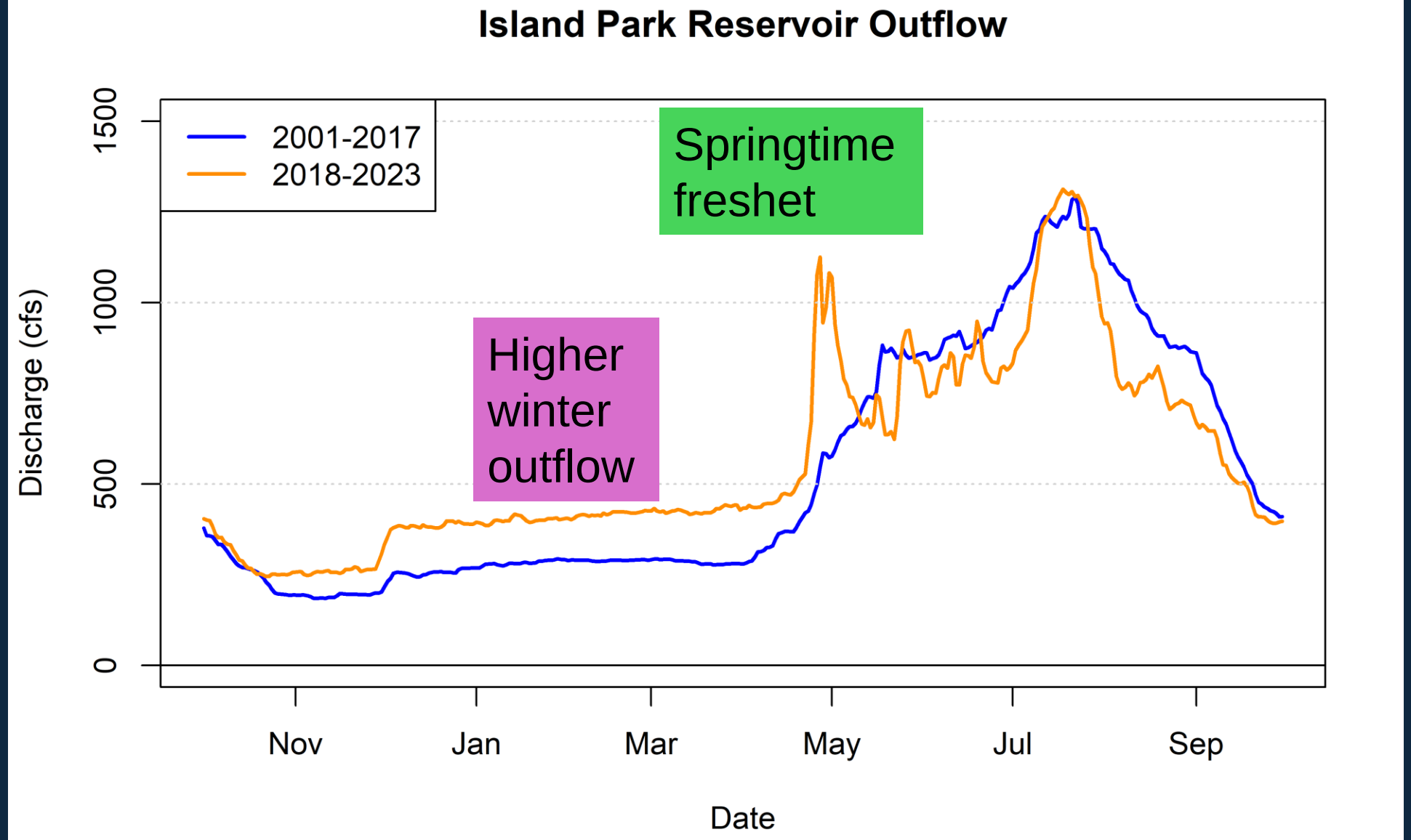

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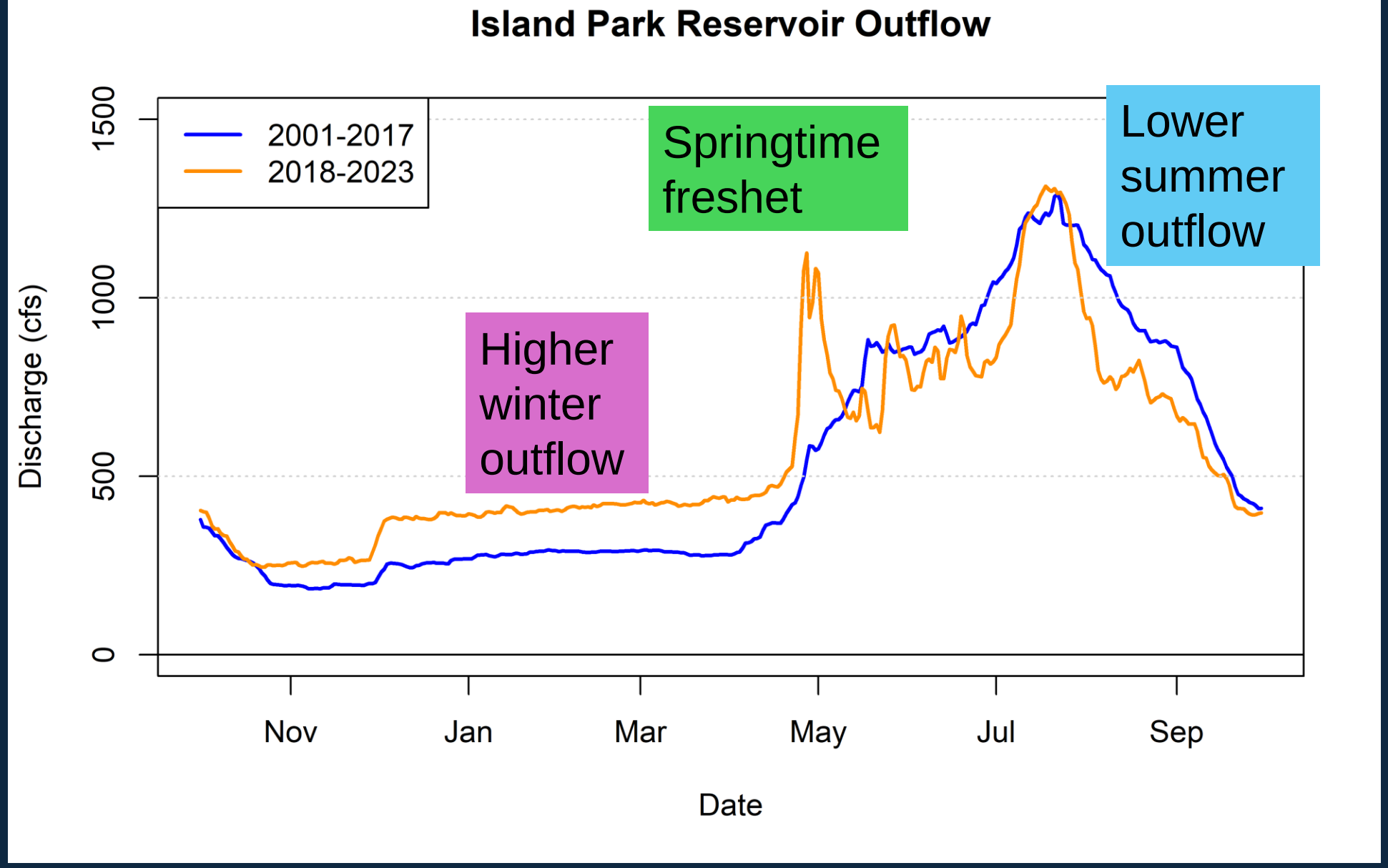

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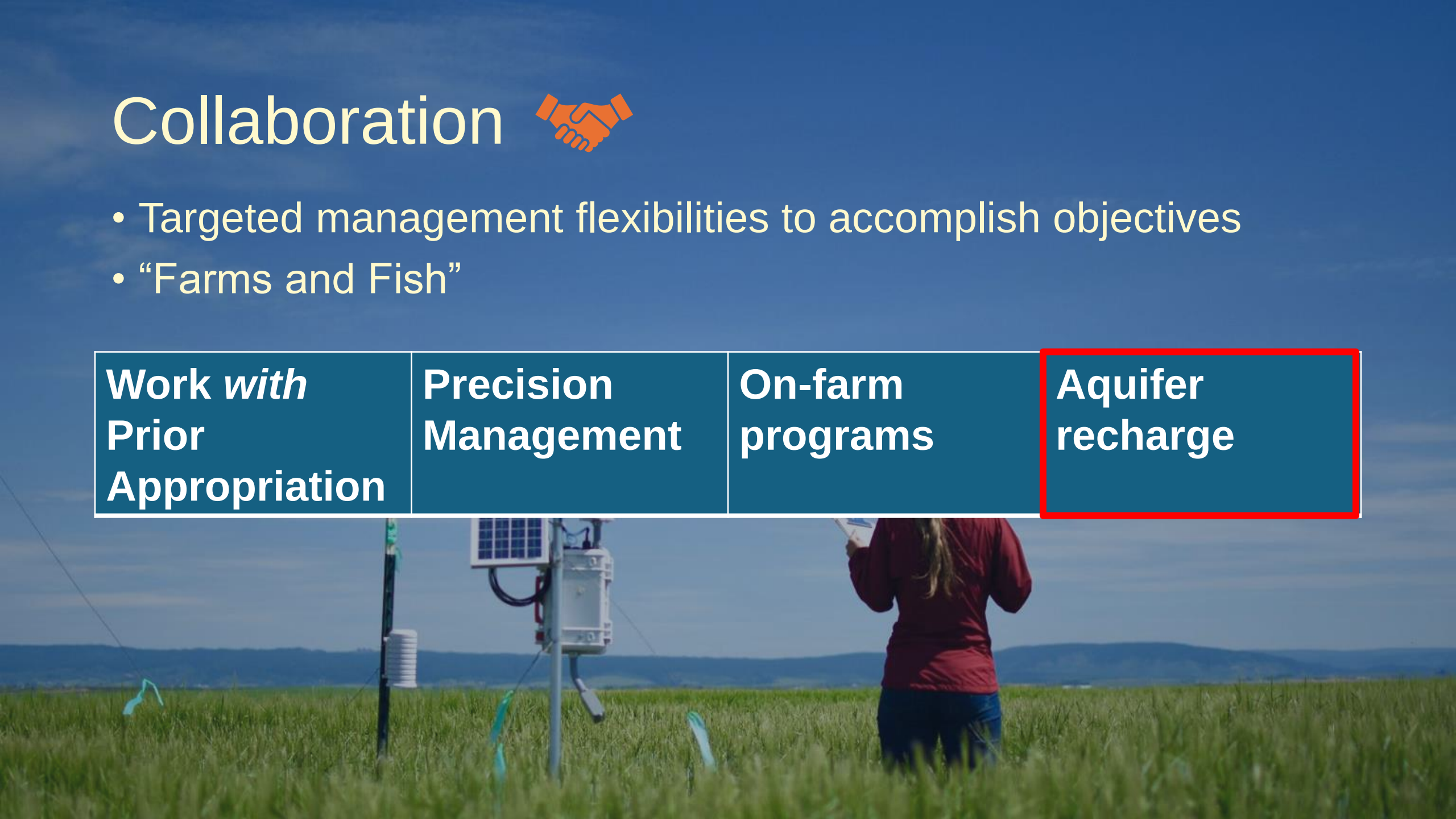
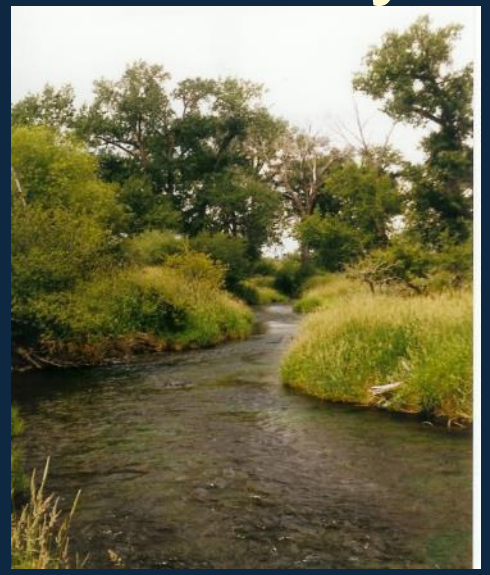
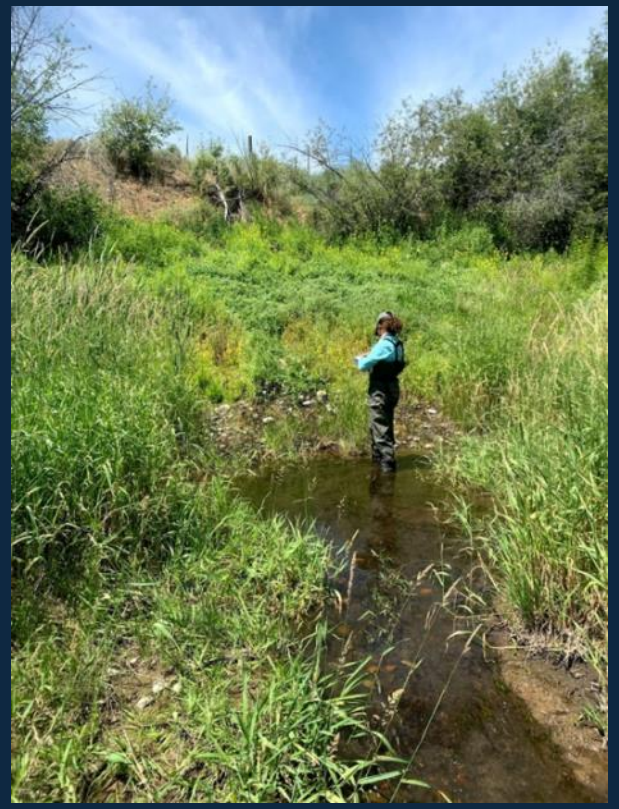
Work *with* Prior Appropriation	Precision Management	On-farm programs	Aquifer recharge



Irrigation seepage has been a major component of hydrologic regimes since late 1800s…



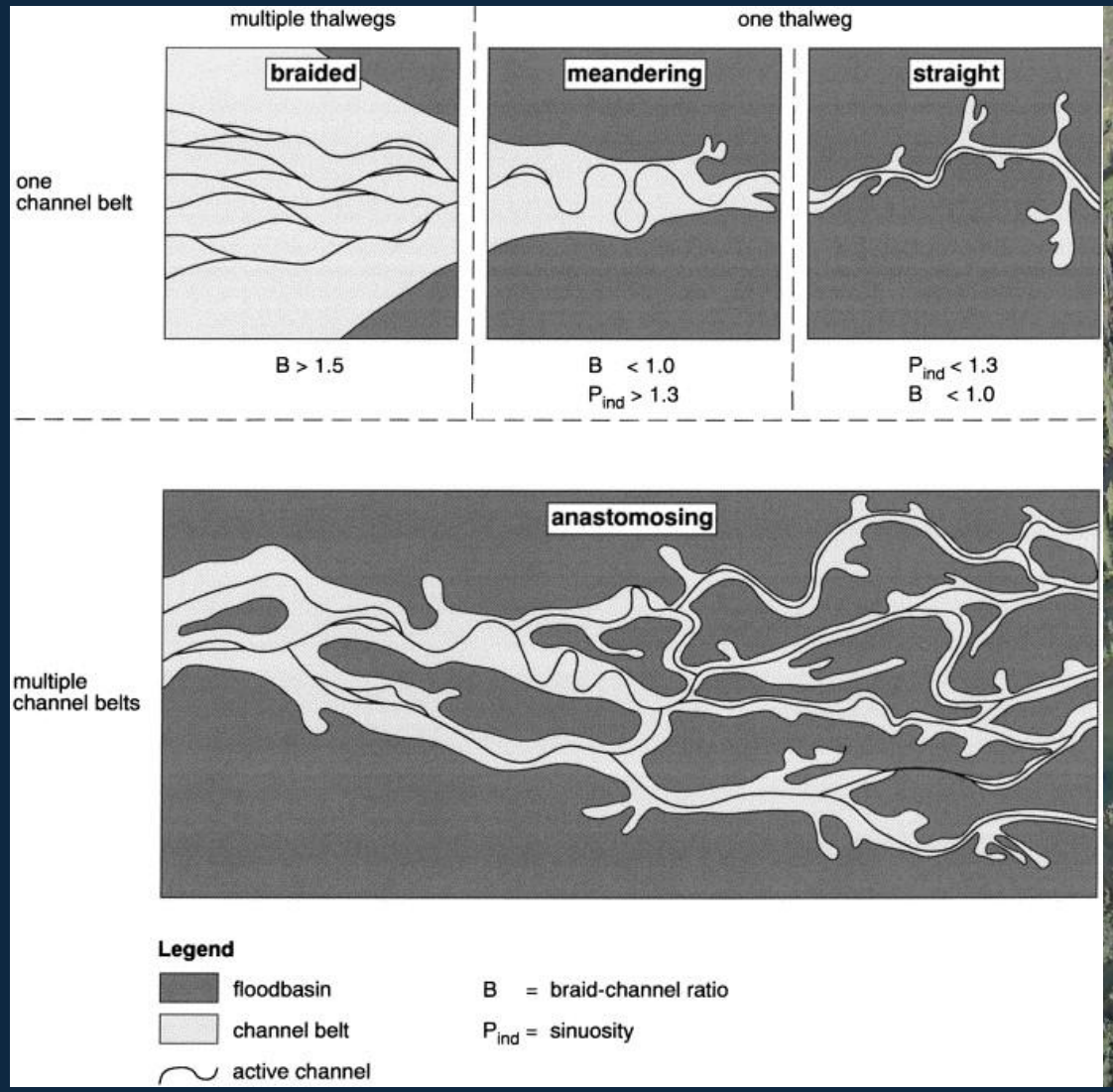
Improved water quality
Floodplain/wetland/riparian habitat
Fisheries
Flood control
“Natural” storage (no dam required)
GW for municipal/domestic use
Supply for downstream users



Collaboration: Incidental Recharge

- Incidental Aquifer Recharge **“Managed inefficiency”**

~~Irrigation~~ seepage has been a major component of hydrologic regimes since late 1800s **or earlier**



From: Makaske et al. 2001 https://doi.org/10.1016/S0012-8252(00)00038-6

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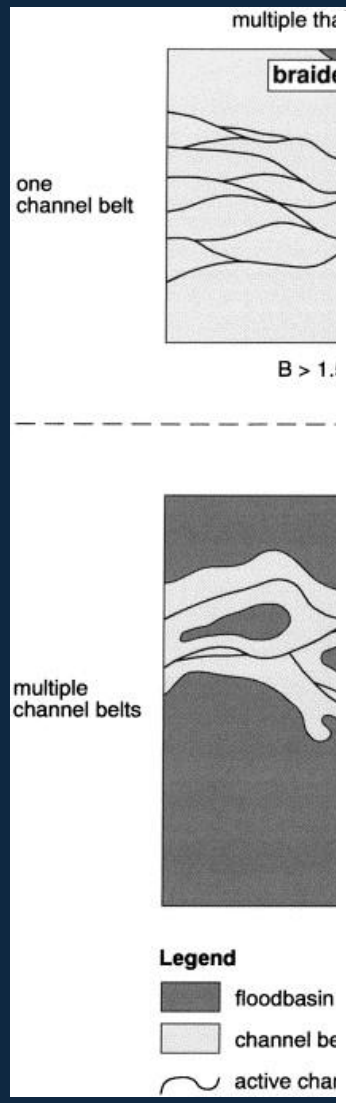
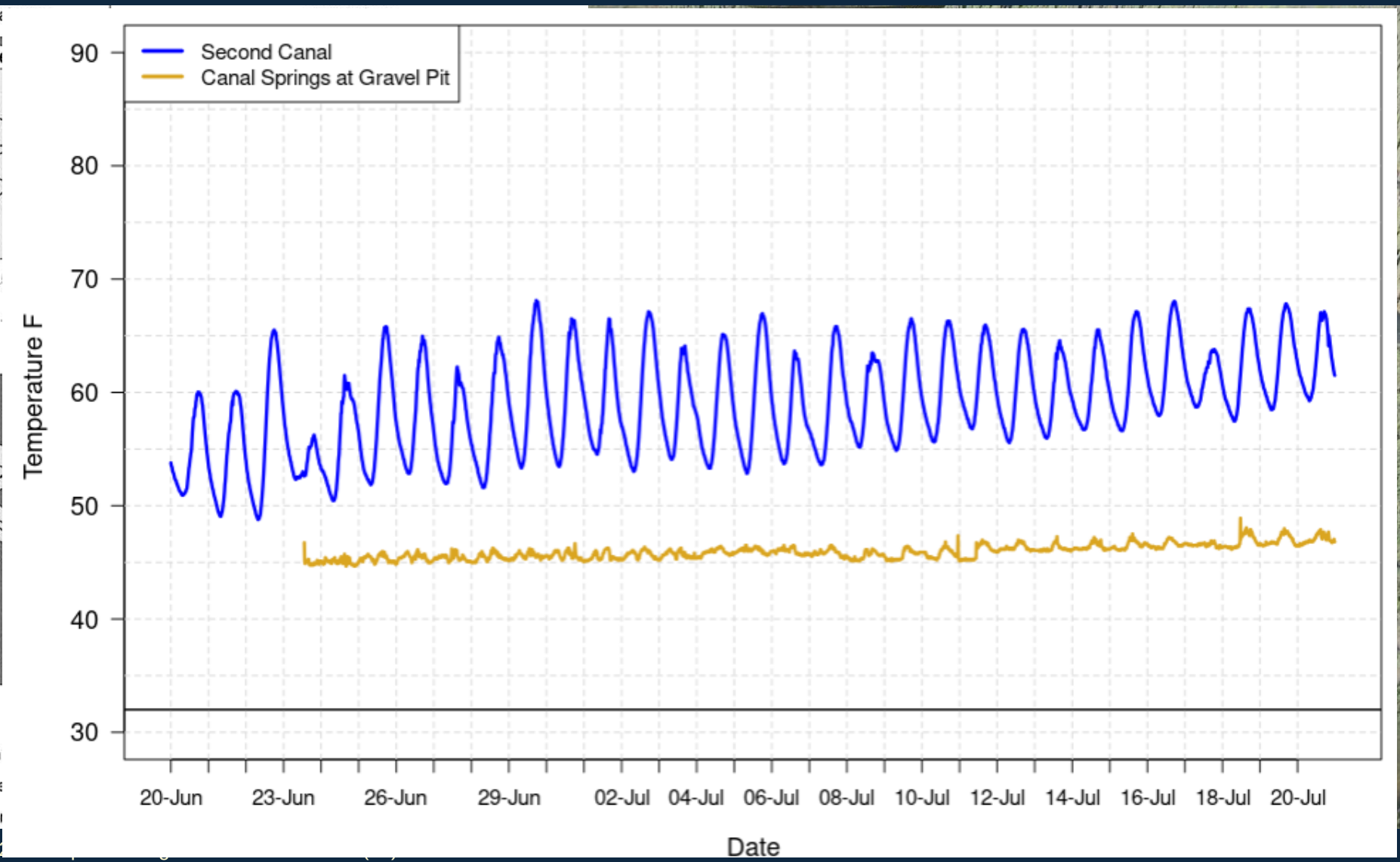
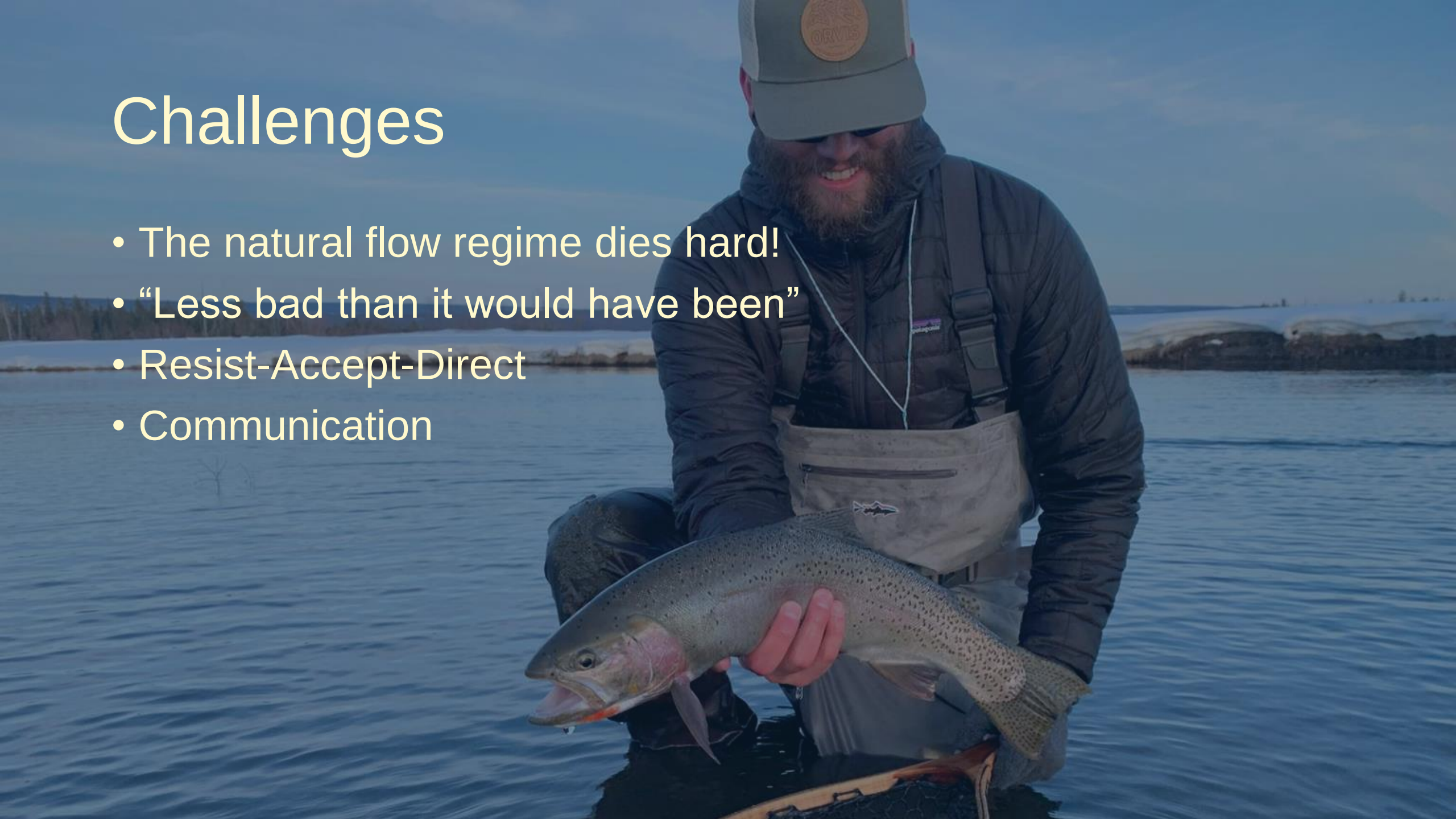




From: Makaske et al. 2

Challenges

- The natural flow regime dies hard!
- “Less bad than it would have been”
- Resist-Accept-Direct
- Communication



Thank you & questions!

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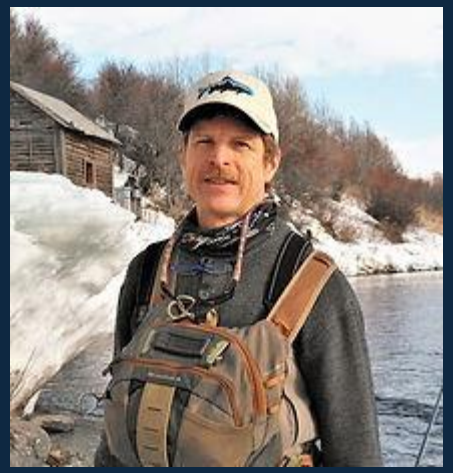


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