

Strategic Planning for Water Rights Acquisitions in the Columbia Basin:

An assessment of regional streamflow response to climate change

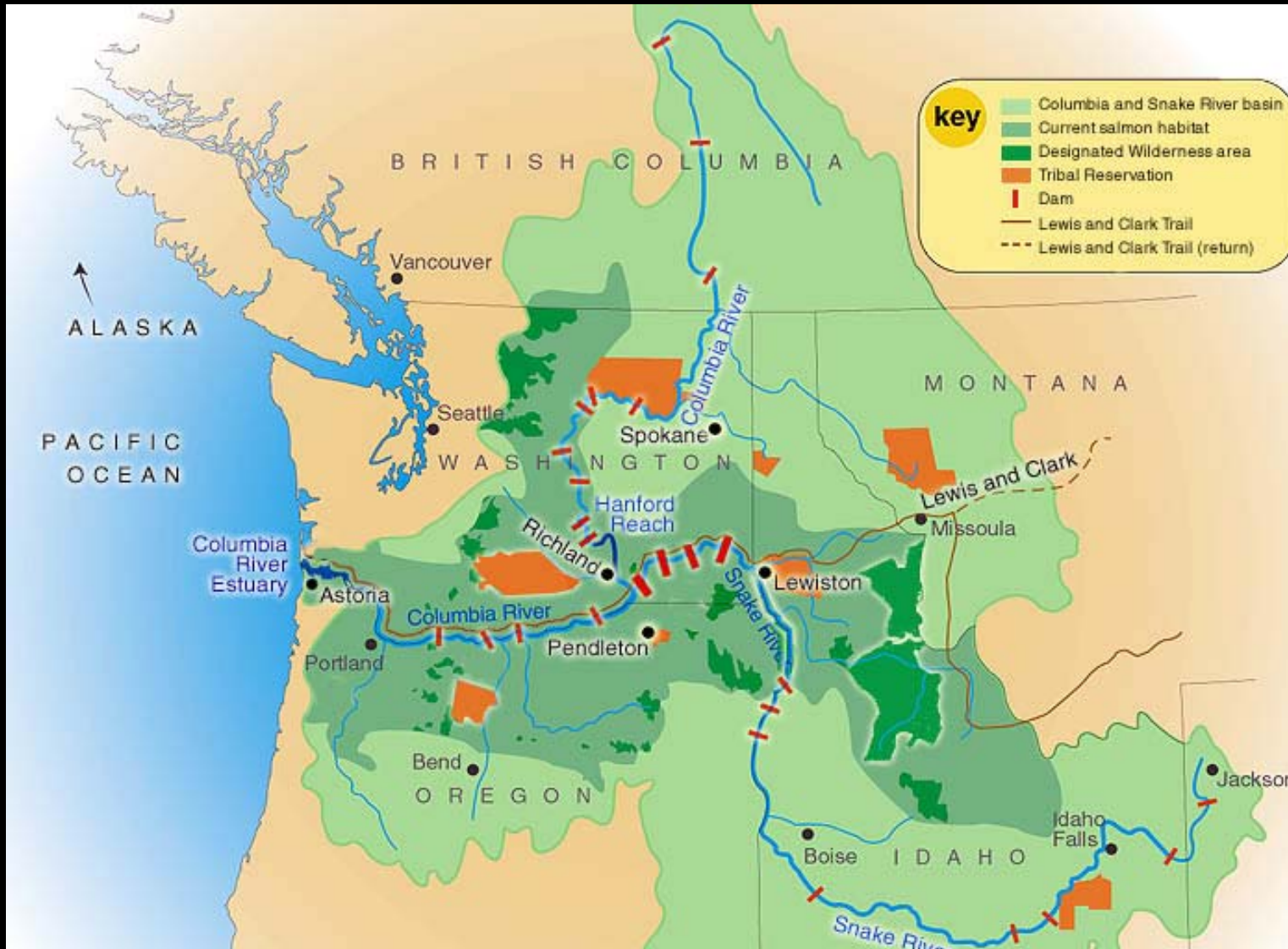
Erin Donley
MS/MPA, School of Forest Resources &
Evans School of Public Affairs

Adviser: Dr. Robert J. Naiman, College of Ocean and Fishery
Sciences

Overview

- Introduction
- Driving Factors
- Research Objectives
- Methods
- Preliminary Results
- Preliminary Conclusions

The Columbia River Basin



Driving Factors:

Impact of low streamflows on salmon



- Thermal impacts on spawning adults
- Dewatering of redds
- Physiological impacts on smolts
- Extend smolt migration time

Driving Factors: Market-based Conservation



WASHINGTON WATER TRUST

Working to restore rivers and streams in Washington state

Driving Factors:

Uncertain hydrologic future resulting from climate change

UW Climate Impacts Group's 2009
Washington Climate Change Assessment

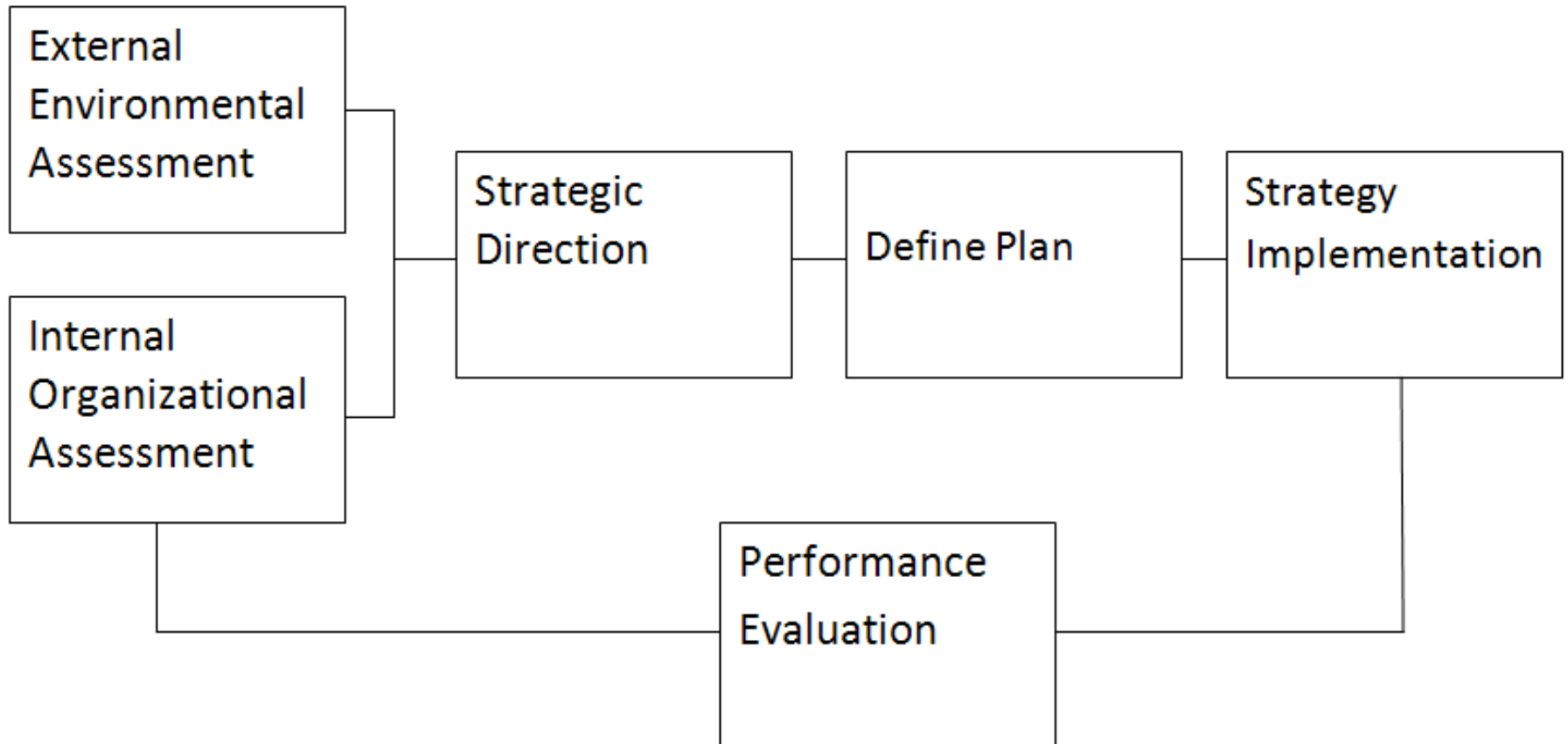
- Lower spring snow water equivalent
- Changes in the timing of stream discharge
- Changes in seasonal stream discharge



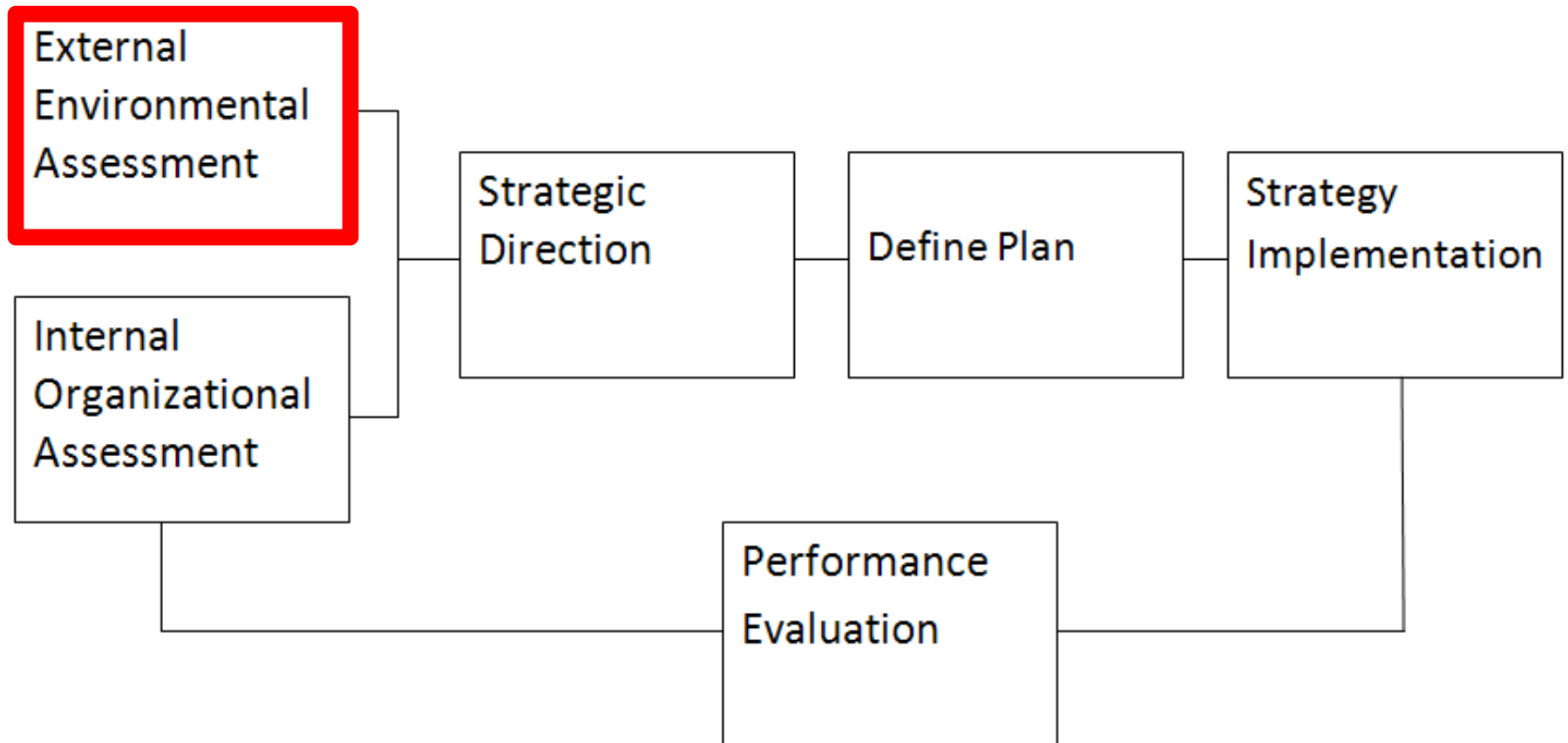
Research Objectives:

- Provide a comprehensive understanding of the projected climate induced changes in hydrology in selected sub-basins.
- Create a strategic plan for water rights acquisitions in areas that may be most flow limited in the next 30 years.
- Facilitate the Department of Ecology, the Washington Water Trust and other organizations' use of the strategic plan in an applied setting.

Methods: Strategic Planning Process



Methods: Strategic Planning Process



Methods

- External Assessment
 - GIS-based sub-basin selection
 - Simulation of historic and future managed stream flows

GIS-based Sub-basin Selection

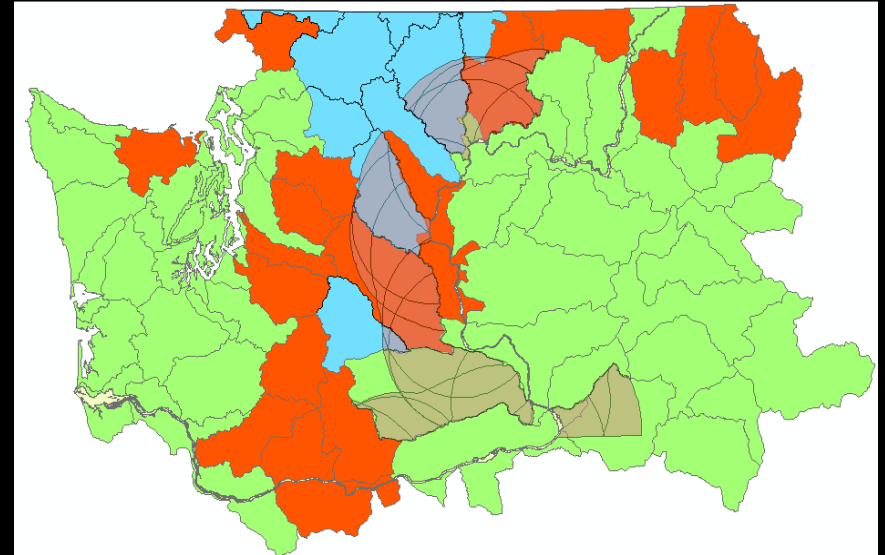
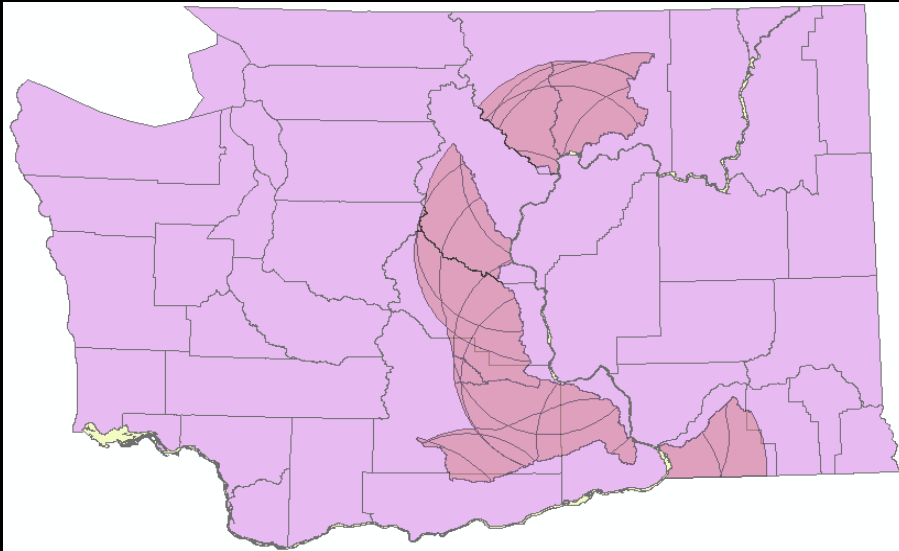
- Criteria:
 - Listed Evolutionary Significant Units (ESUs) of salmon
 - High water use for irrigation
 - High potential for future hydrologic change



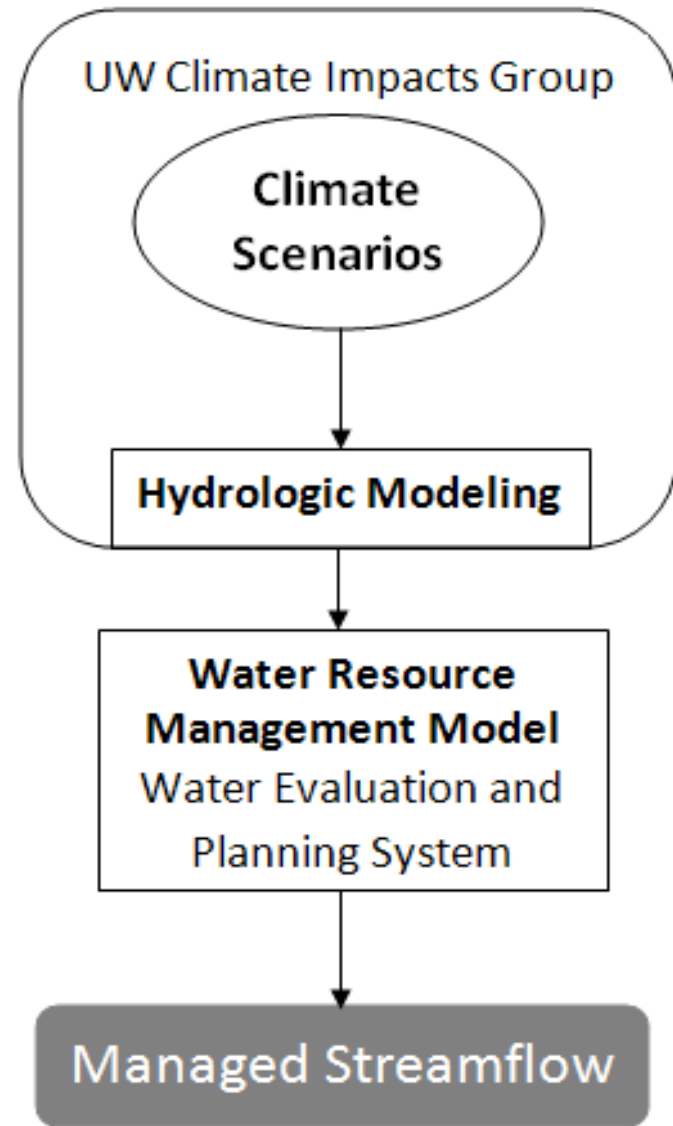
Satisfies Selection Criteria



Selection Criteria Transitional
Rain Dominant Snow Dominant



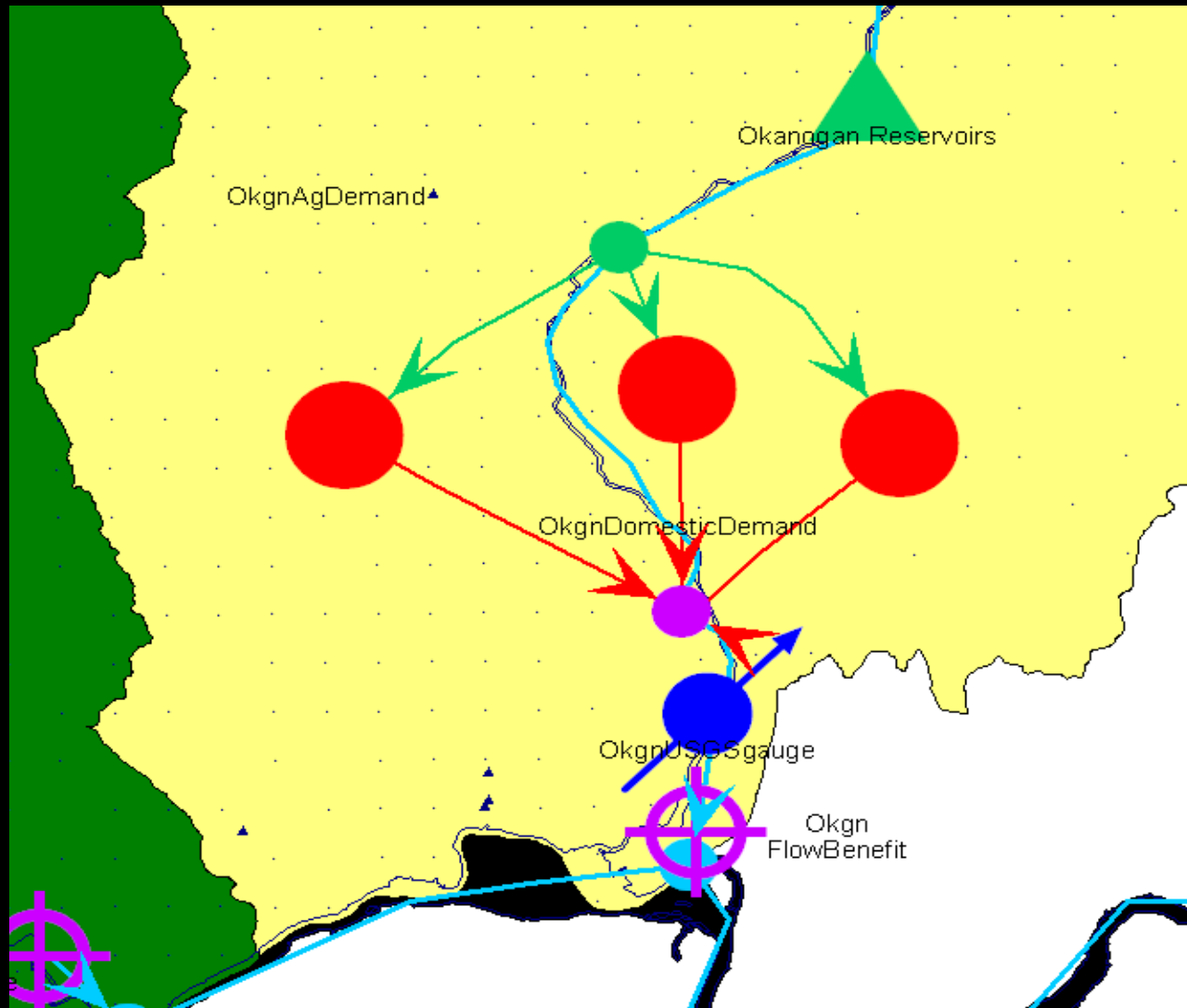
External Assessment: Simulation of historic and future managed streamflow



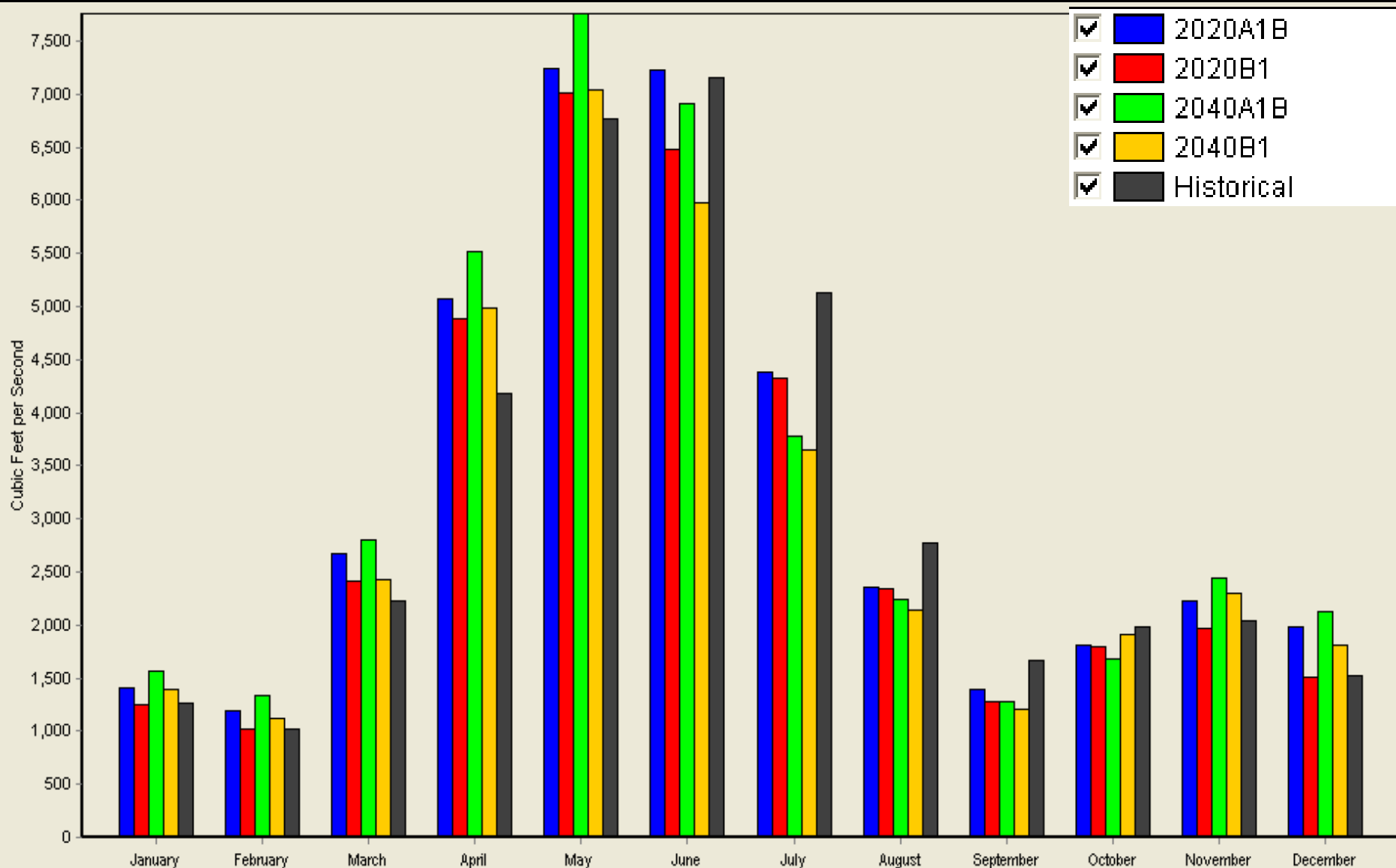
External Assessment: Planning Scenarios

	Climate	20 % Ag Increase	40 % Ag Increase	Instream flow rule 1st priority	Biologically-based Flow Rule 1st Priority
2020A1B	X	X			
2020A1B	X		X		
2020A1B	X	X		X	
2020A1B	X	X			X
2020B1	X	X			
2020B1	X		X		
2020B1	X	X		X	
2020B1	X	X			X
2040A1B	X	X			
2040A1B	X		X		
2040A1B	X	X		X	
2040A1B	X	X			X
2040B1	X	X			
2040B1	X		X		
2040B1	X	X		X	
2040B1	X	X			X

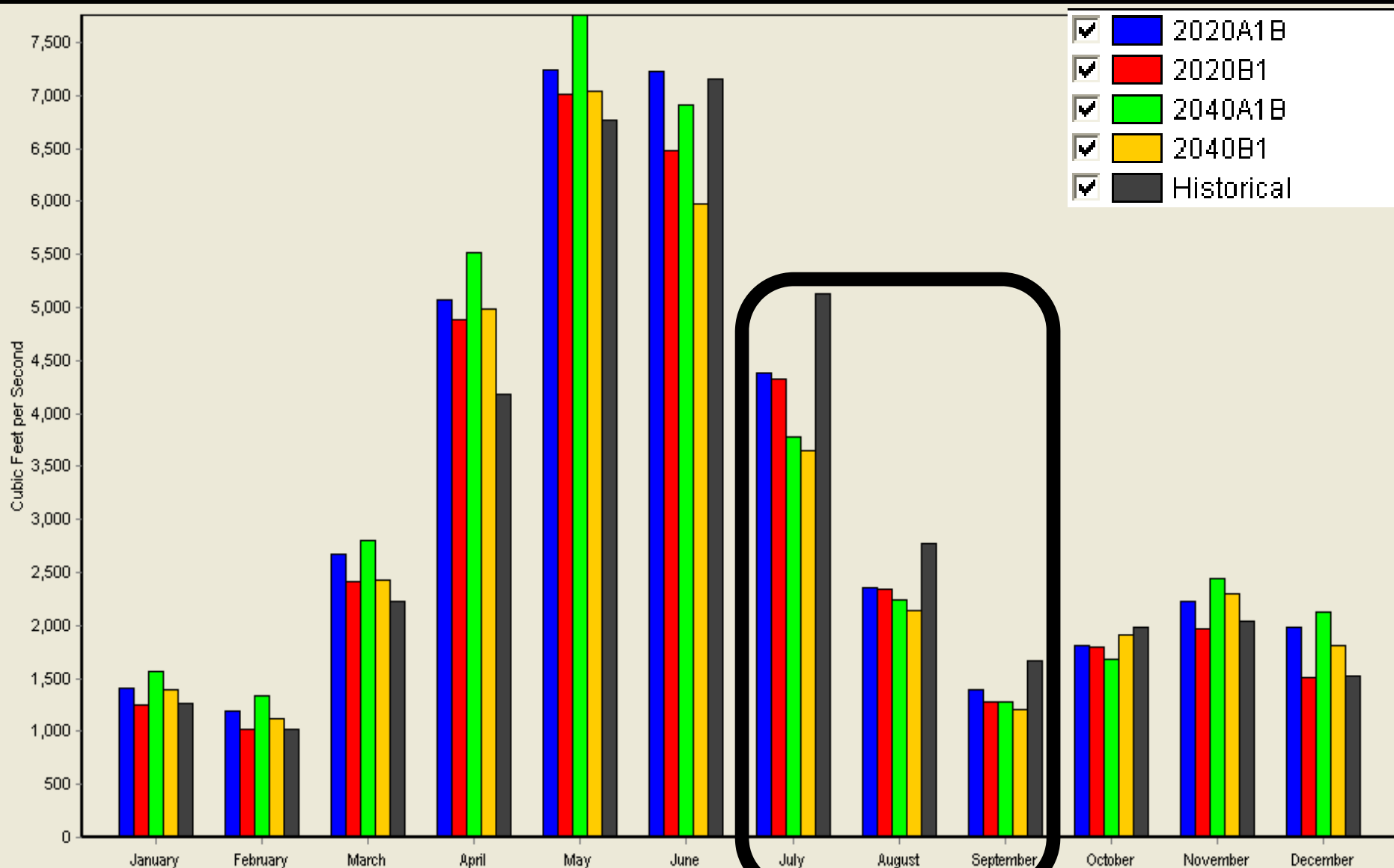
External Assessment: WEAP Interface



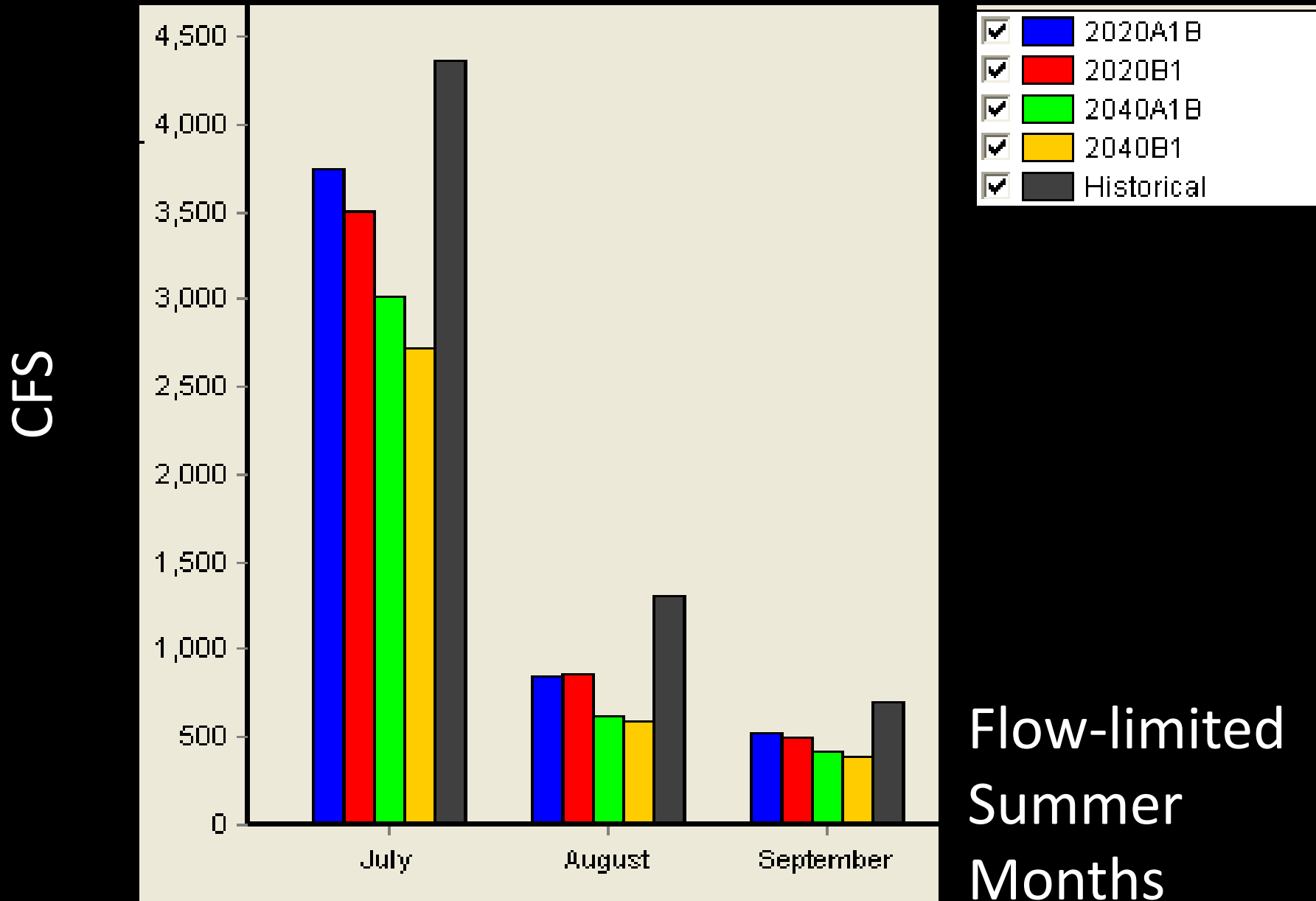
Preliminary Results: Okanogan



Preliminary Results: Okanogan



Preliminary Results: Wenatchee



Flow-limited
Summer
Months

Summary: % Reduction in Average Monthly Streamflow in Dry Season

	Okanogan	Methow	Wenatchee	Yakima	
Scenario	2020A1B	15%	21%	25%	20%
	2020B1	18%	20%	28%	18%
	2040A1B	23%	30%	42%	31%
	2040B1	27%	32%	46%	28%

Summary: % Reduction in Average Monthly Streamflow in Dry Season

	Okanogan	Methow	Wenatchee	Yakima
2020A1B	15%	21%	25%	20%
2020B1	18%	20%	28%	18%
2040A1B	23%	30%	42%	31%
2040B1	27%	32%	46%	28%

WEAP flows in Context

- **NEXT STEP:** Compare simulated flows with salmonid life-stage and species-specific flow duration curves

Preliminary Conclusions

- Many salmonids in the Central Columbia Basin are in danger of extinction
- Traditional command and control regulation has not significantly restored salmon population numbers
- Market-based approaches to instream flow conservation show great promise
- My study will result in strategic recommendations for future water rights acquisitions to maximize the benefit of instream flow conservation

Application: Political Governance

Federal Regulation: ESA

Environmental
Outcome: Conserved
Instream Flow



CBWTP: Conservation Funding



Water right acquisitions for flow
conservation

Environmental Outcome:
Conserved Instream Flow



Local Agencies and Organizations:
Water right acquisitions for flow
conservation

UW Climate Impacts Group

Climate
Scenarios

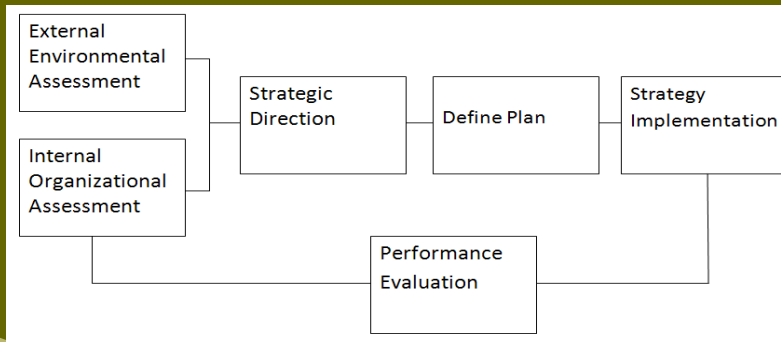
Hydrologic Modeling

Water Resource
Management Model
Water Evaluation and
Planning System

Managed Streamflow

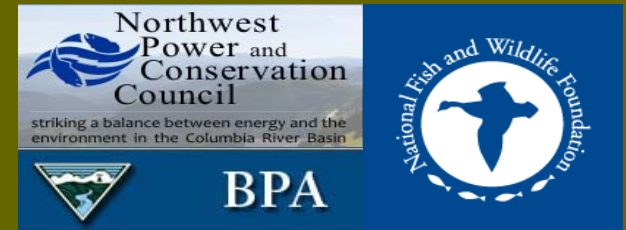
Objective 1

Strategic Planning



CBWTP: Conservation Funding

Environmental Outcome: Conserved Instream Flow



Objectives 2 & 3



Objectives 2 & 3

Funding recipients: Water right acquisitions for flow conservation

Acknowledgements

- Dr. Robert Naiman
UW School of Aquatic and Fisheries Science
- Dr. Joe Cook
UW Evans School of Public Affairs
- Dr. Joshua Lawler
UW School of Forest Resources
- Susan Adams and Amanda Cronin
Washington Water Trust
- Dr. David Purkey
Stockholm Environment Institute

Acknowledgements

- Dr. Vishal Meta
Stockholm Environment Institute
- UW Climate Impacts Group
- Dr. Alan Hamlet
UW Department of Civil and Environmental Engineering
- Mathieu Marineau
UW Department of Civil and Environmental Engineering
- Julie Vano
UW Department of Civil and Environmental Engineering

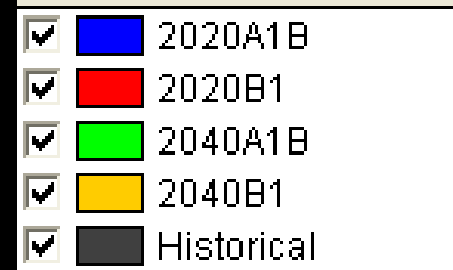
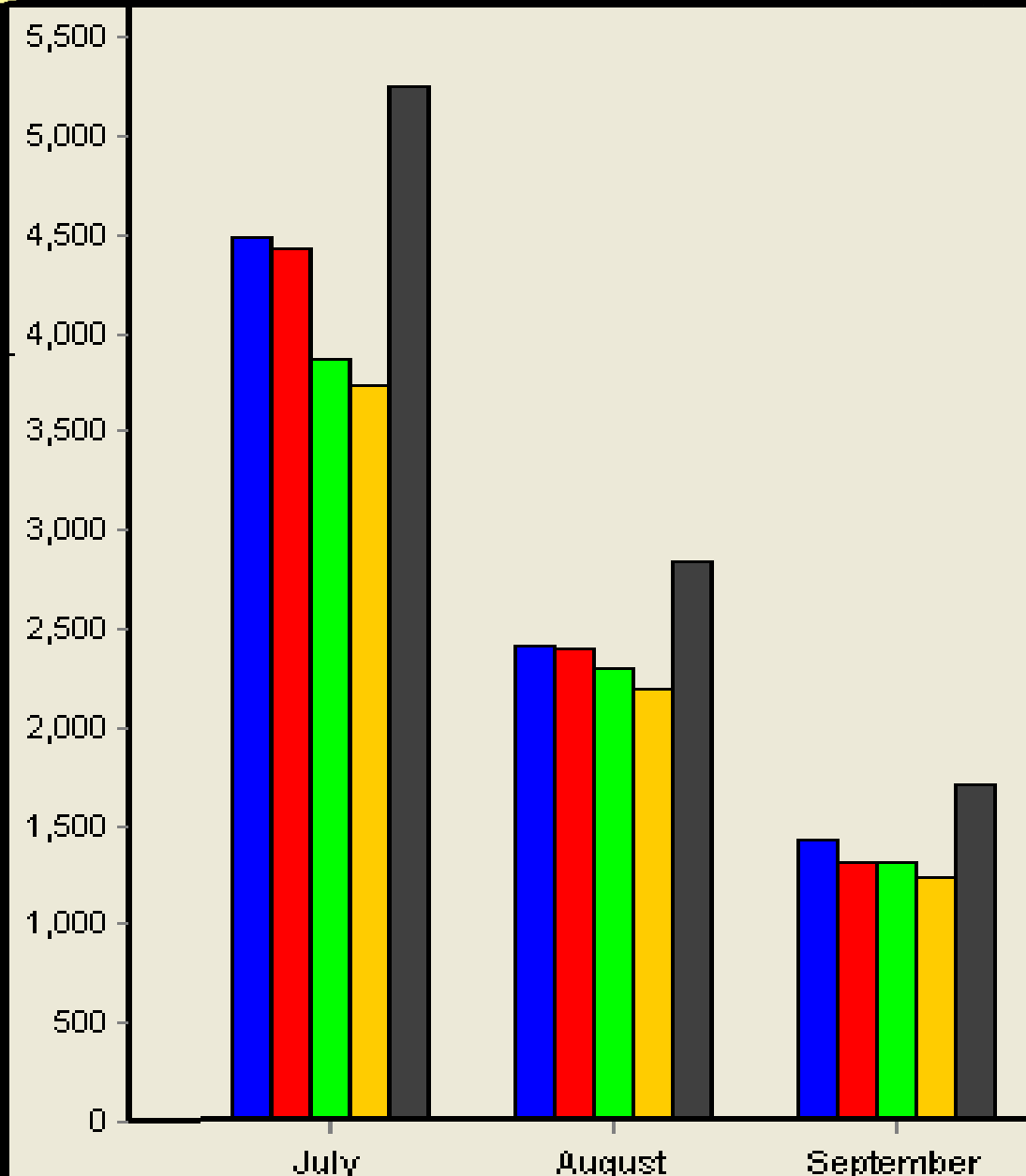
END



Contact: edonley@uw.edu

Preliminary Results: Okanogan

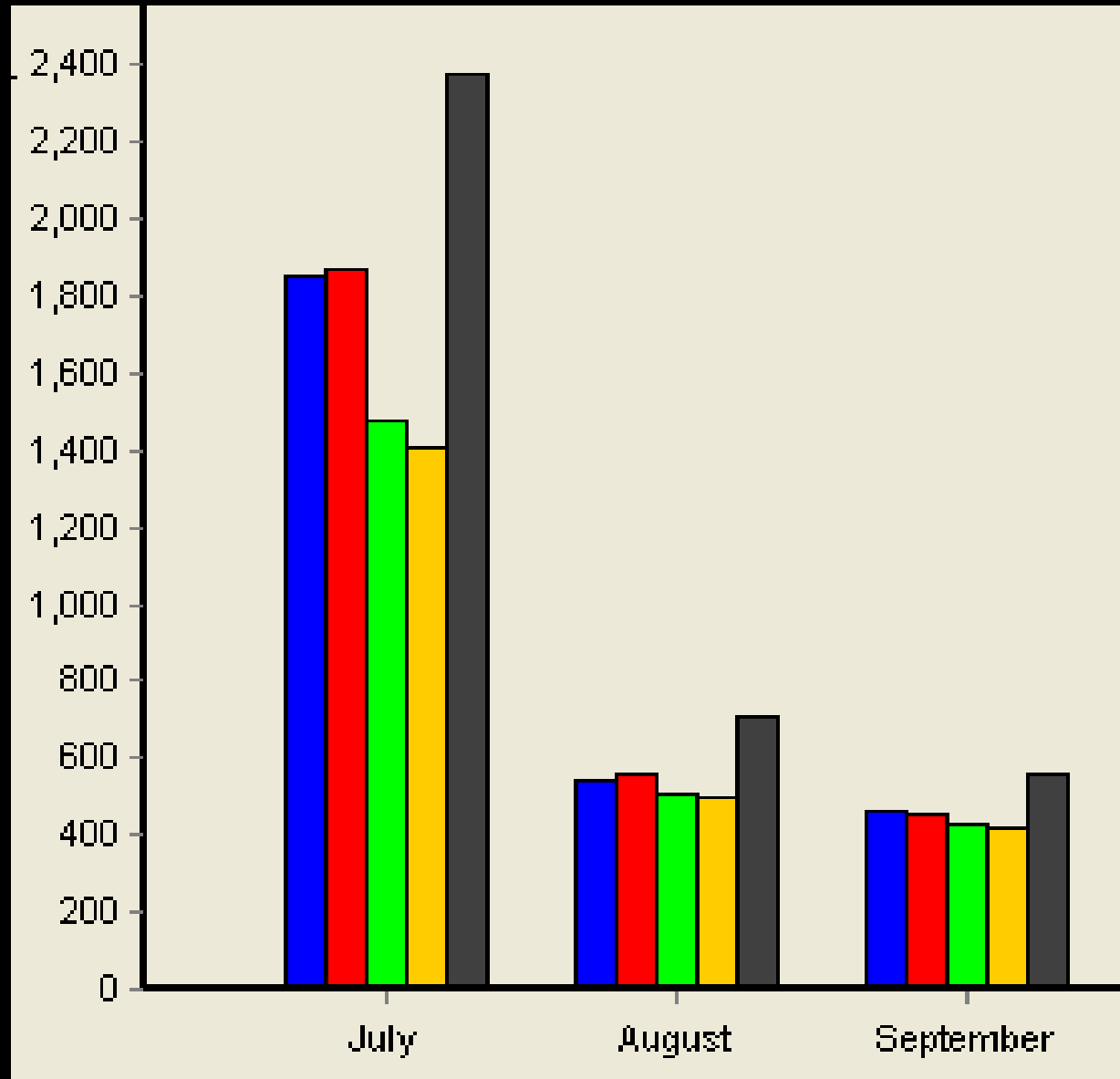
CFS



Flow-limited
Summer
Months

Preliminary Results: Methow

CFS

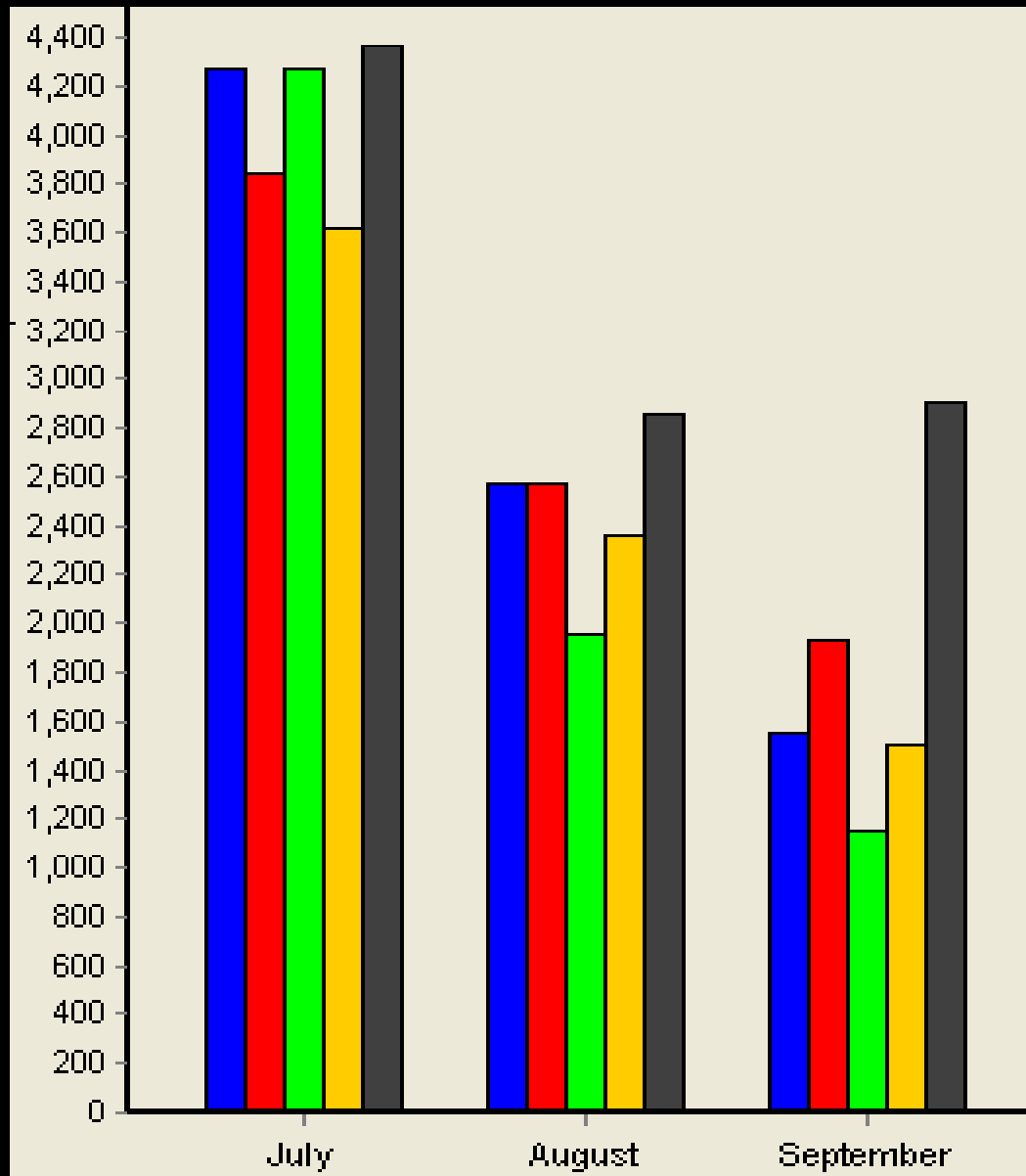


- 2020A1B
- 2020B1
- 2040A1B
- 2040B1
- Historical

Flow-limited
Summer
Months

Preliminary Results: Yakima

CFS



- 2020A1B
- 2020B1
- 2040A1B
- 2040B1
- Historical

Flow-limited
Summer
Months