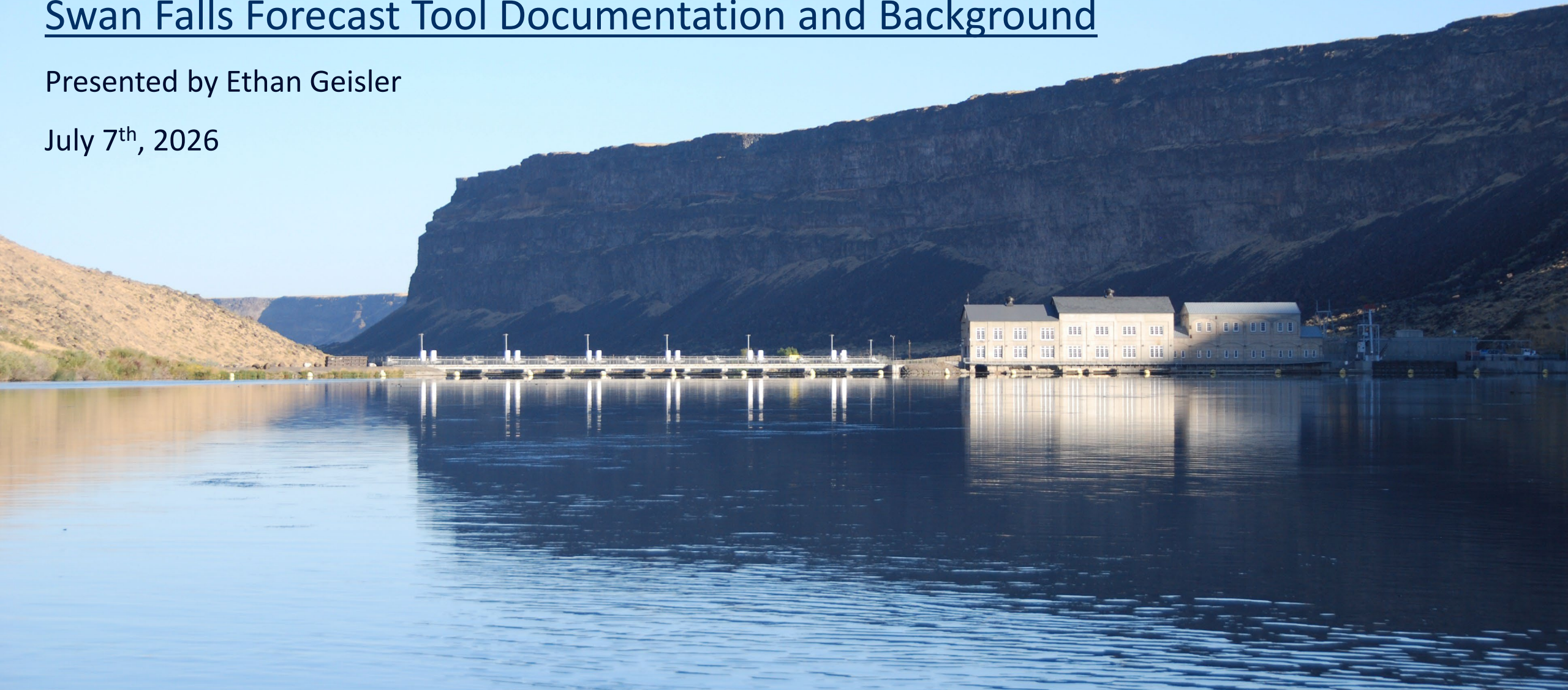


Swan Falls Forecast Tool Documentation and Background

Presented by Ethan Geisler

July 7th, 2026



Milner to Murphy Reach Gain Forecast Tool or Swan Falls Forecast Tool (SFFT)

- Forecasting Snake River gains between Milner and Murphy to support water management decisions under the Swan Falls Agreement
- Winter and Spring Forecast Tools – Two Separate Tools
 - Best at forecasting the low flow period in June-July
- Updated and Adapted from CH2M Hill Final signed document on May 31st, 2017
 - Concepts based on Boggs et al. (2010), which developed analytical aquifer response methods foundational to ESPA forecasting.

Manual for the Milner to Murphy
Reach Gain Forecast Tool
Version 1.1

DRAFT Final

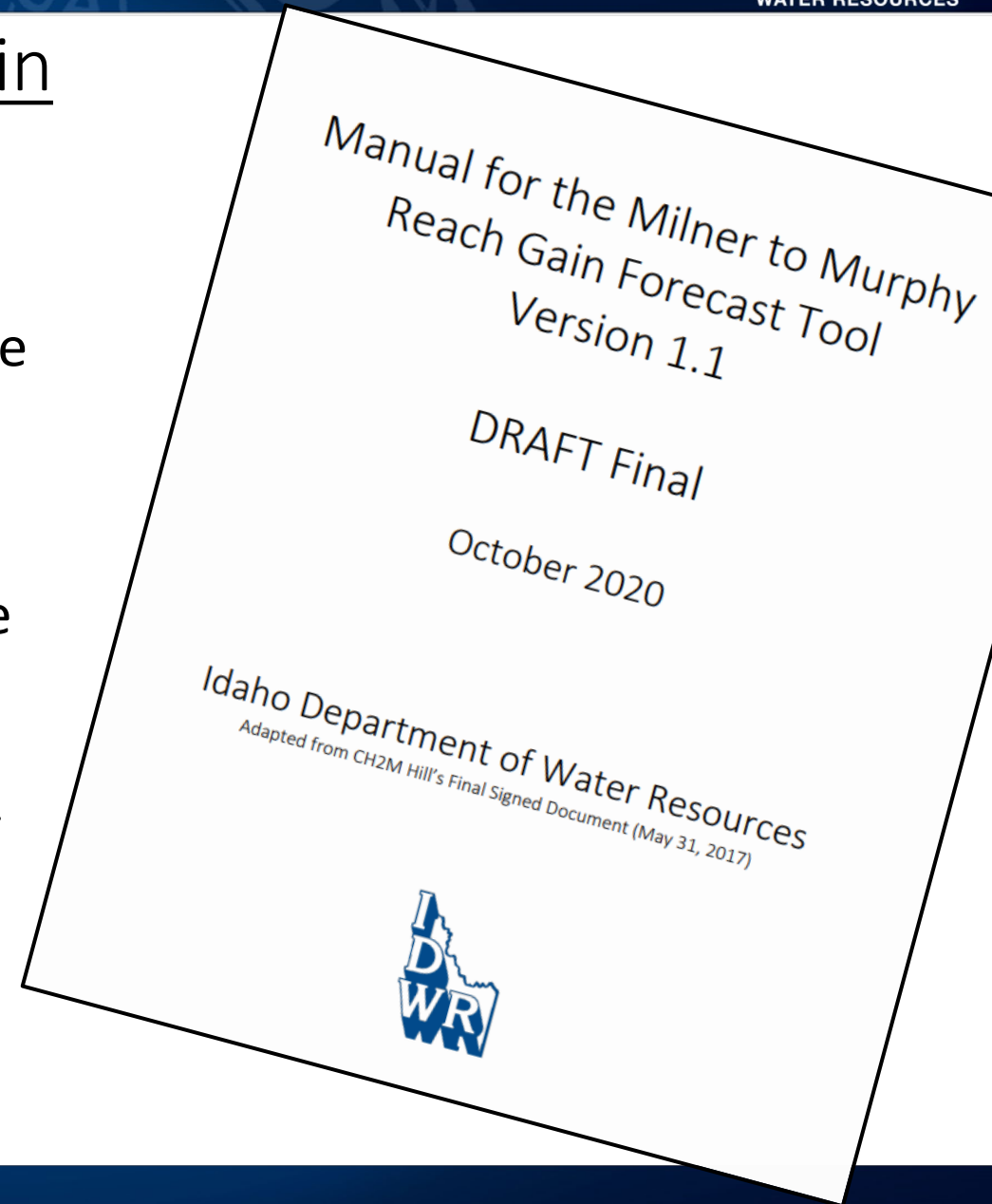
October 2020

Idaho Department of Water Resources
Adapted from CH2M Hill's Final Signed Document (May 31, 2017)

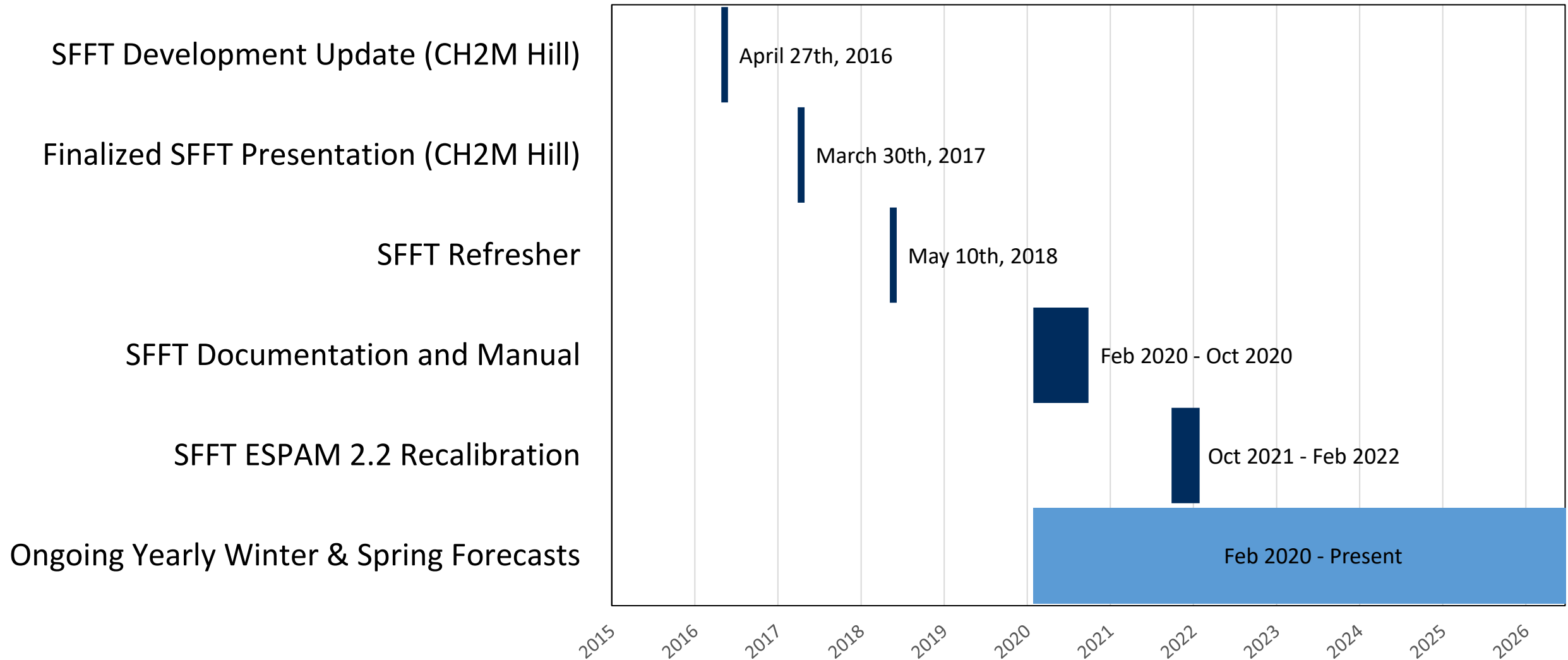


Manual for the Milner to Murphy Reach Gain Forecast Tool

- Overview of components and analysis that went into the original Swan Falls Forecast Tool.
 - Presented for comments and review to the TWG from Feb 2020 – October 2020
- SFFT has since been recalibrated to ESPAM 2.2 response functions and data inputs, but all other components remain the same.
 - Presented for comment and review to the TWG from October 2021 – February 2022



Swan Falls Forecast Tool (SFFT) and Technical Working Group



Swan Falls Forecast Tool Components

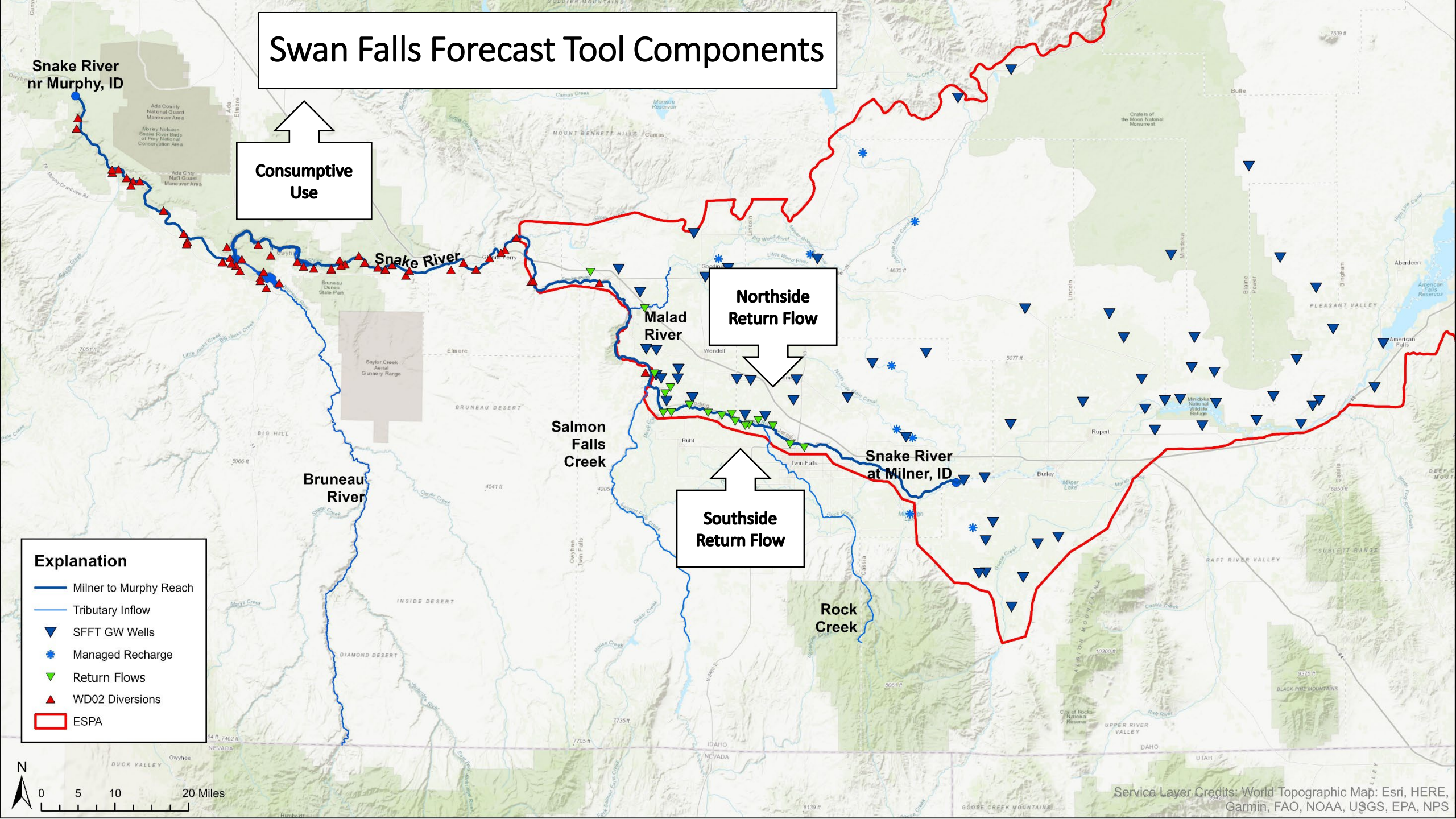
Consumptive
Use

Northside
Return Flow

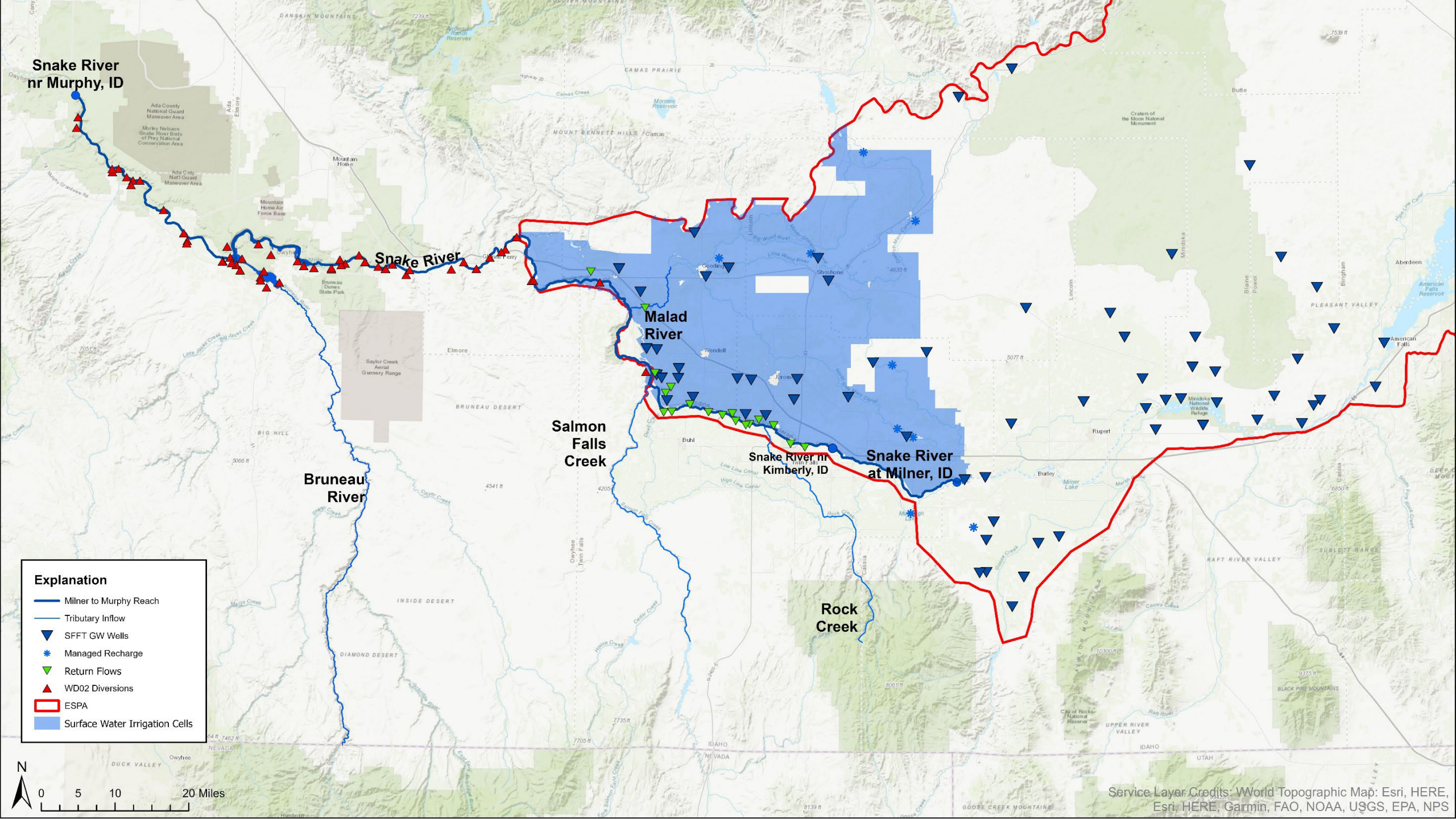
Southside
Return Flow

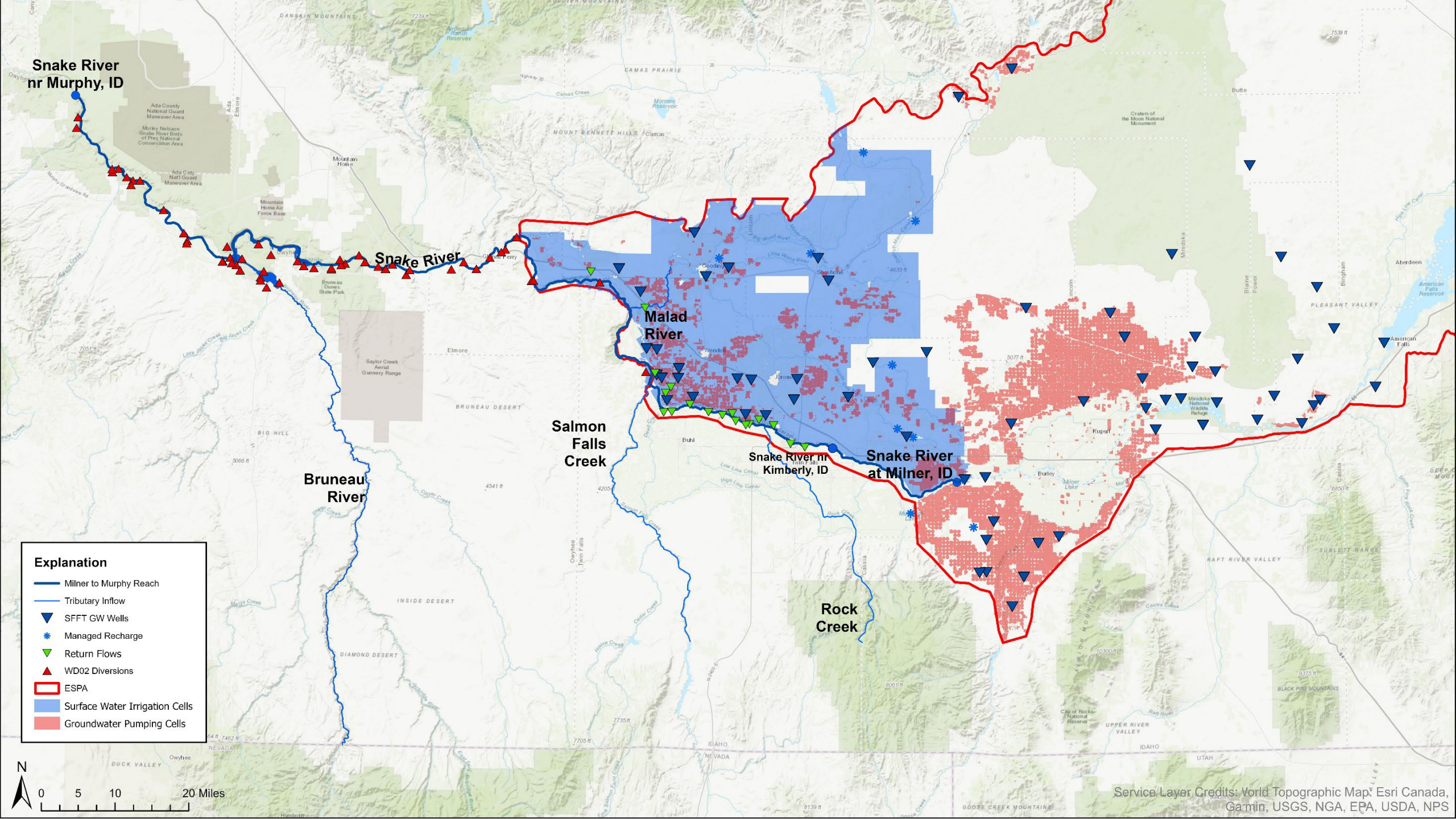
Explanation

- Milner to Murphy Reach
- Tributary Inflow
- SFFT GW Wells
- Managed Recharge
- Return Flows
- WD02 Diversions
- ESPA



	Type of Data	Input	Date Range	Statistic	Notes
Q_{ESPA}	Starting Head Component	Response Functions			ESPAM 2.2
		Groundwater Water Level Data	Preceding Fall or Spring synoptic		
	Managed Recharge	Response Functions			ESPAM 2.2
		Monthly Recharge values	Current year recharge operations		
	Incidental Recharge	SWSI: (Big Wood & Snake nr Heise) & Reservoir Storage	1981 to 2018	Correlation to SWSI value	Correlation built with ESPAM 2.2
	Groundwater Pumping	ESPAM 2.2	2009 to 2018	Average	
$Q_{\text{non-ESPA}}$	Tributary Flow	Salmon Falls Creek	1986 to Present	Median	
		Rock Creek	1993 to Present	Median	
		Bruneau River	1986 to Present	Analog SWSI	
		Malad River	1987 to Present	Analog SWSI	
	Return Flow	Northside Returns	2002 - Present	Median	
		Southside Returns	2002 - Present	Median	
	Kimberly Reach Gains	Snake River at Kimberly & Snake River at Milner	1993 to 2022	Median	Smoothed with a 5 day moving average (centered)
Q_{DivET}	WSU Irrigation Scheduler Mobile Results		2003 - 2022	Median	





Snake River
nr Murphy, ID

Snake River

Malad
River

Salmon
Falls
Creek

Snake River nr
Kimberly, ID

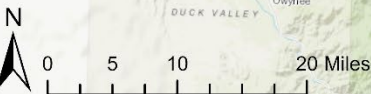
Snake River
at Milner, ID

Rock
Creek

Bruneau
River

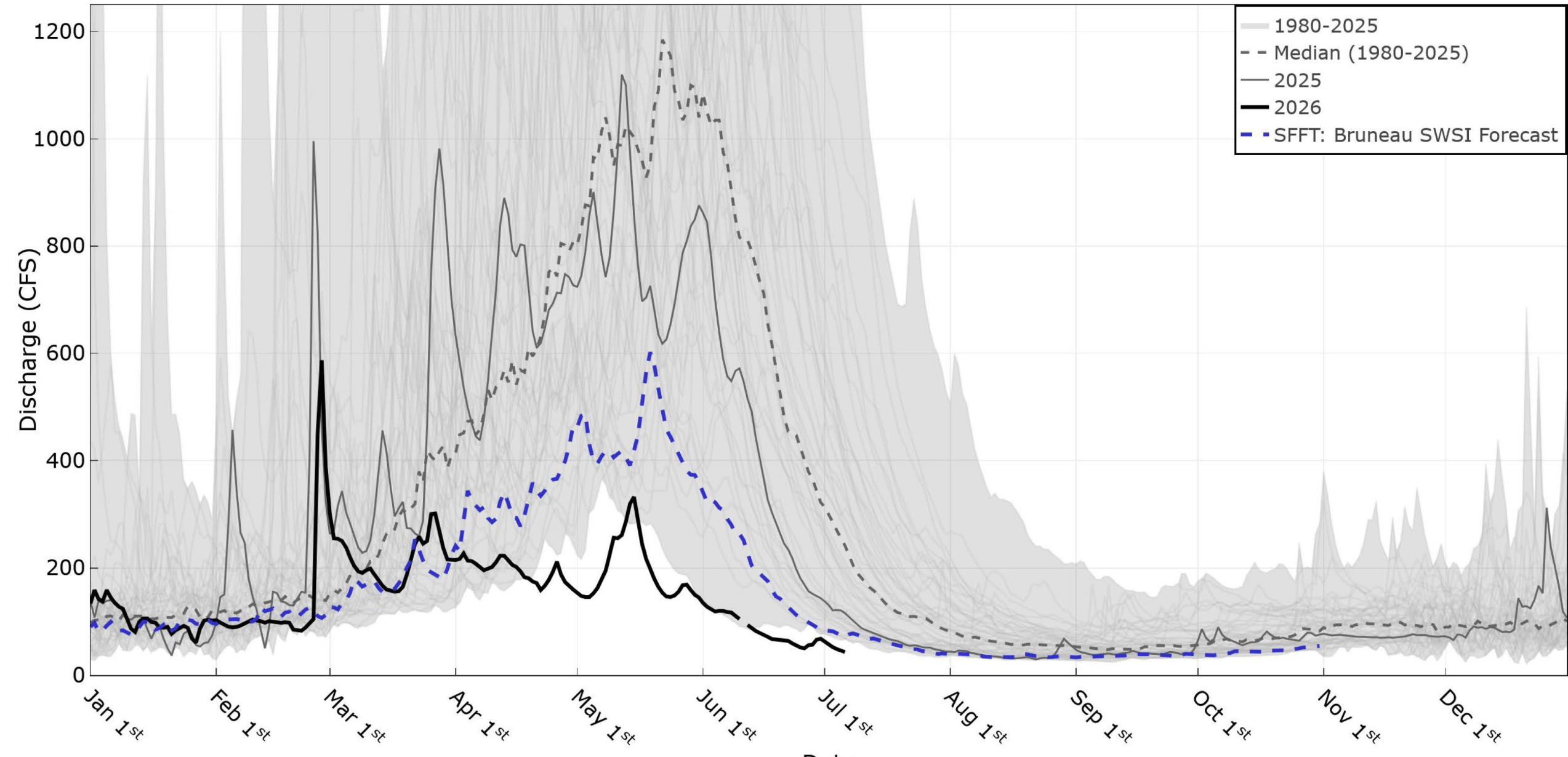
Explanation

- Milner to Murphy Reach
- Tributary Inflow
- SFFT GW Wells
- Managed Recharge
- Return Flows
- WD02 Diversions
- ESPA
- Surface Water Irrigation Cells
- Groundwater Pumping Cells



Bruneau River nr Hot Springs

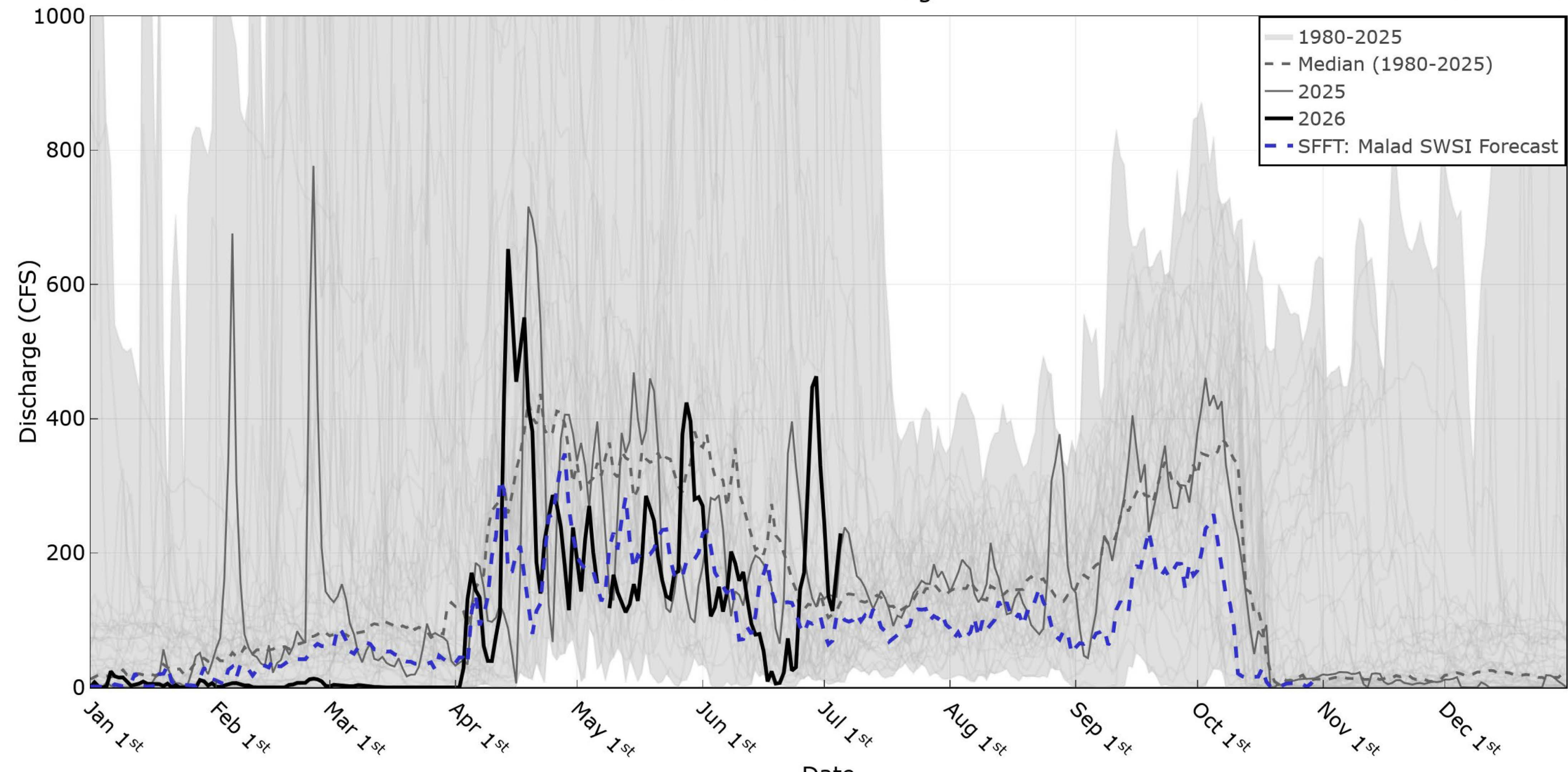
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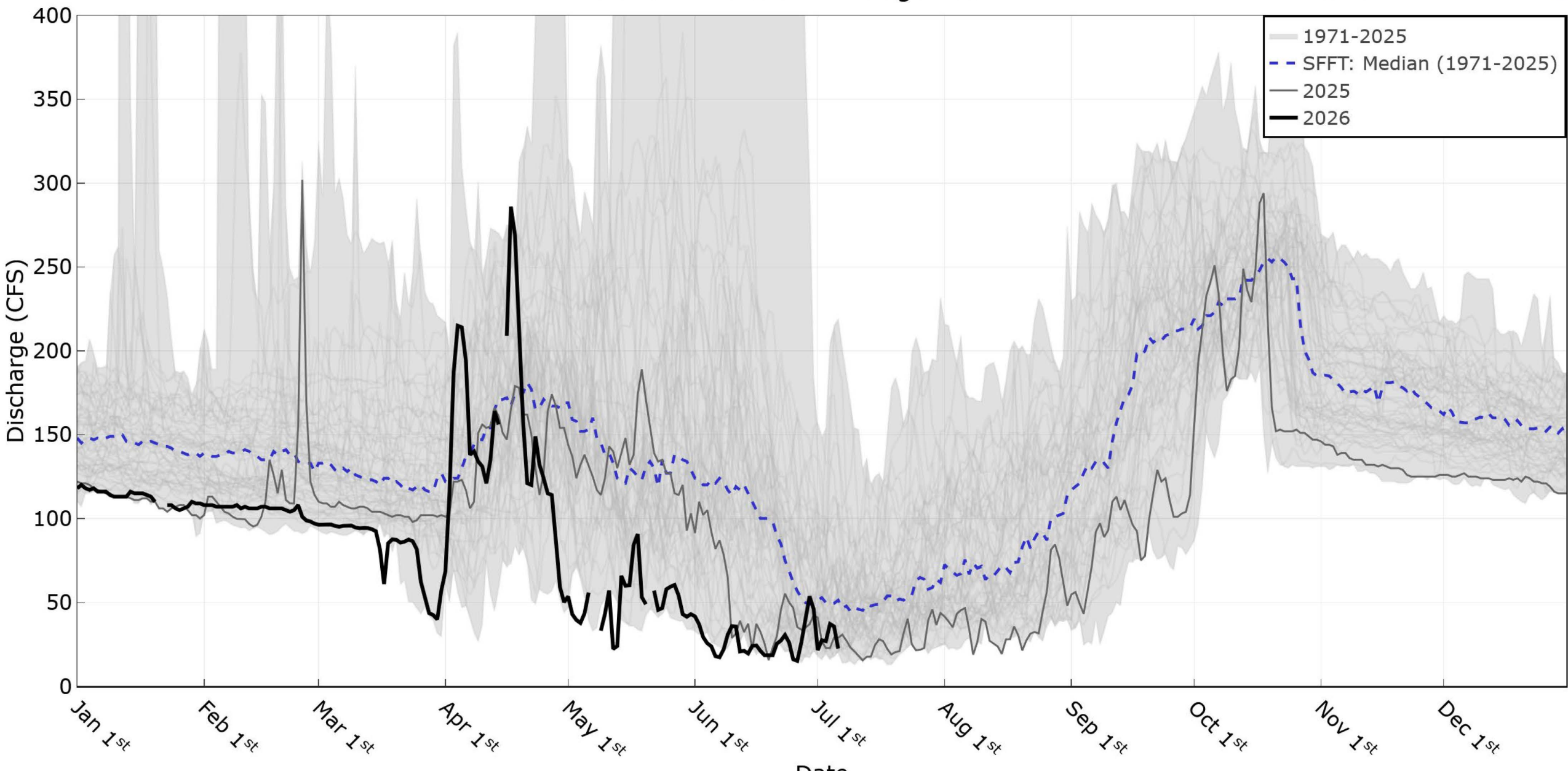
Malad River nr Gooding

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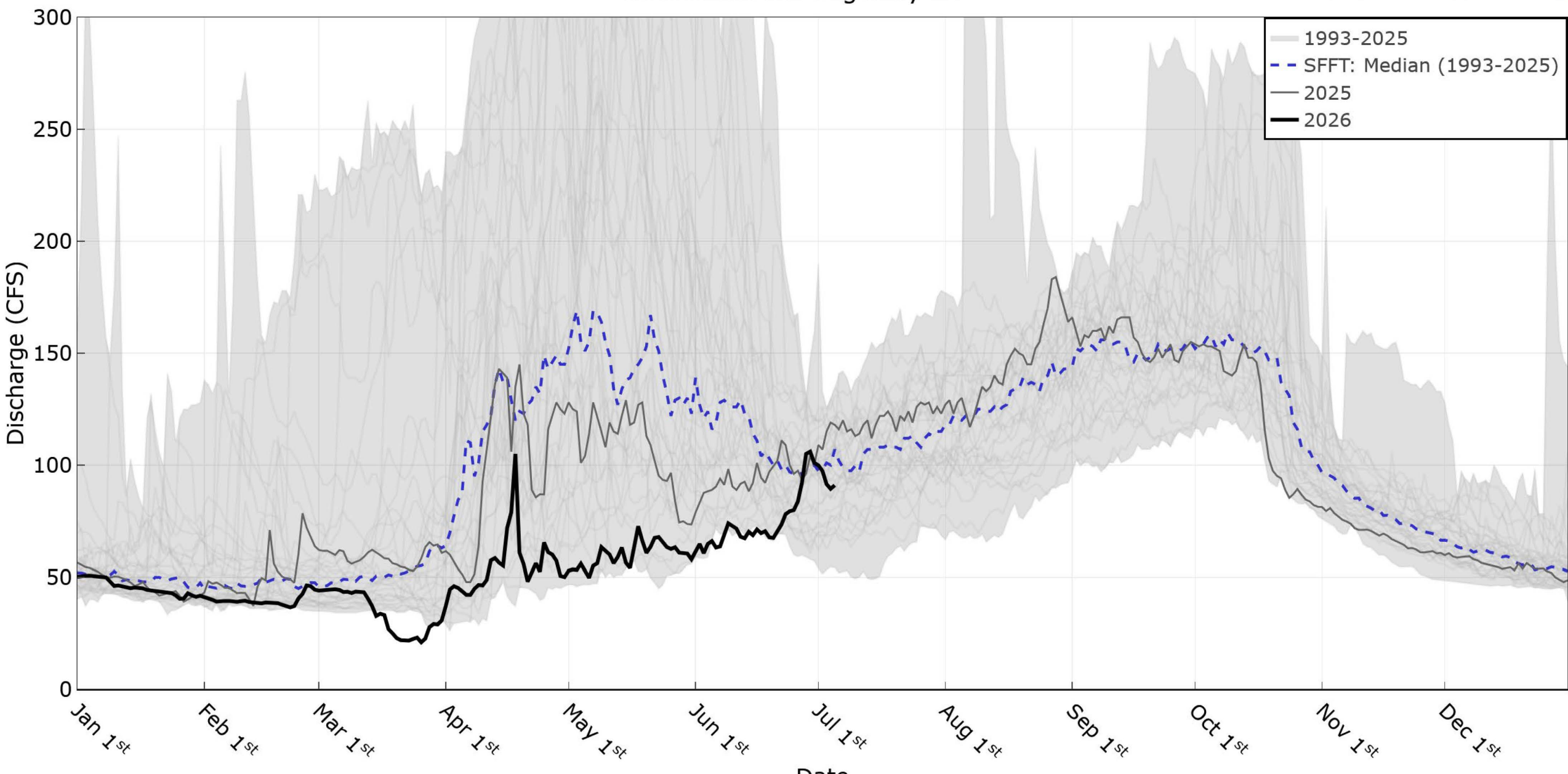


Salmon Falls Creek nr Hagerman



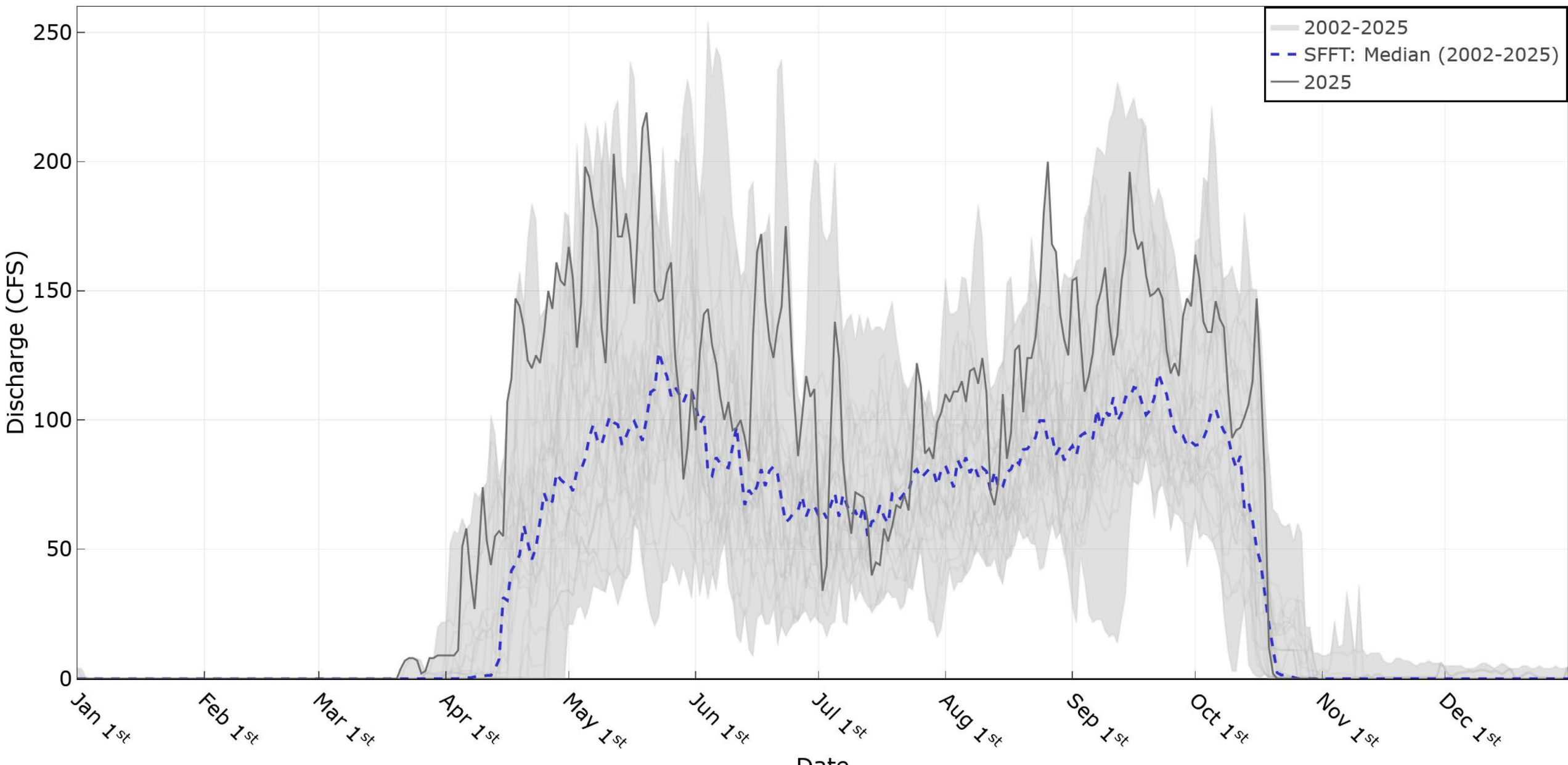


Rock Creek abv Highway 30





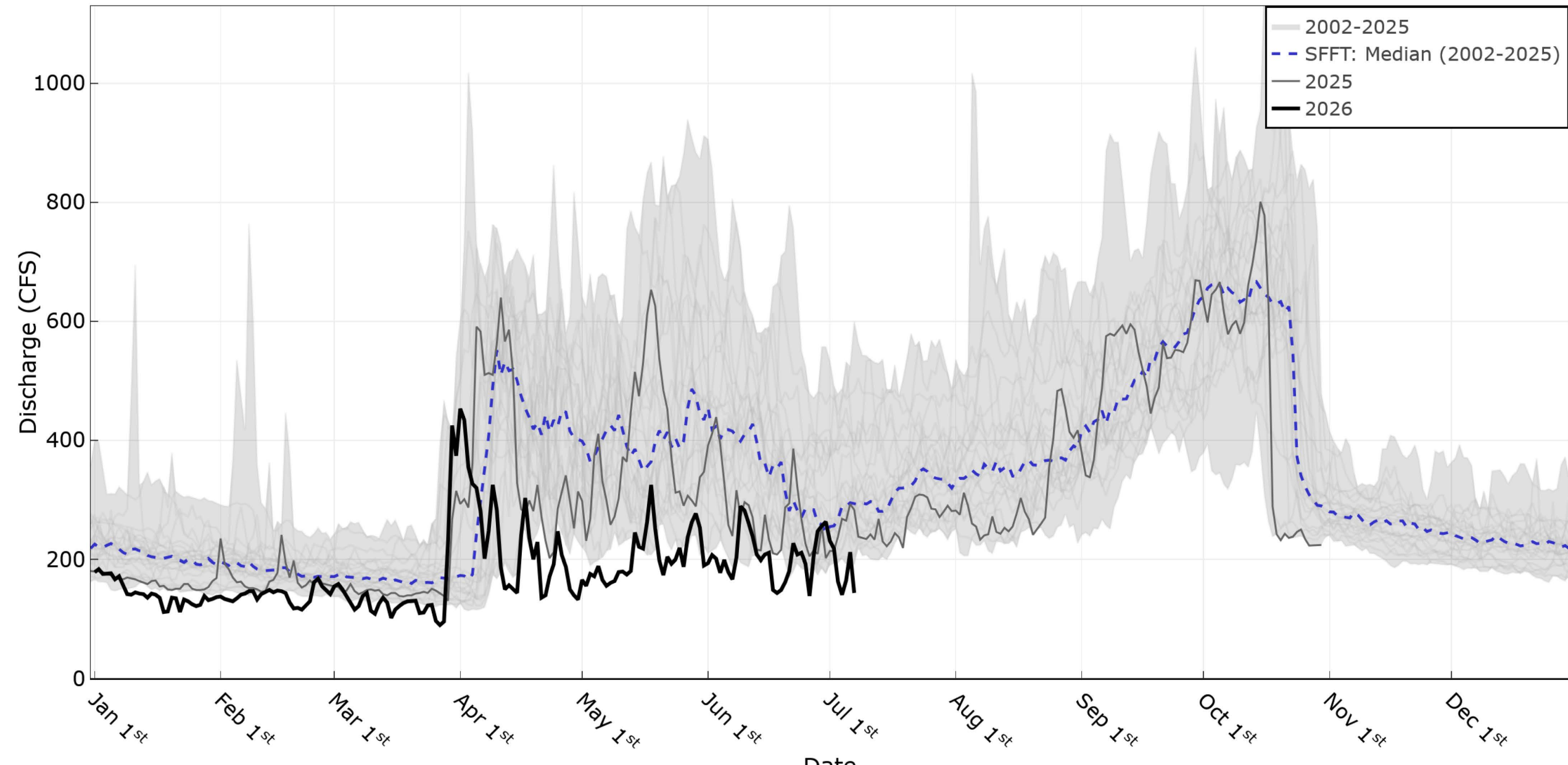
Snake River Northside Return Flow





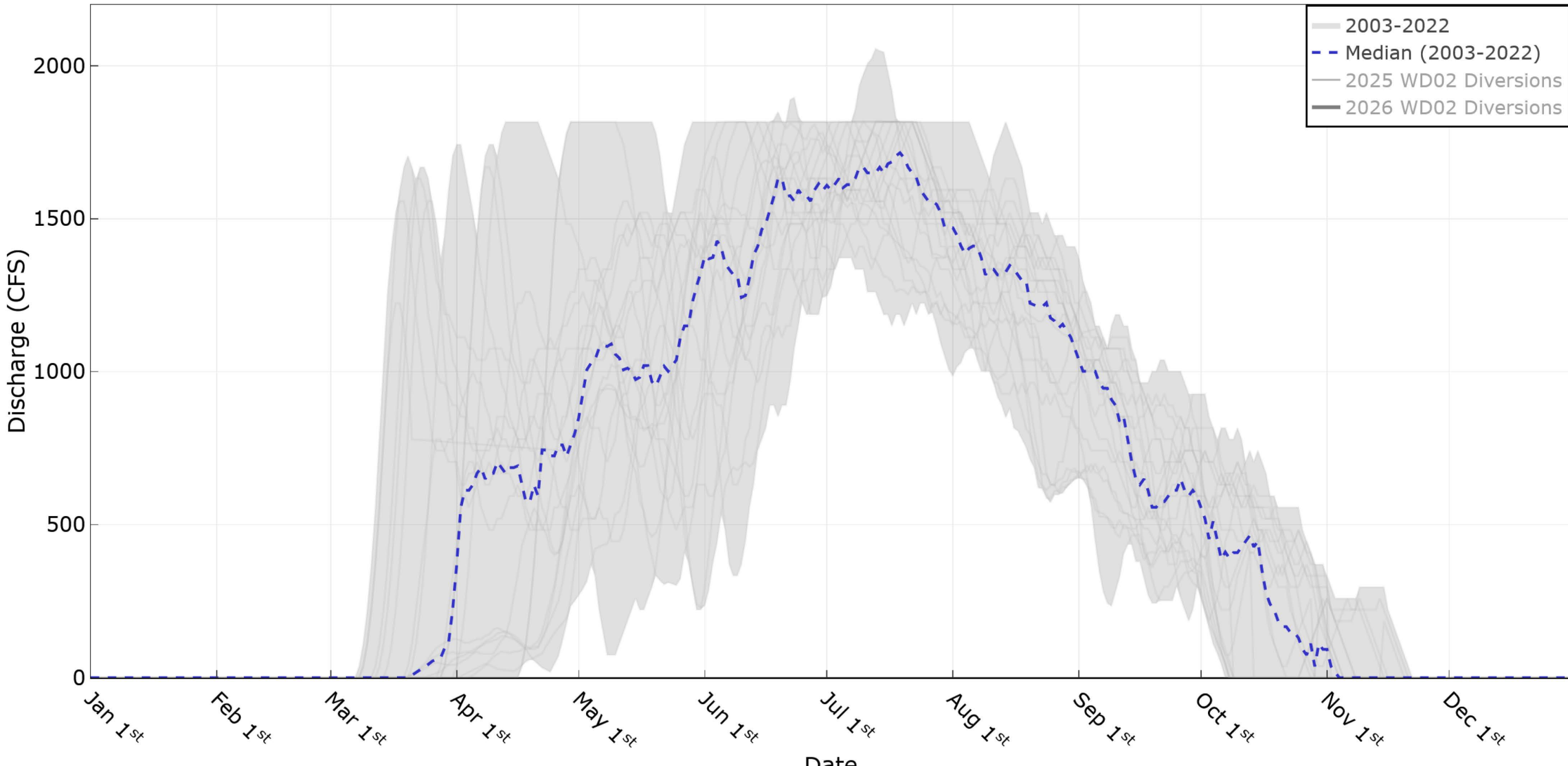
Snake River Southside Return Flow

Interactive chart controls: zoom, pan, and other tools.



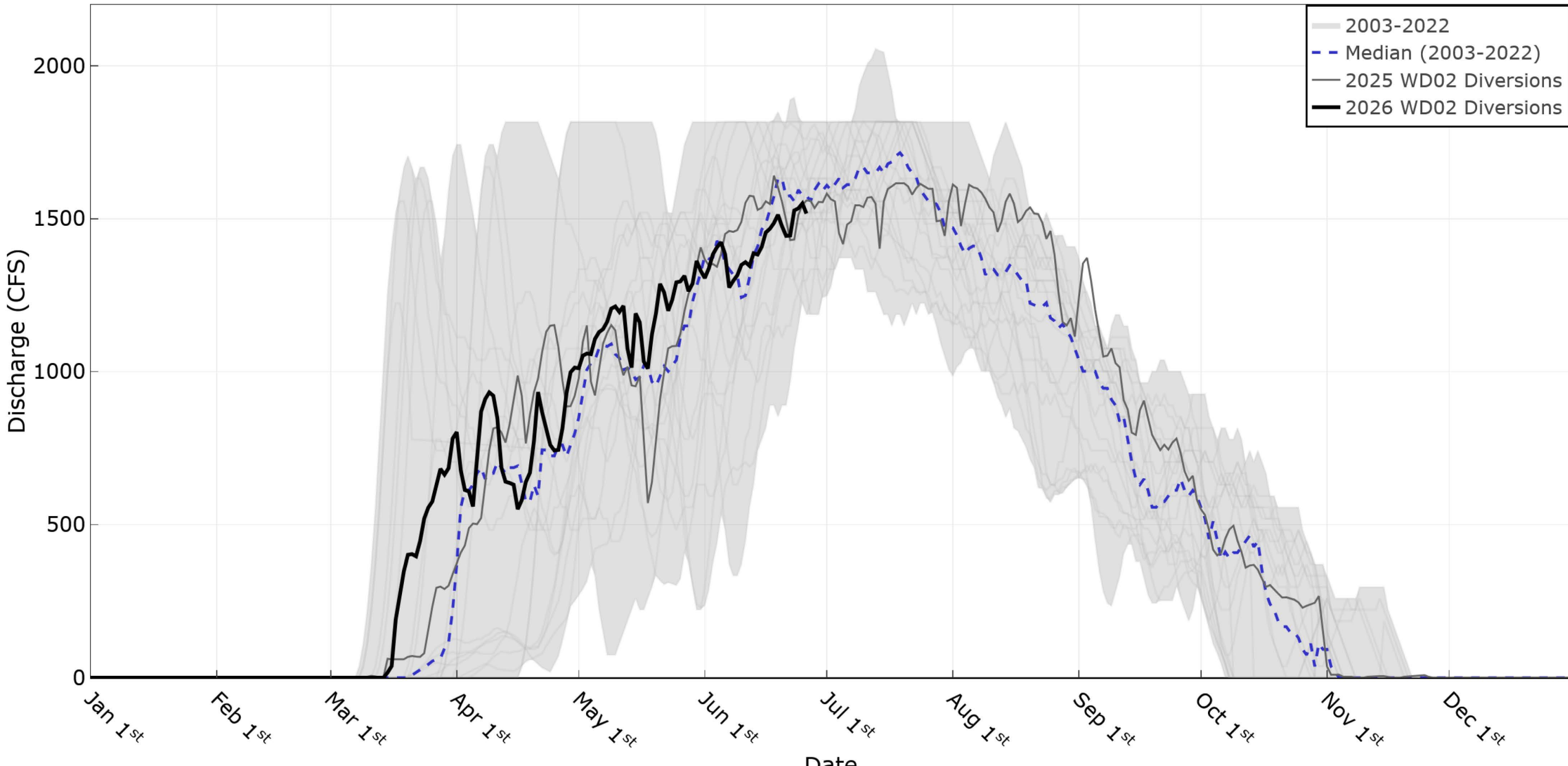


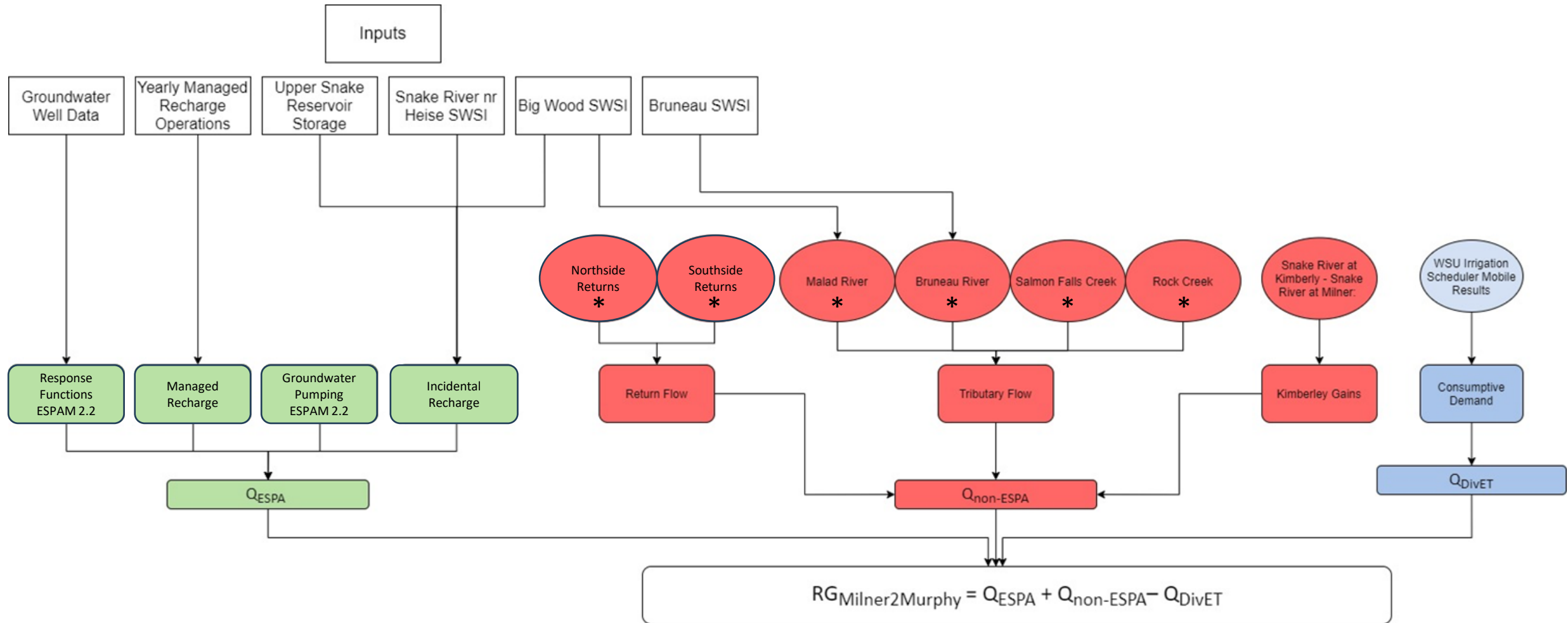
Consumptive Demand





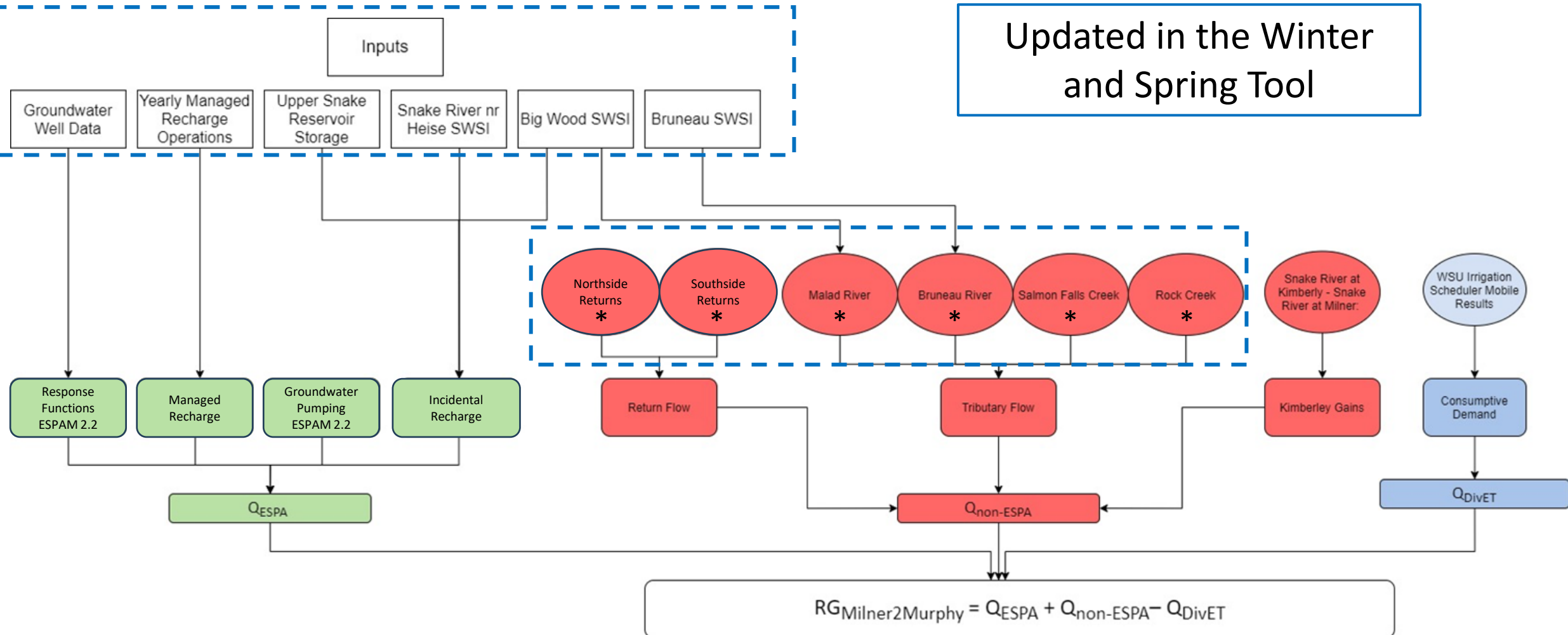
Consumptive Demand





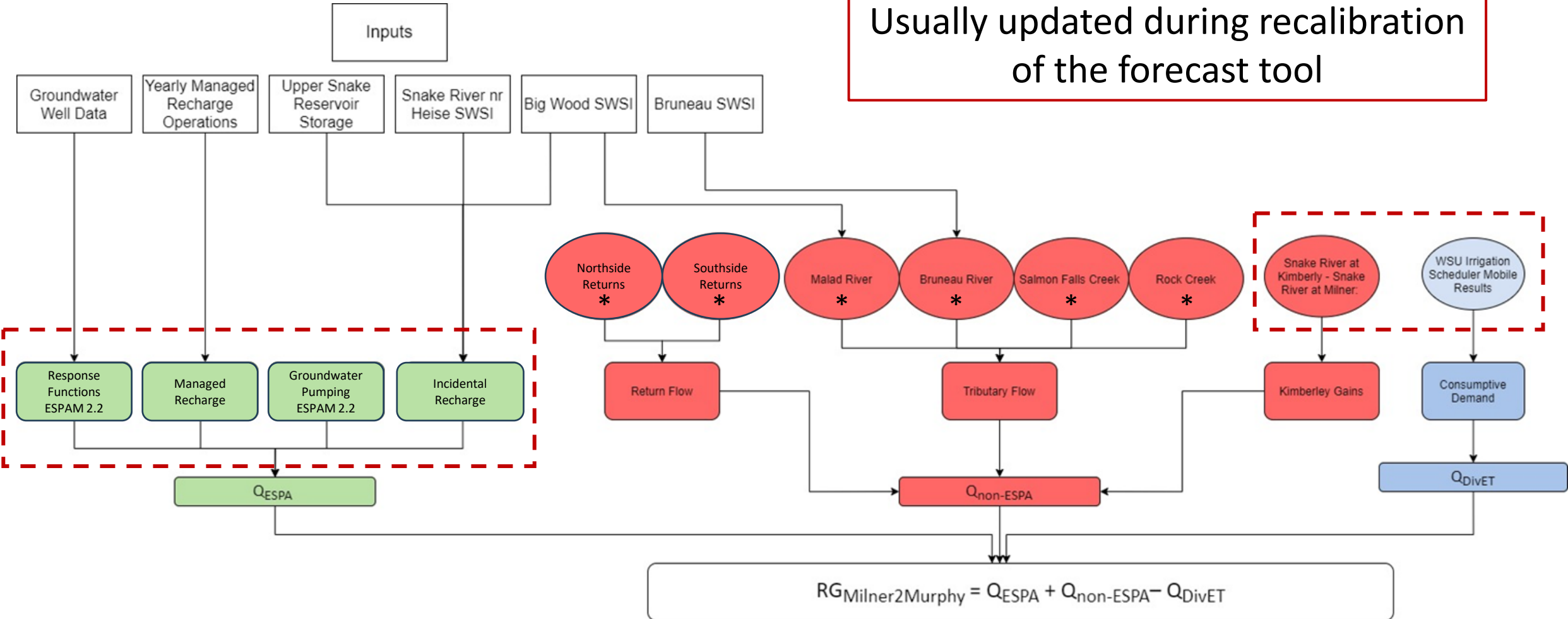
* Annually updated through the previous water year

Updated in the Winter
and Spring Tool



* Annually updated through the previous water year

Usually updated during recalibration
of the forecast tool

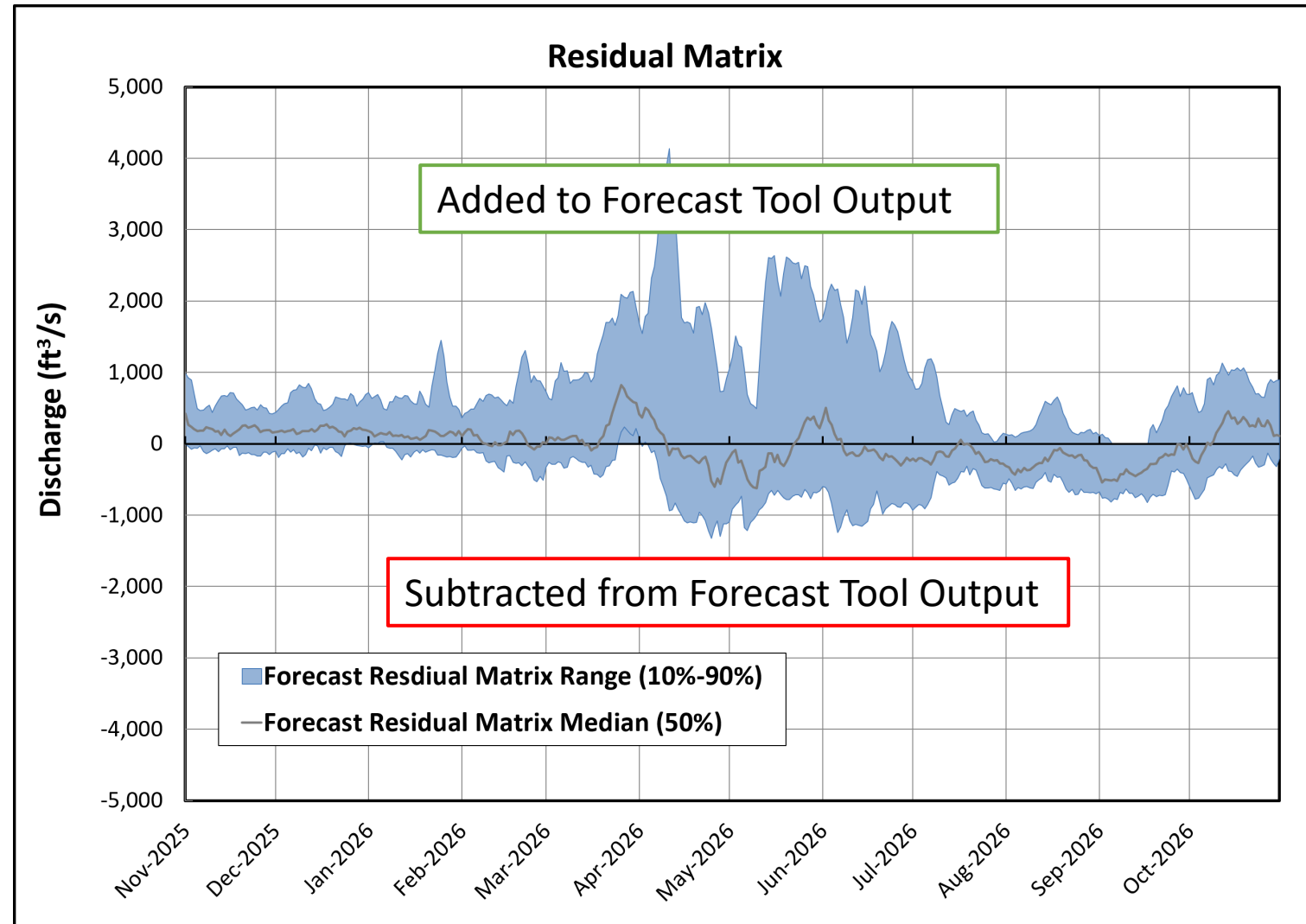


* Annually updated through the previous water year

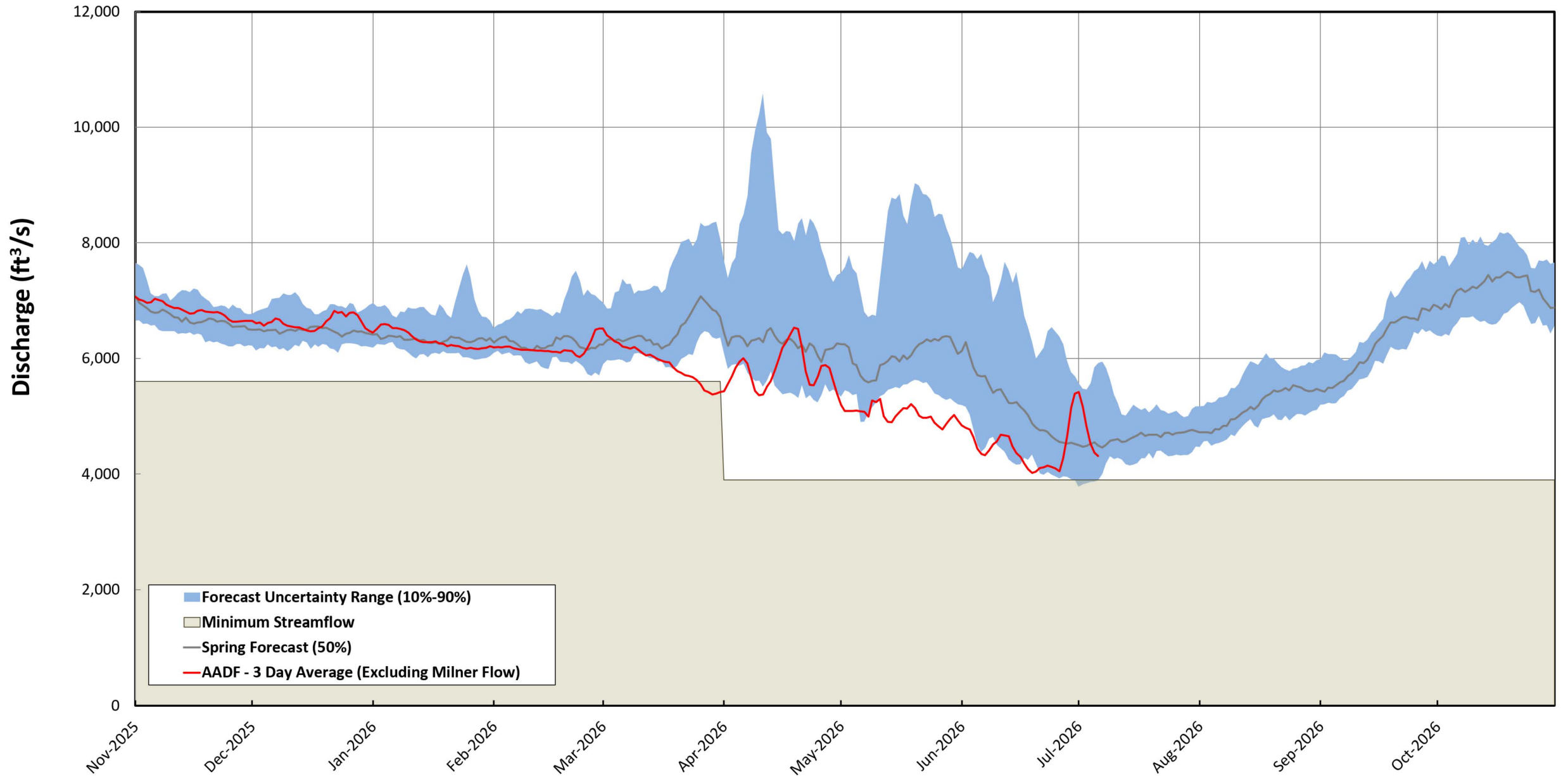
Forecast Tool Calibration

Hindcast and Residual Analysis

- Forecast Tool is run on historical years
 - 2002-2022
- Residual - The difference between observed and forecasted Milner to Murphy Reach Gains



2026 Spring Forecast



Conclusions

- Any major changes to input components should be made during a recalibration because of the residual analysis
- ESPAM 2.3 calibration ongoing
 - Update to SFFT after ESPAM 2.3 is finalized
- TWG for suggestions and review

