Groundwater and the Spokane River

How They Communicate
(The Physics of it All)

Prepared by
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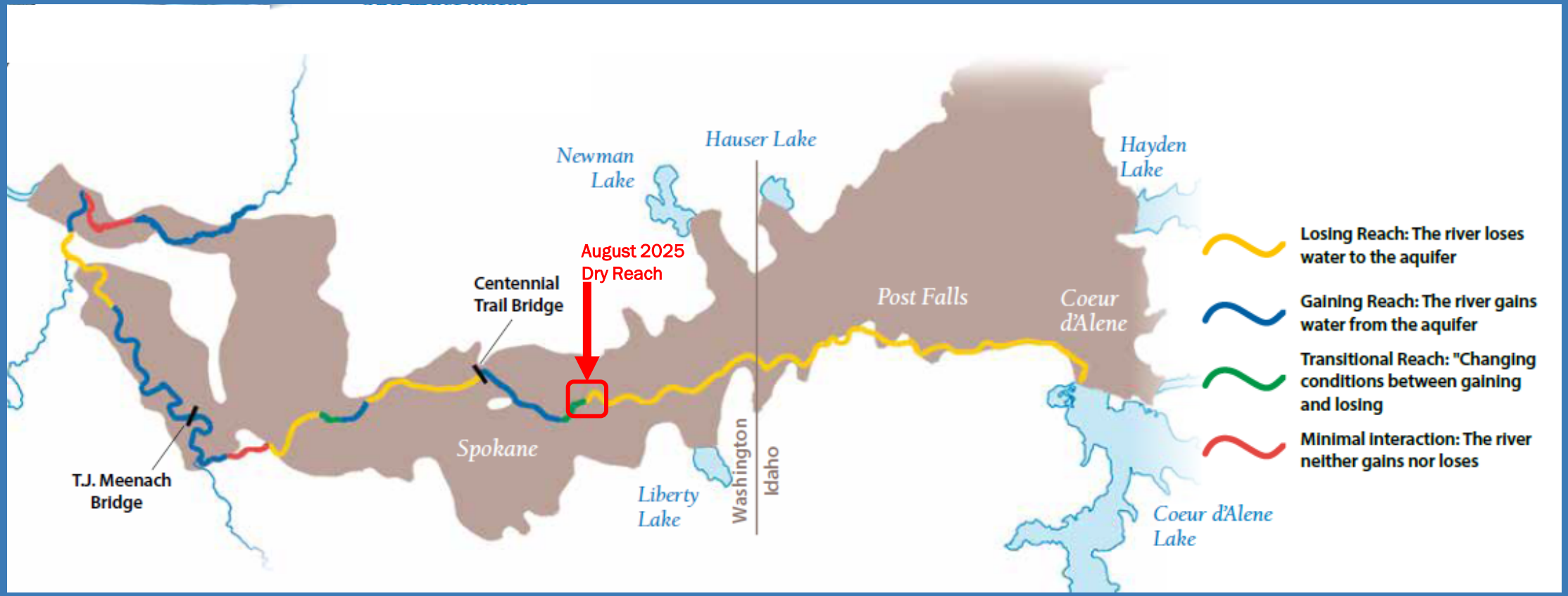
GSI Water Solutions, Inc.

Prepared for
City of Spokane Climate Resiliency and Sustainability Board

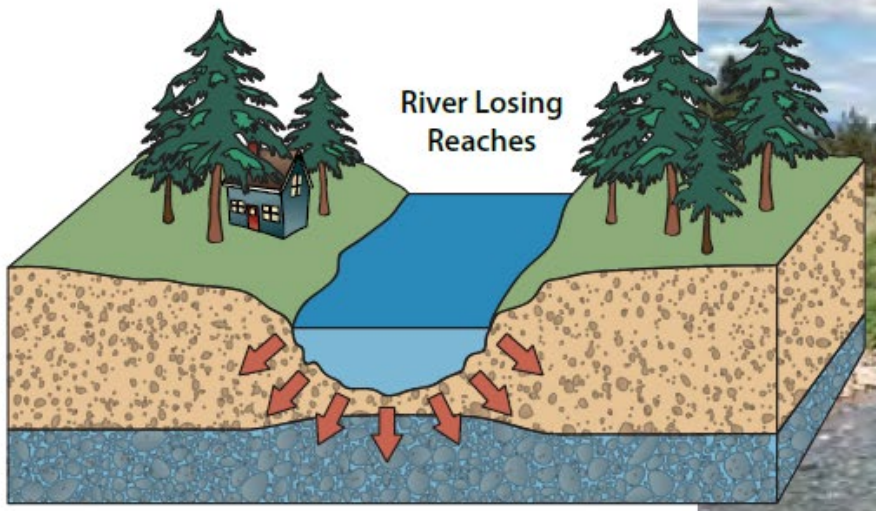
September 18, 2025

Photo by John Porcello
Sept. 11, 2025

Losing and Gaining Reaches of the River
(Aquifer Atlas, 2023)



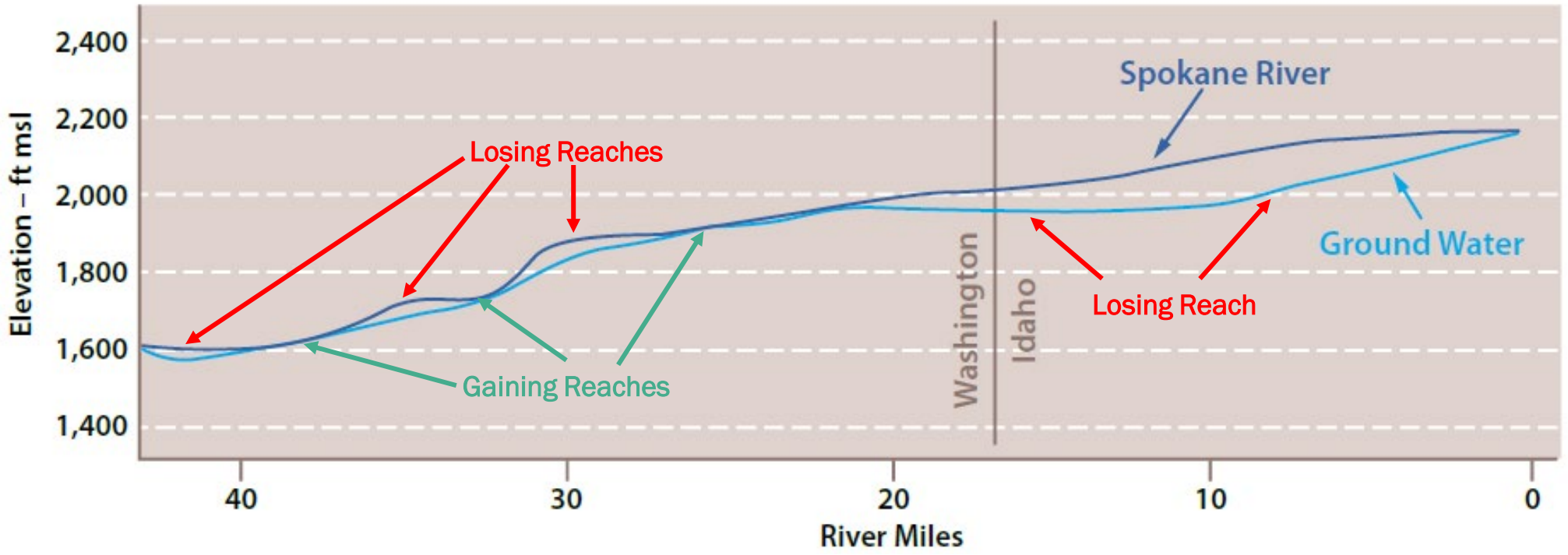
Typical Late Summer Conditions Near Barker Road *(Aquifer Atlas, 2023)*



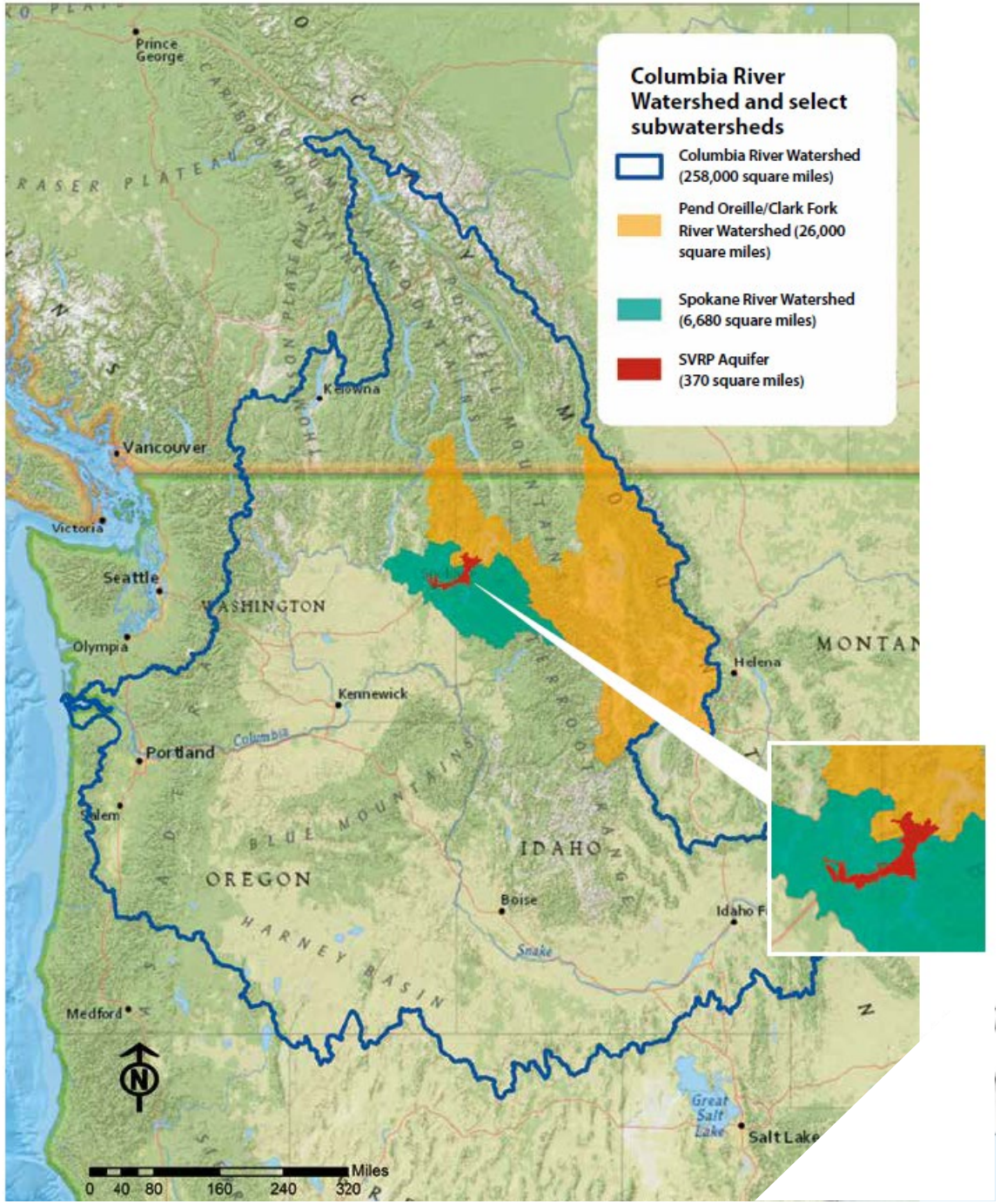
Aquifer-River Interchange 11

The river bottom is higher than the SVRP Aquifer in Idaho and parts of Washington. In these areas the water seeps out of the bottom of the river and recharges the aquifer. These are called "losing reaches" of the river. This losing reach of the Spokane River near Greenacres had very little flow on August 18, 2021.

Elevation Profile of the Riverbed and the Water Table *(Aquifer Atlas, 2023)*

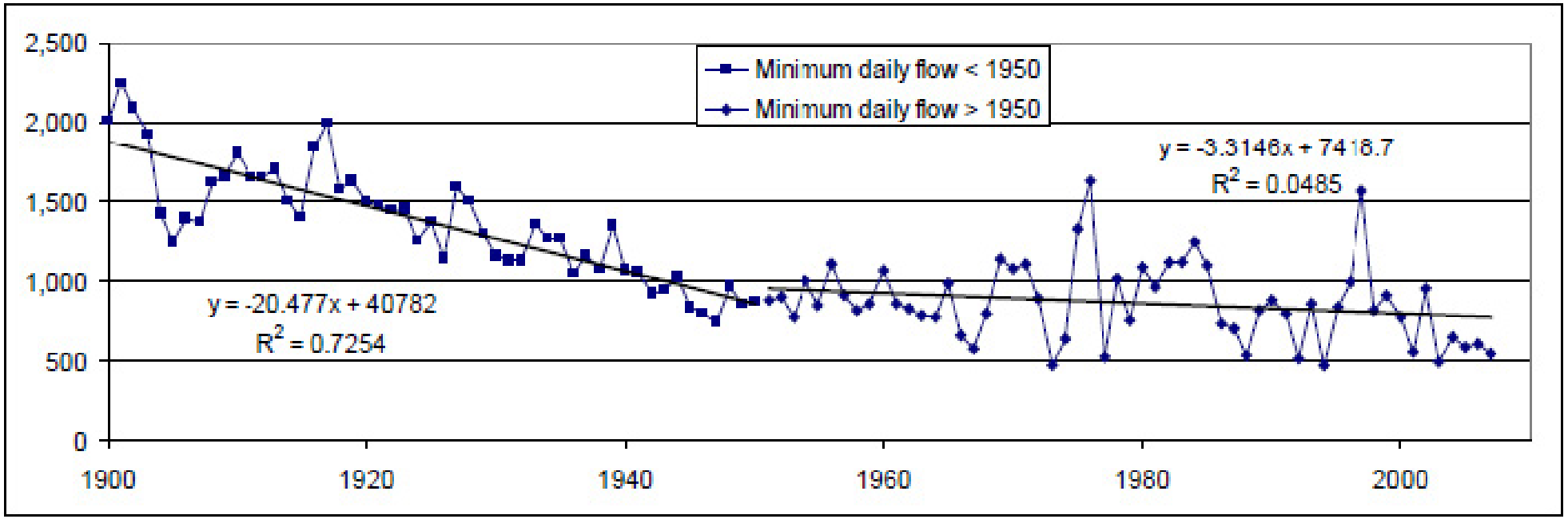


Location Map *(Aquifer Atlas, 2023)*



2015 Study of Spokane River Summer Streamflows

- Gage in downtown Spokane shows declines since 1900
- USGS (2005) said watershed inflows are not declining



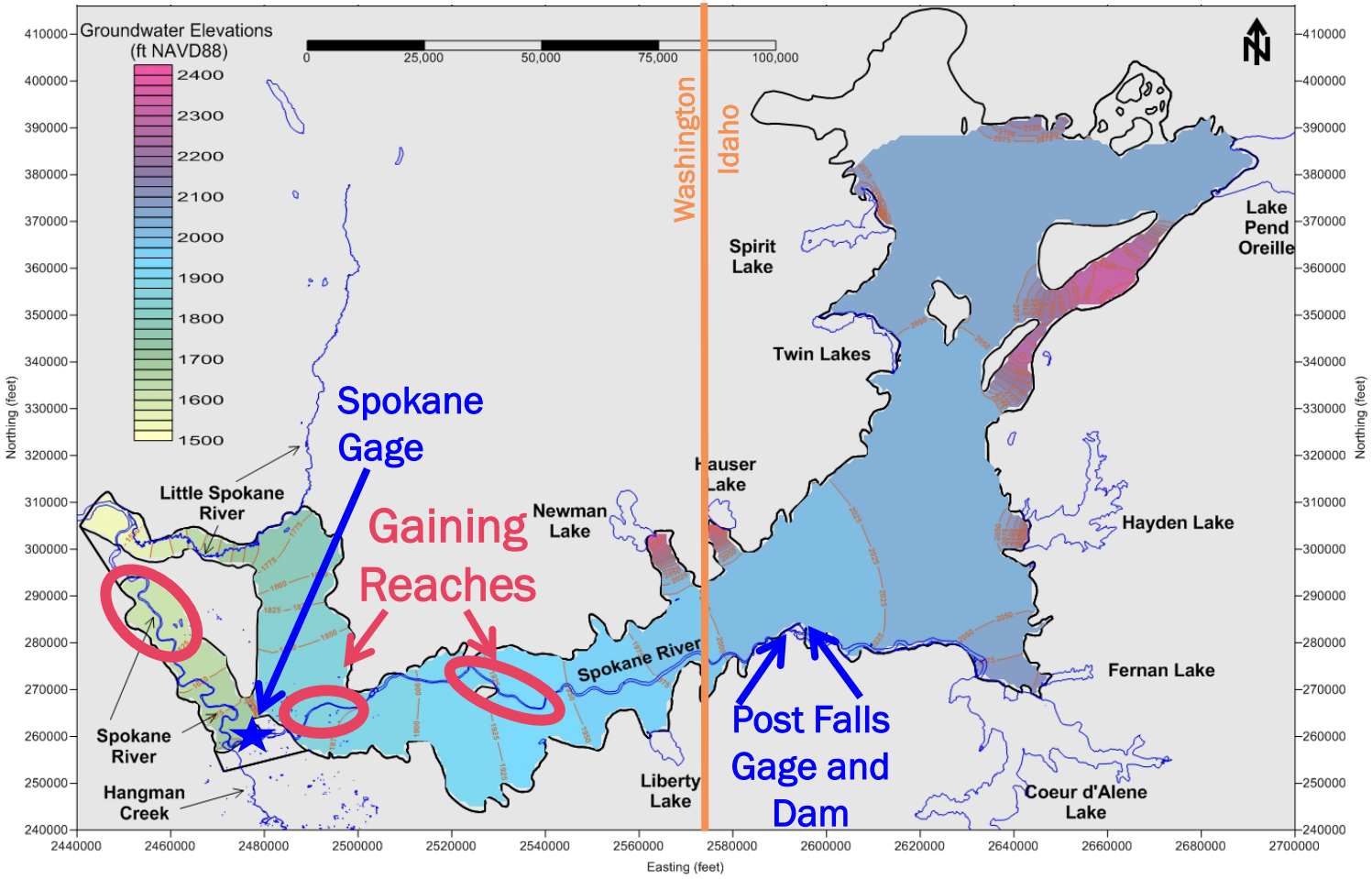
Source:

Barber, M.E., Hossain, Md. A., Poor, C.J., Shelton, C., Garcia, L., and M. McDonald. 2011. *Spokane Valley-Rathdrum Prairie Aquifer Optimized Recharge for Summer Flow Augmentation of the Columbia River.* Submitted to Washington State Department of Ecology Office of Columbia River, Yakima, Washington. April 1, 2011.

2015 Study of Spokane River Summer Streamflows

- If there was no change occurring in the upstream watershed (in and above Coeur d'Alene Lake), then what was occurring inside the aquifer's footprint to cause the declines in streamflow?
  - Have groundwater levels decreased? (No)
  - Has groundwater pumping increased? (No)
  - Is groundwater pumping "drying up" the river? (No)

Source: GSI Water Solutions

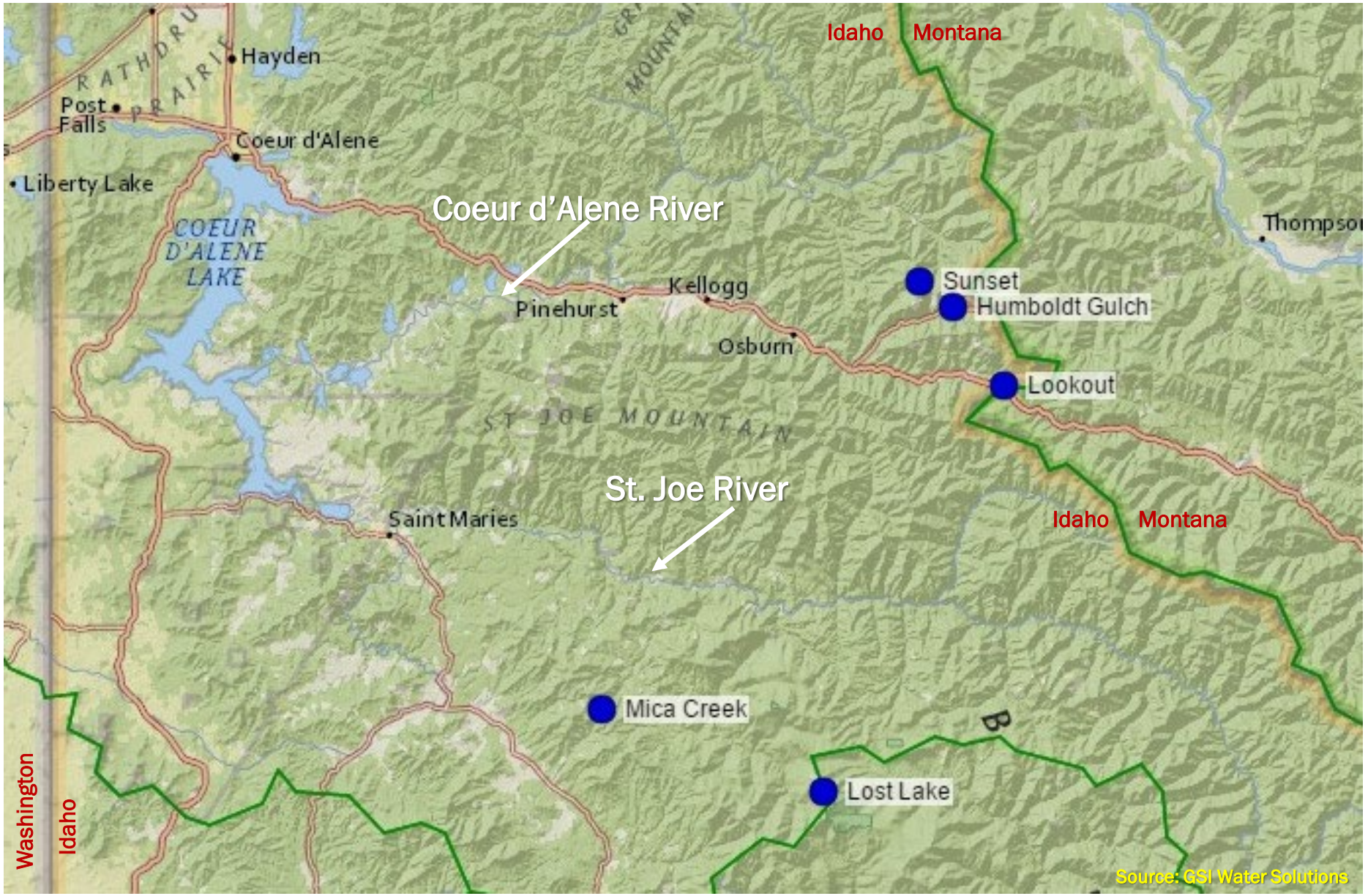


Source:

Porcello, J., Burt, W., Gorski, J., and T. Wick. 2017. *Climate Change and Summer Streamflows: Climate Change Influence on Summer Streamflows: Unanticipated Discovery While Studying Other Influences*. The Water Report. Issue #166. December 15, 2017.

Analyzing SNOTEL Data in the Watershed

Examining the Coeur d'Alene Lake Watershed in the 2015 Study



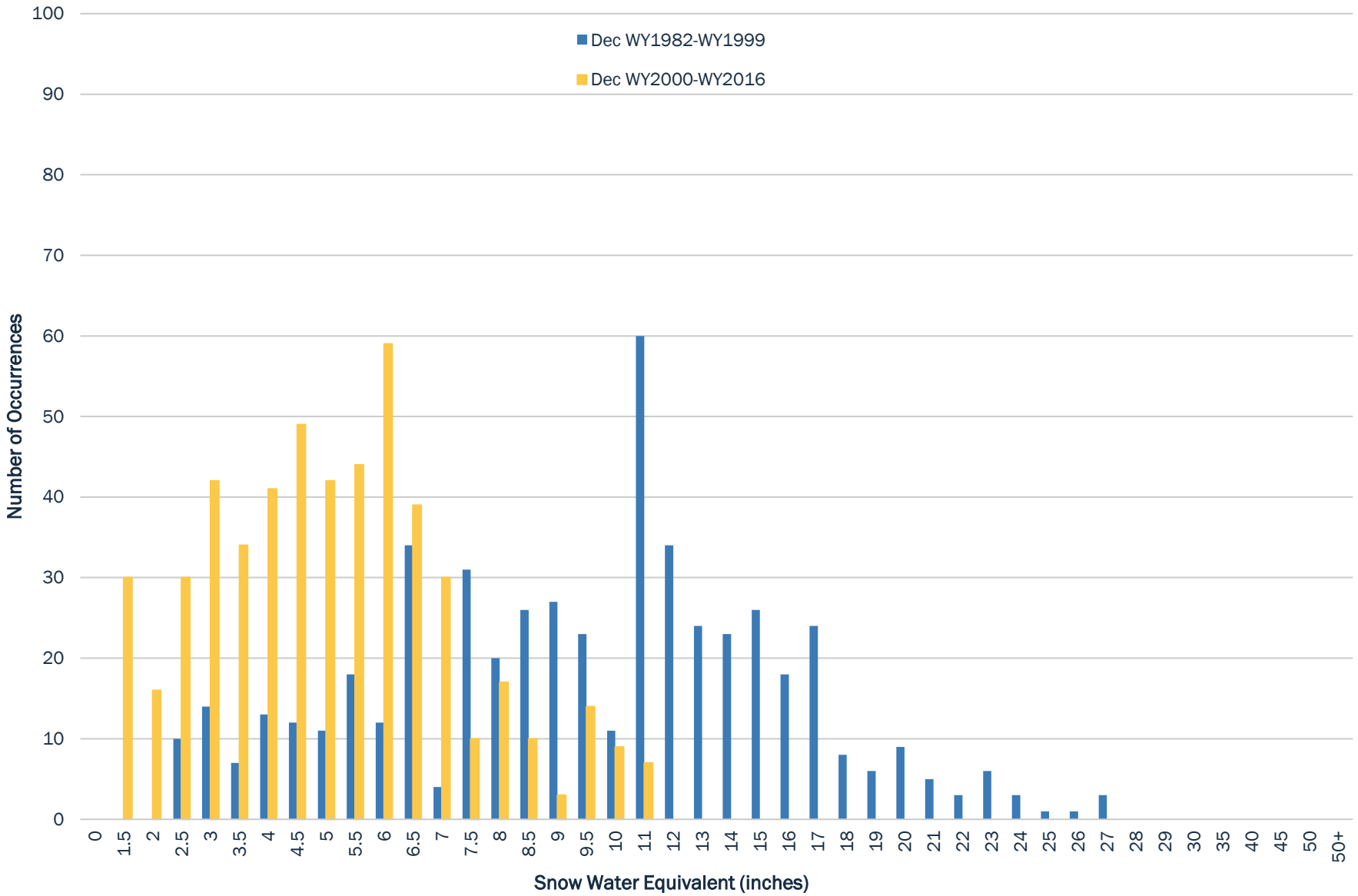
GSI Water Solutions

Trends In Daily Snow Water Equivalent

Examining the Coeur d'Alene Lake Watershed in the 2015 Study

Binned Frequency of Occurrences of Snow Water Equivalent, Sunset SNOTEL Station,

December

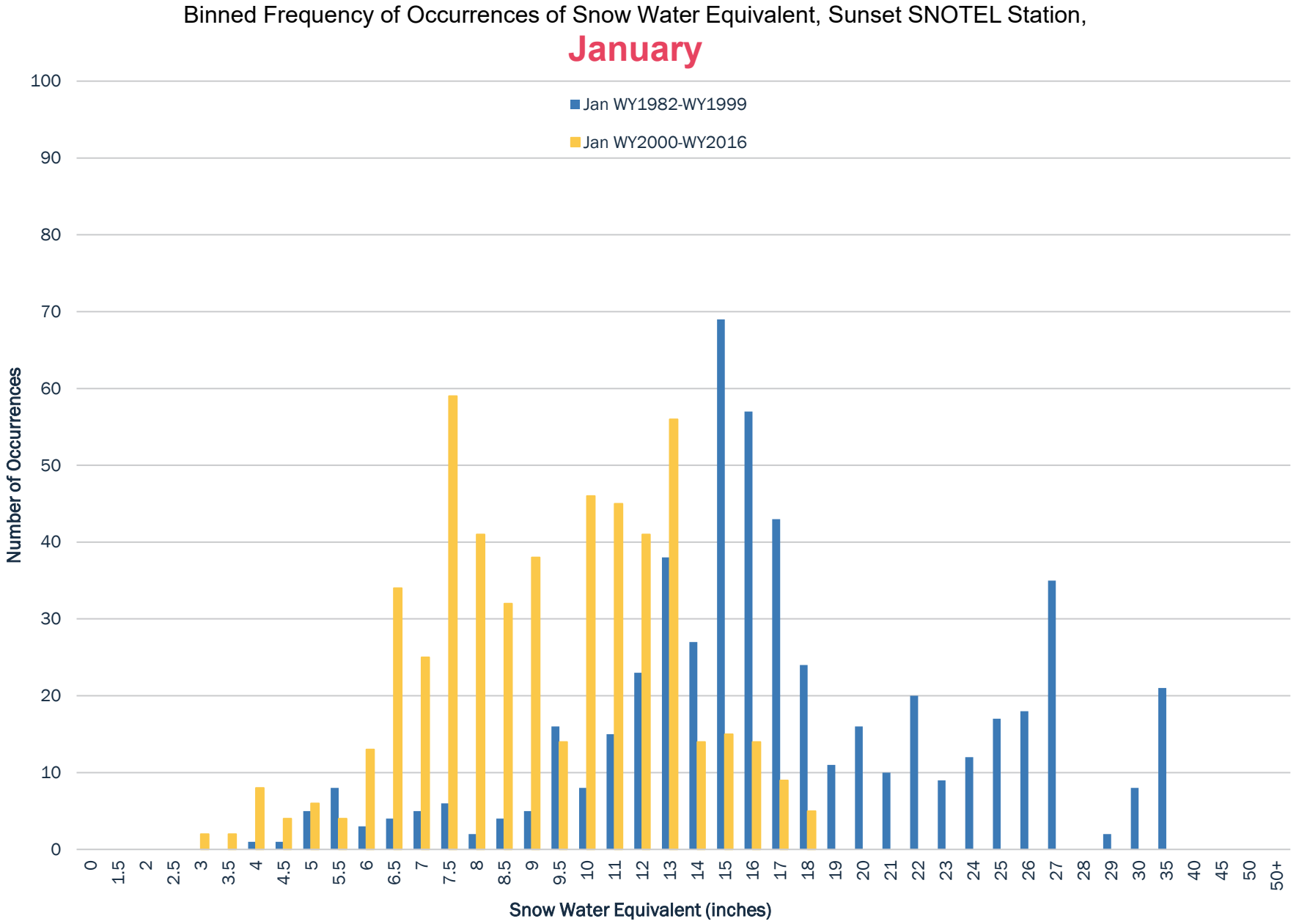


Data Source:
USDA NRCS

Source of Plot:
GSI Water Solutions

Examining the Coeur d'Alene Lake Watershed in the 2015 Study

Trends In Daily Snow Water Equivalent



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Trends In Daily Snow Water Equivalent

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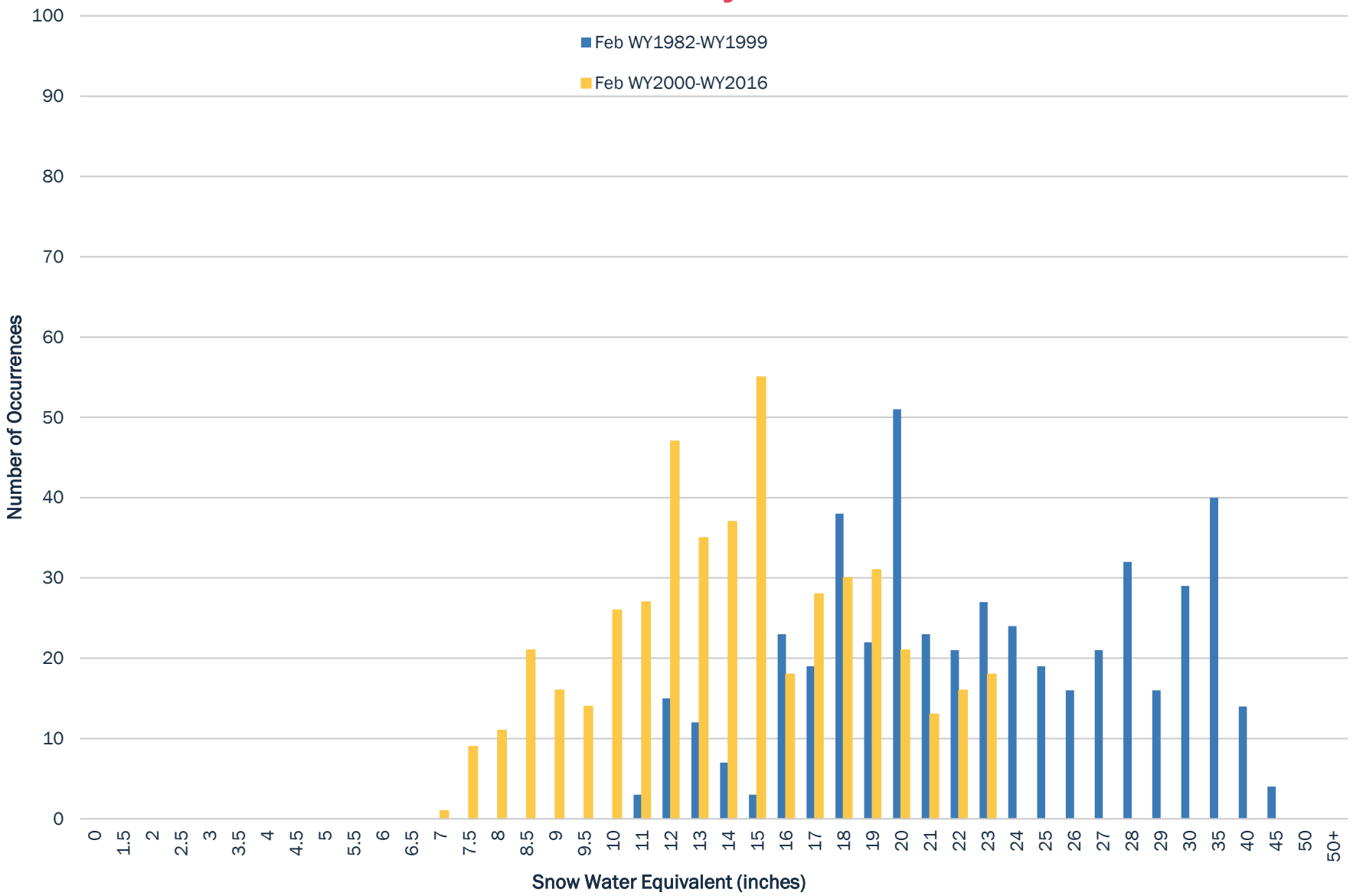
Binned Frequency of Occurrences of Snow Water Equivalent, Sunset SNOTEL Station,

February



Data Source:
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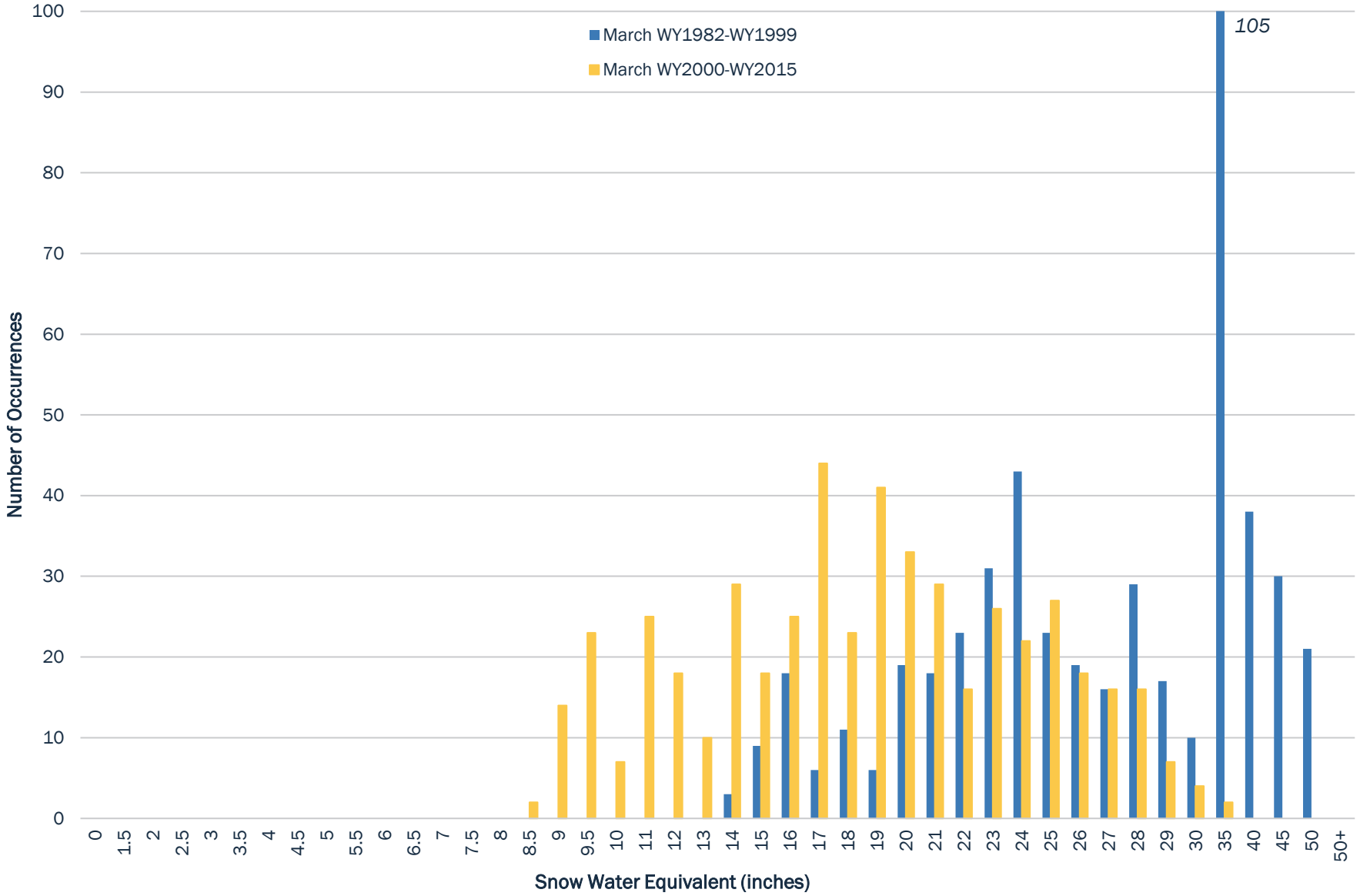
March



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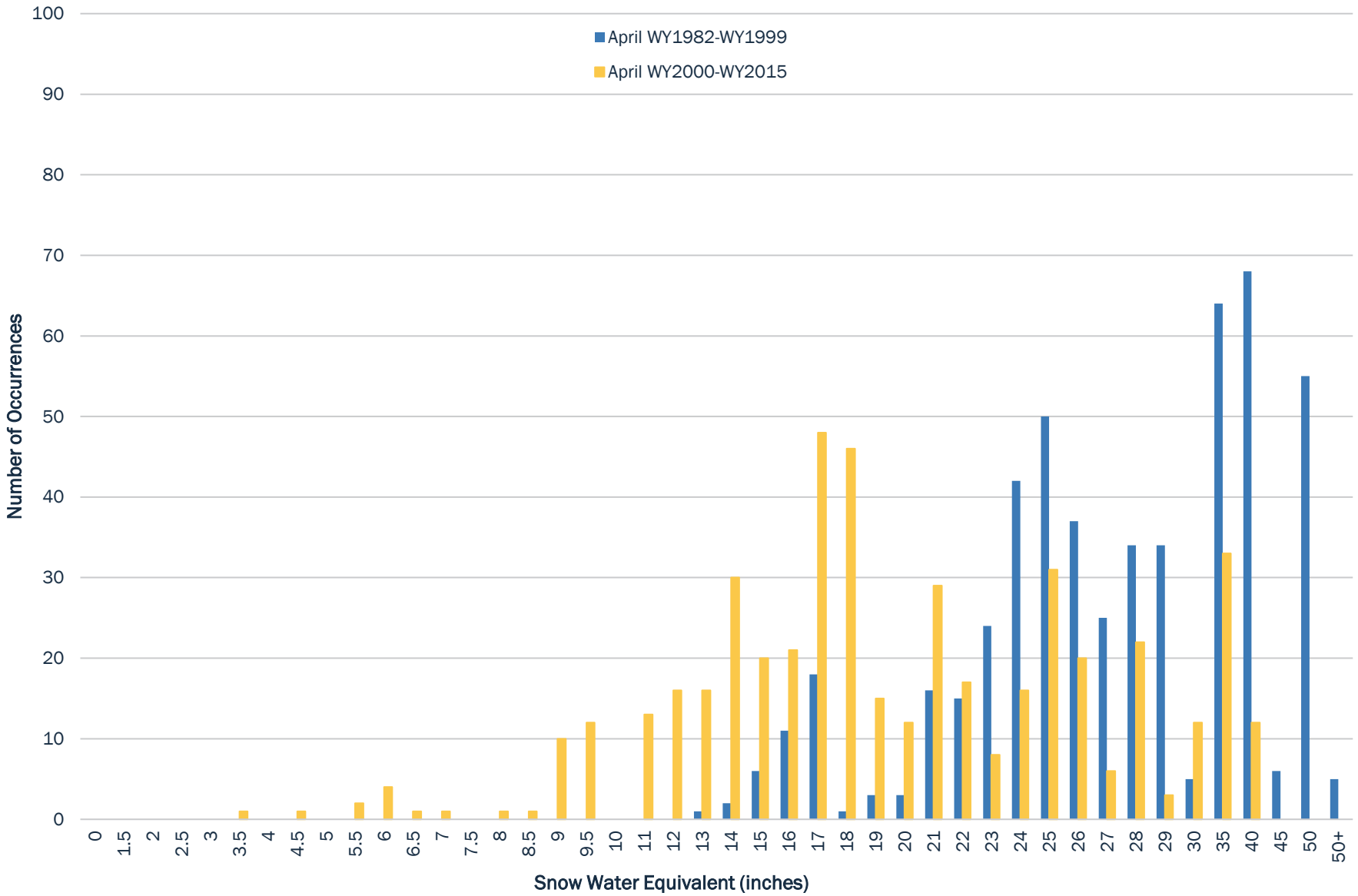
Binned Frequency of Occurrences of Snow Water Equivalent, Sunset SNOTEL Station,

April



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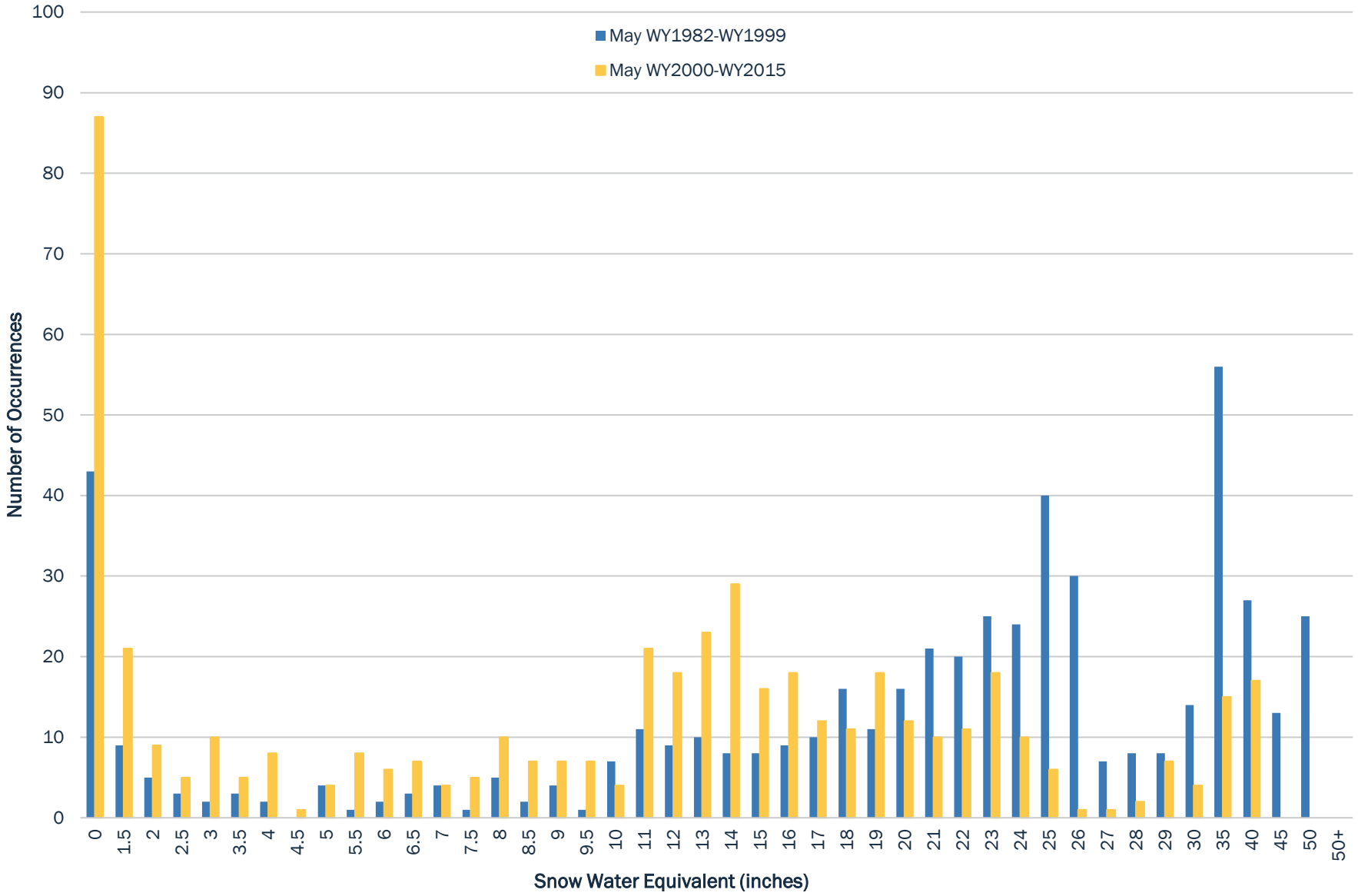
May

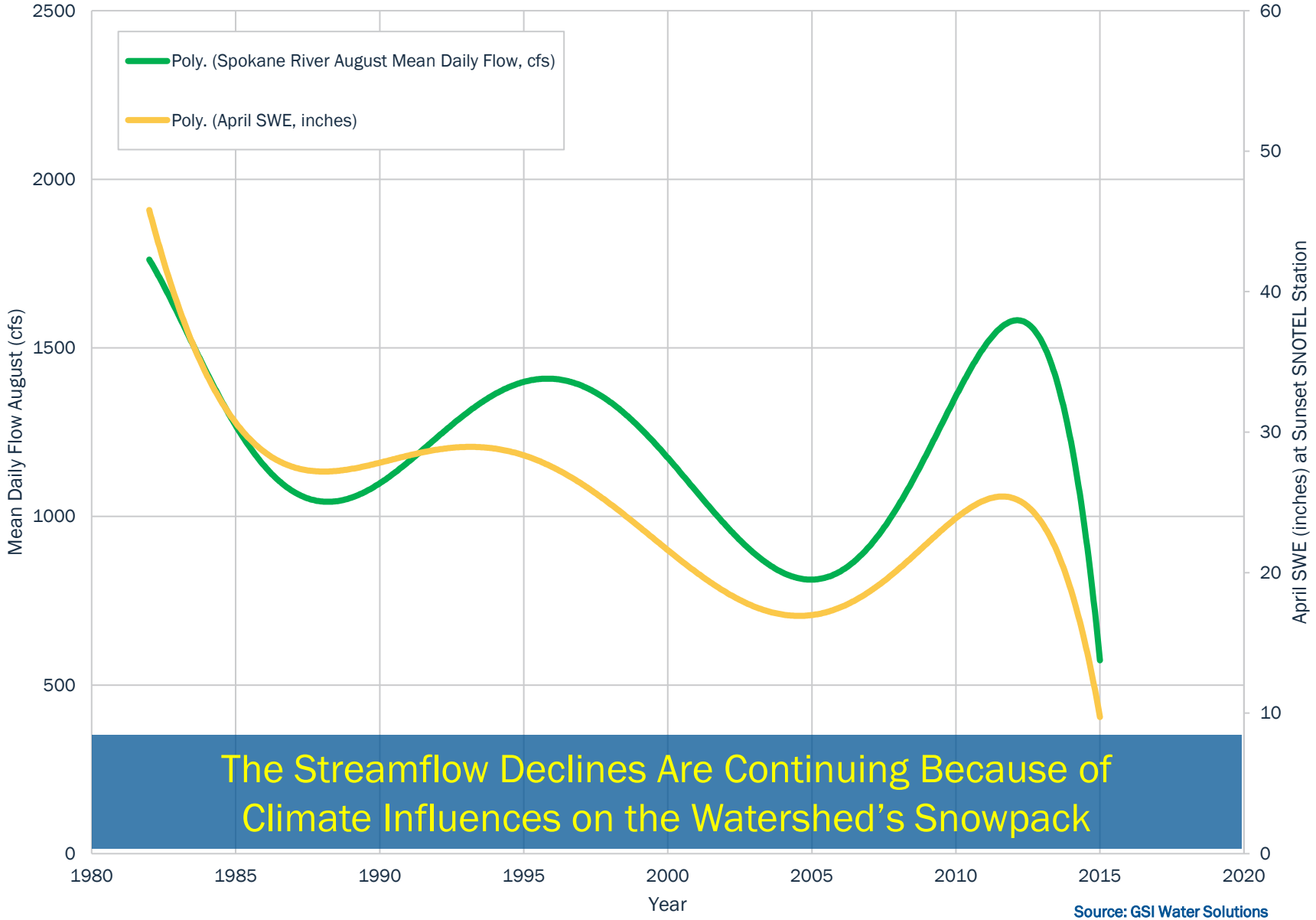


Data Source:
USDA NRCS

Source of Plot:
GSI Water Solutions

Examining the Coeur d'Alene Lake Watershed in the 2015 Study

April Snow Water Equivalent and August Mean Daily Streamflow in Downtown Spokane *(1982-2015)*



Source: GSI Water Solutions

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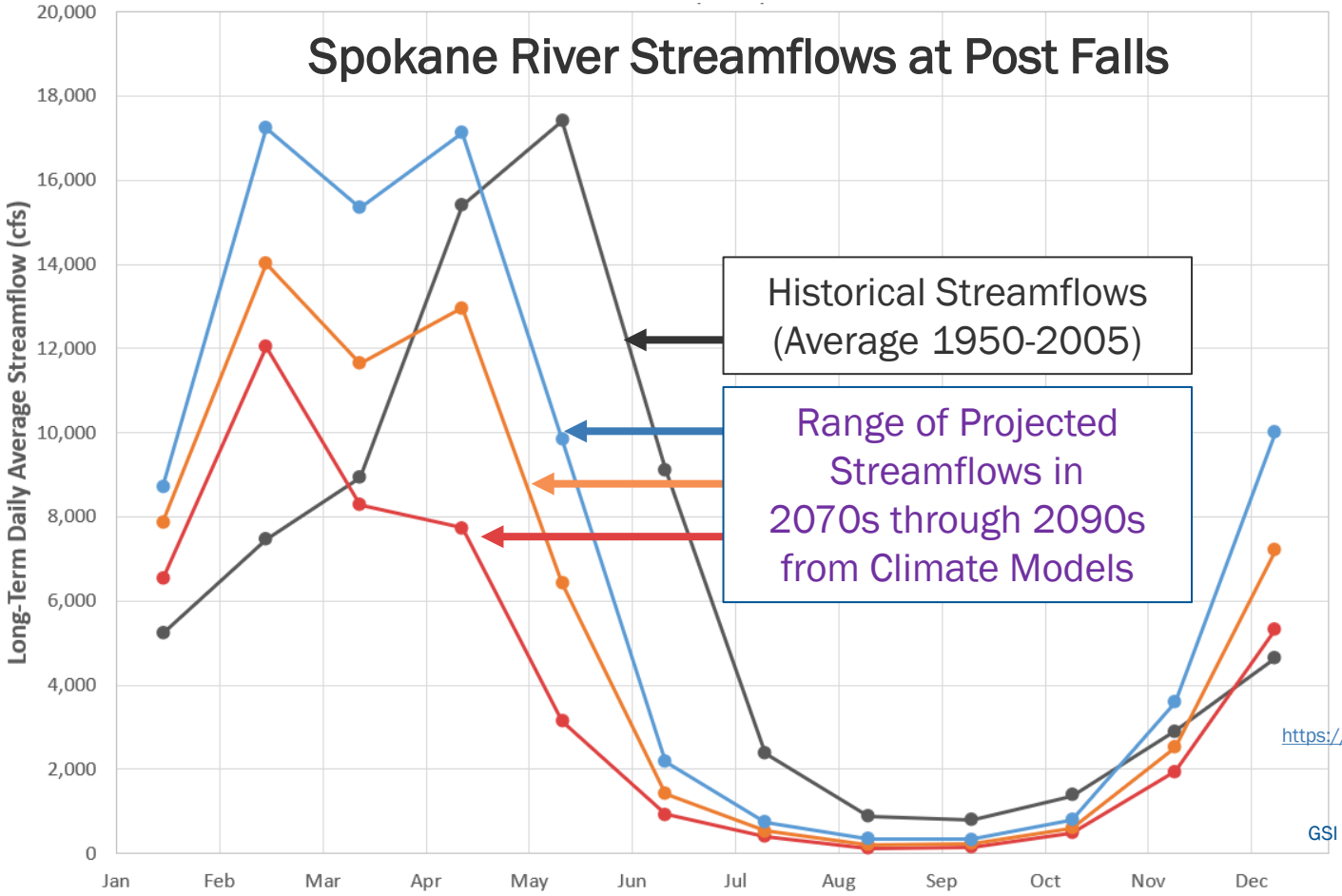
What Might the Future Hold?

The City has used a detailed groundwater model to examine potential climate effects on streamflows and the aquifer in the latter 3 decades of the 21st century

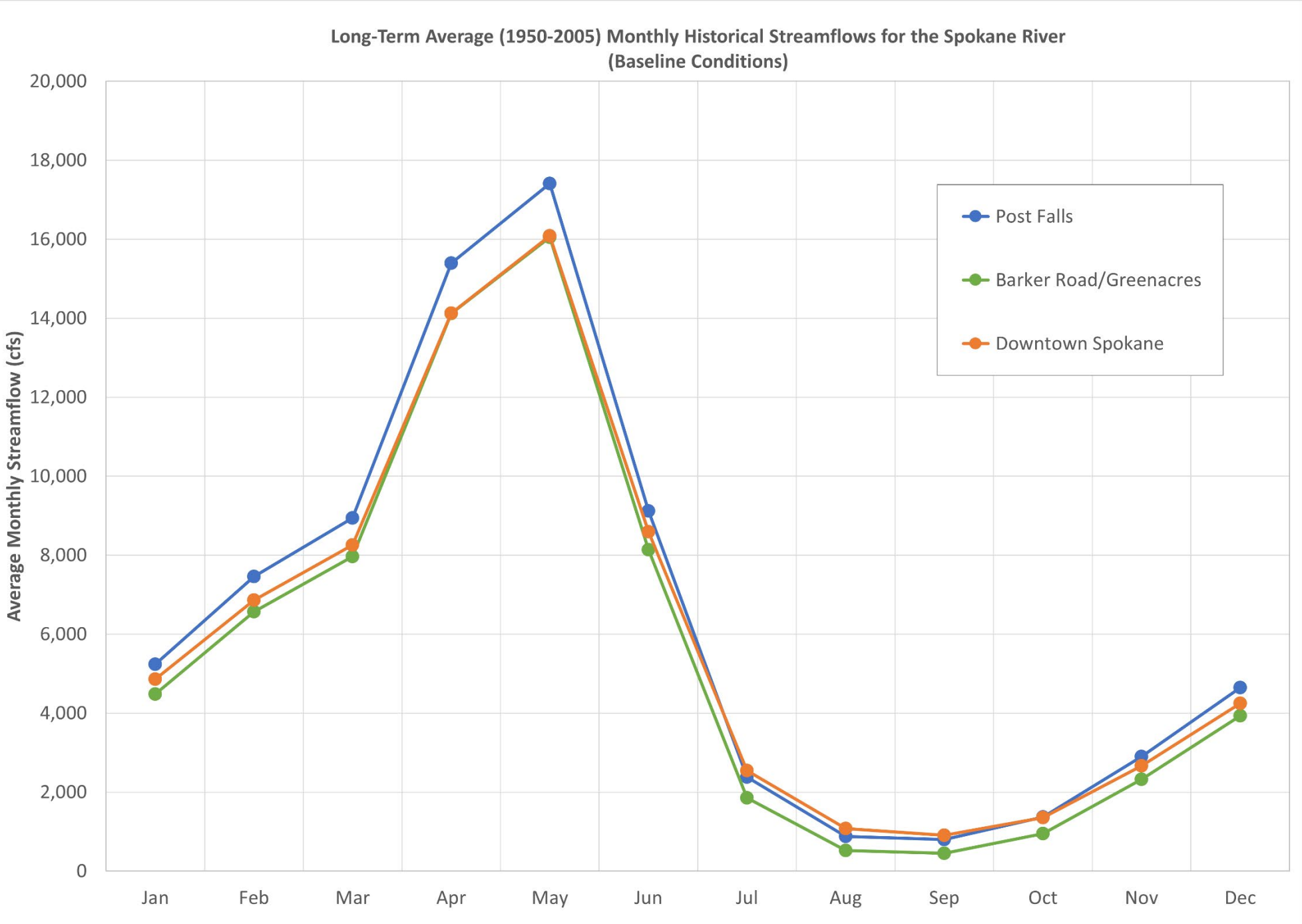


Data Source:
The Climate Toolbox
https://climatetoolbox.org/

Source of Plot:
GSI Water Solutions and City of Spokane

Monthly Simulated Streamflows

Historical



CITY OF SPOKANE

SAJB

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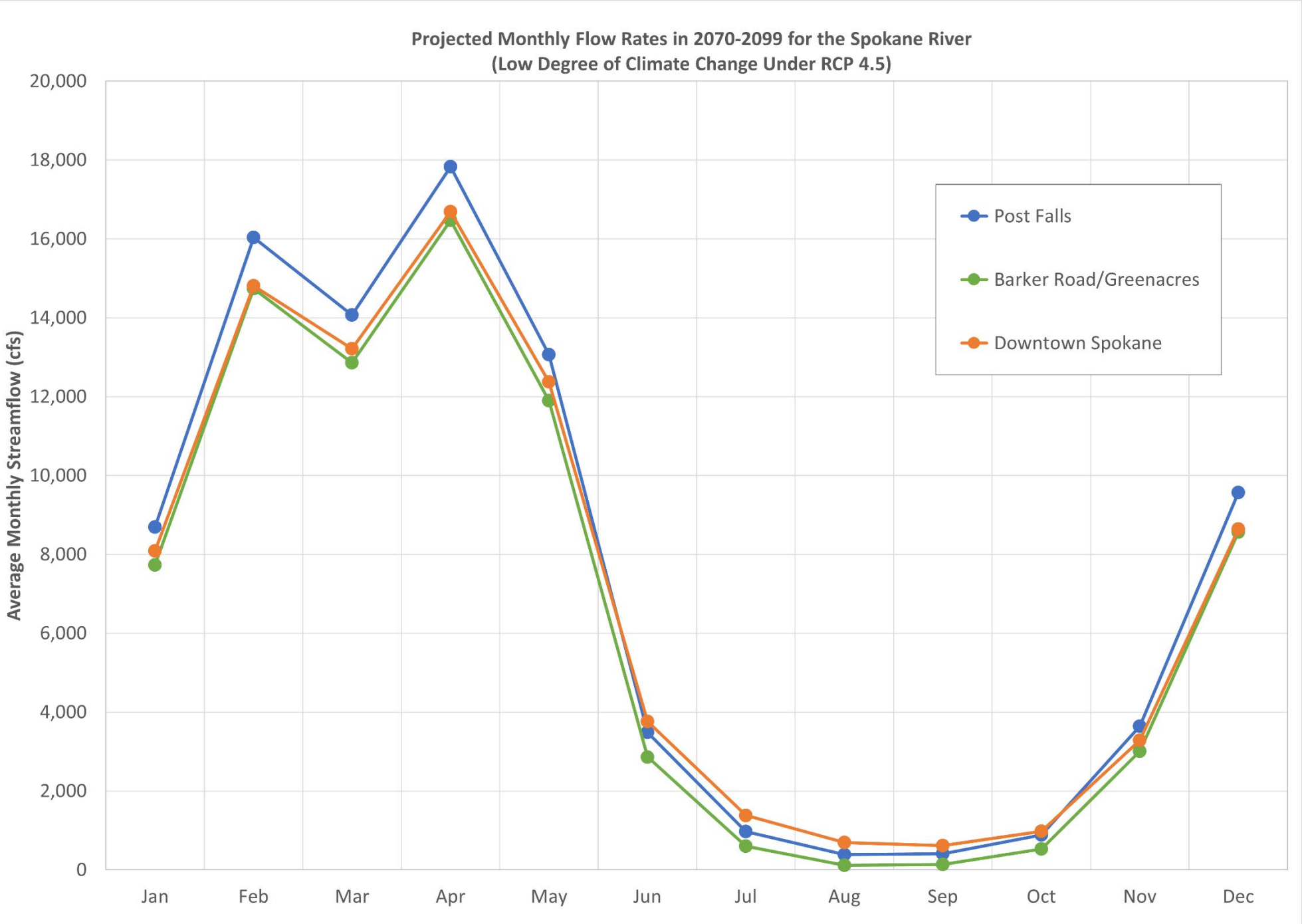
Monthly Simulated Streamflows

Optimistic Scenario for the 2070s thru 2090s



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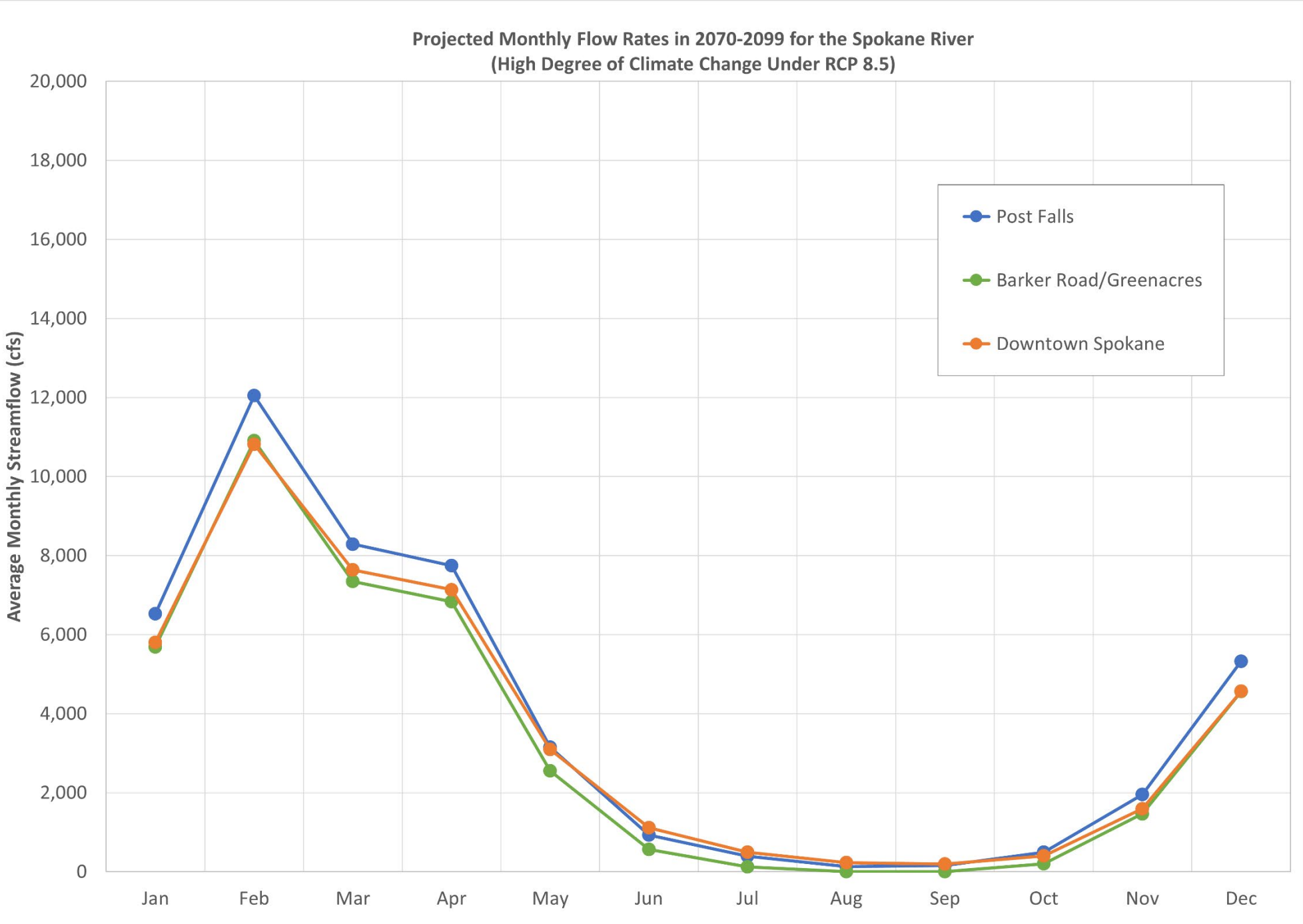

CITY OF SPOKANE

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Monthly Simulated Streamflows at Barker Road/ Greenacres

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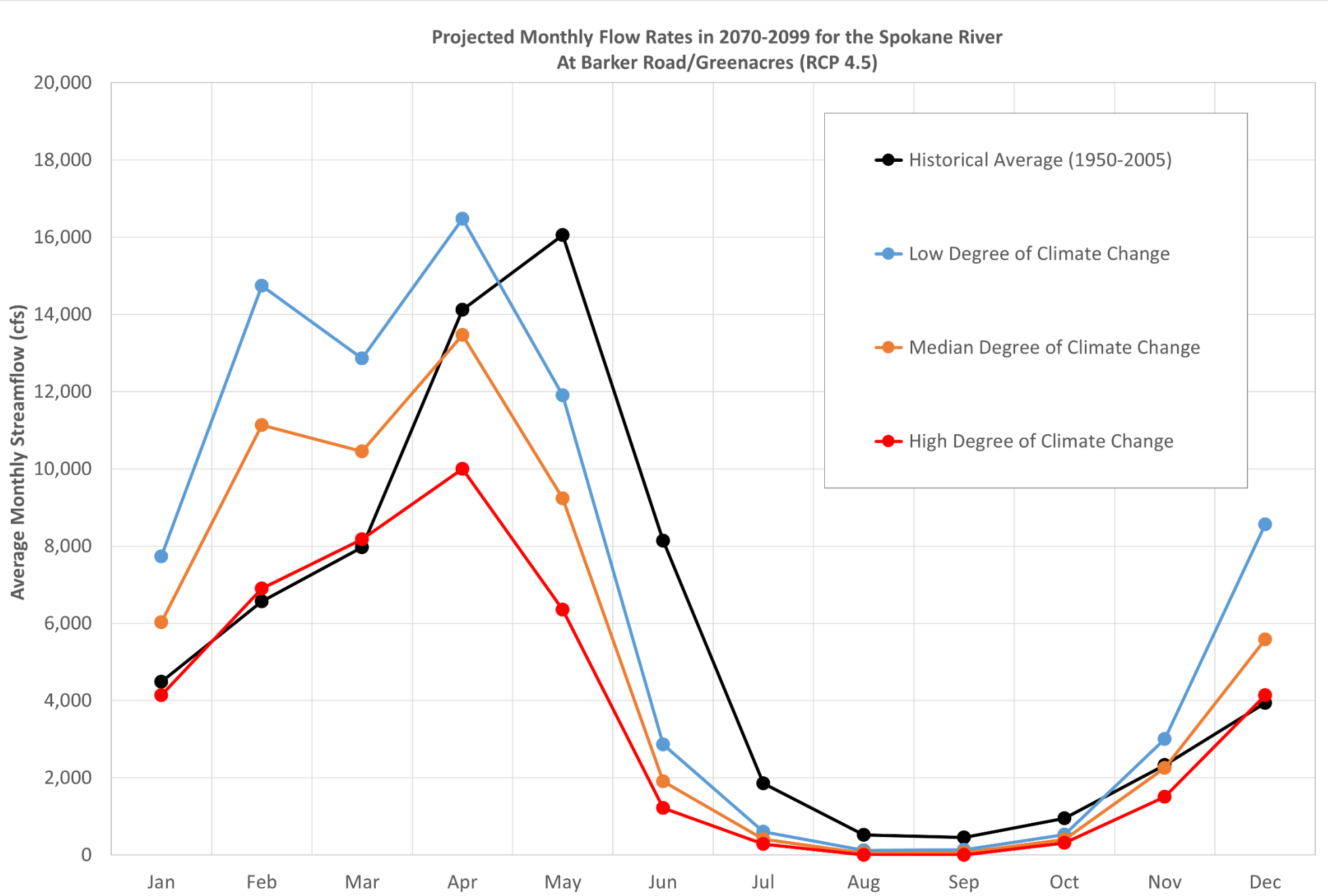

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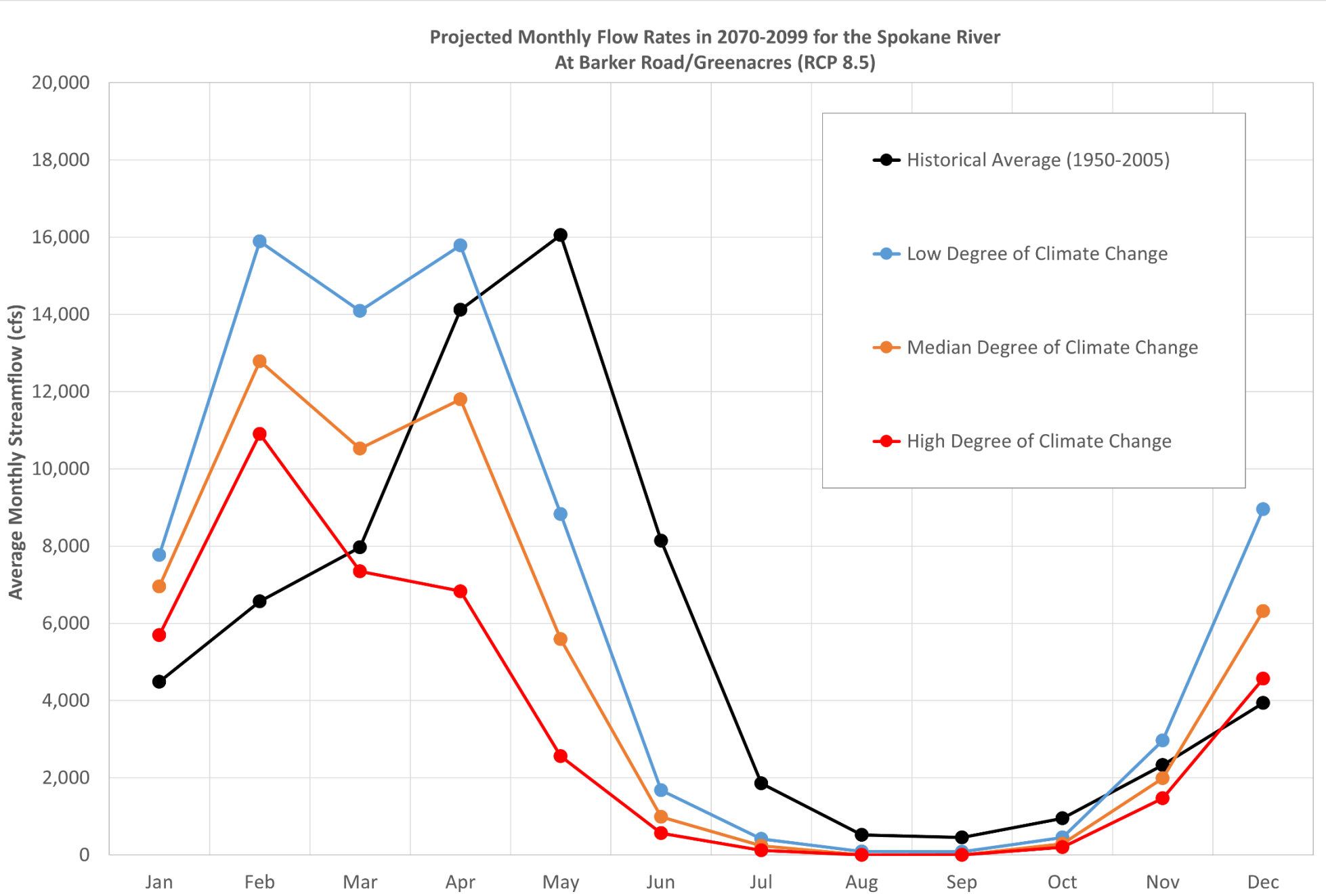

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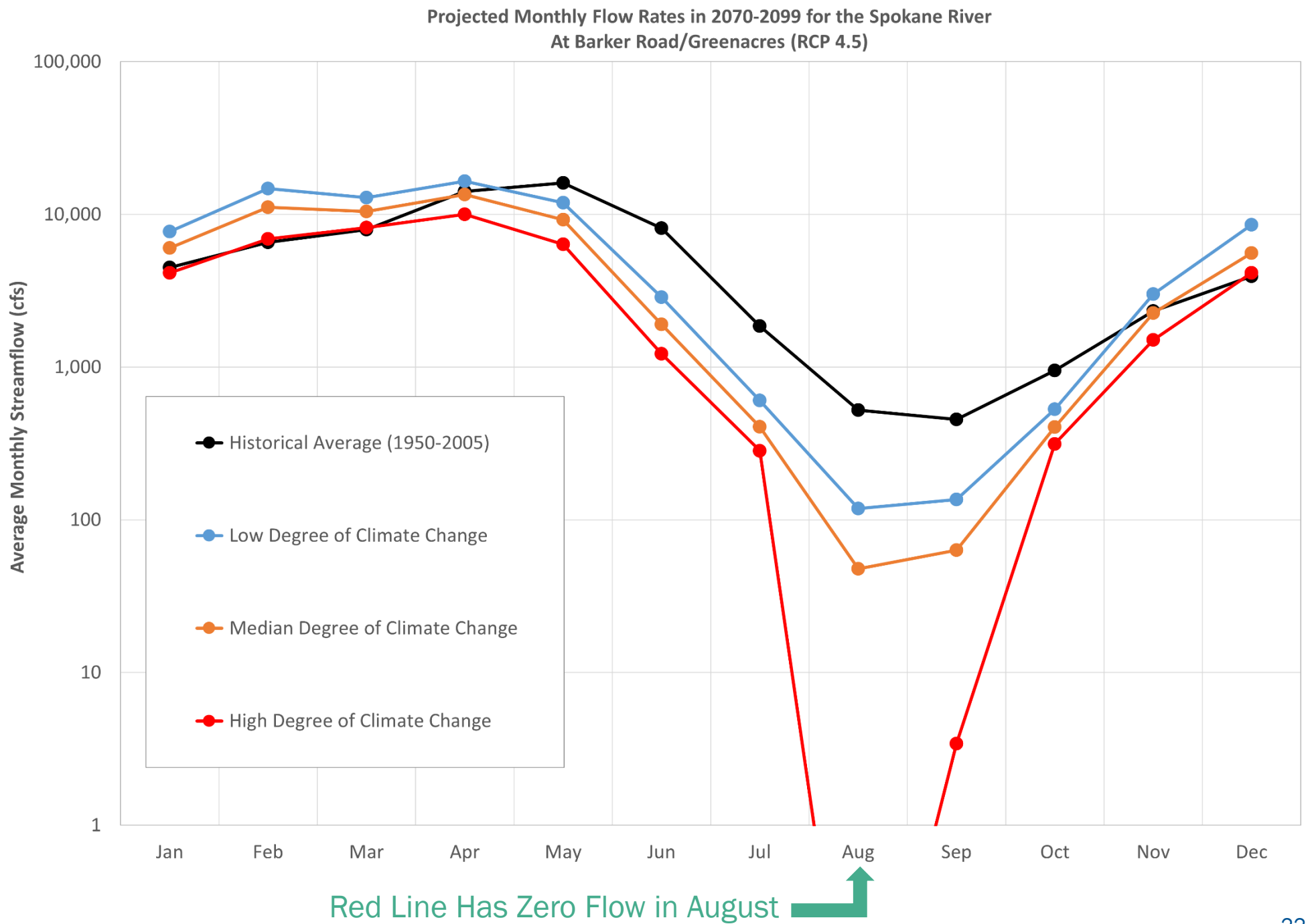

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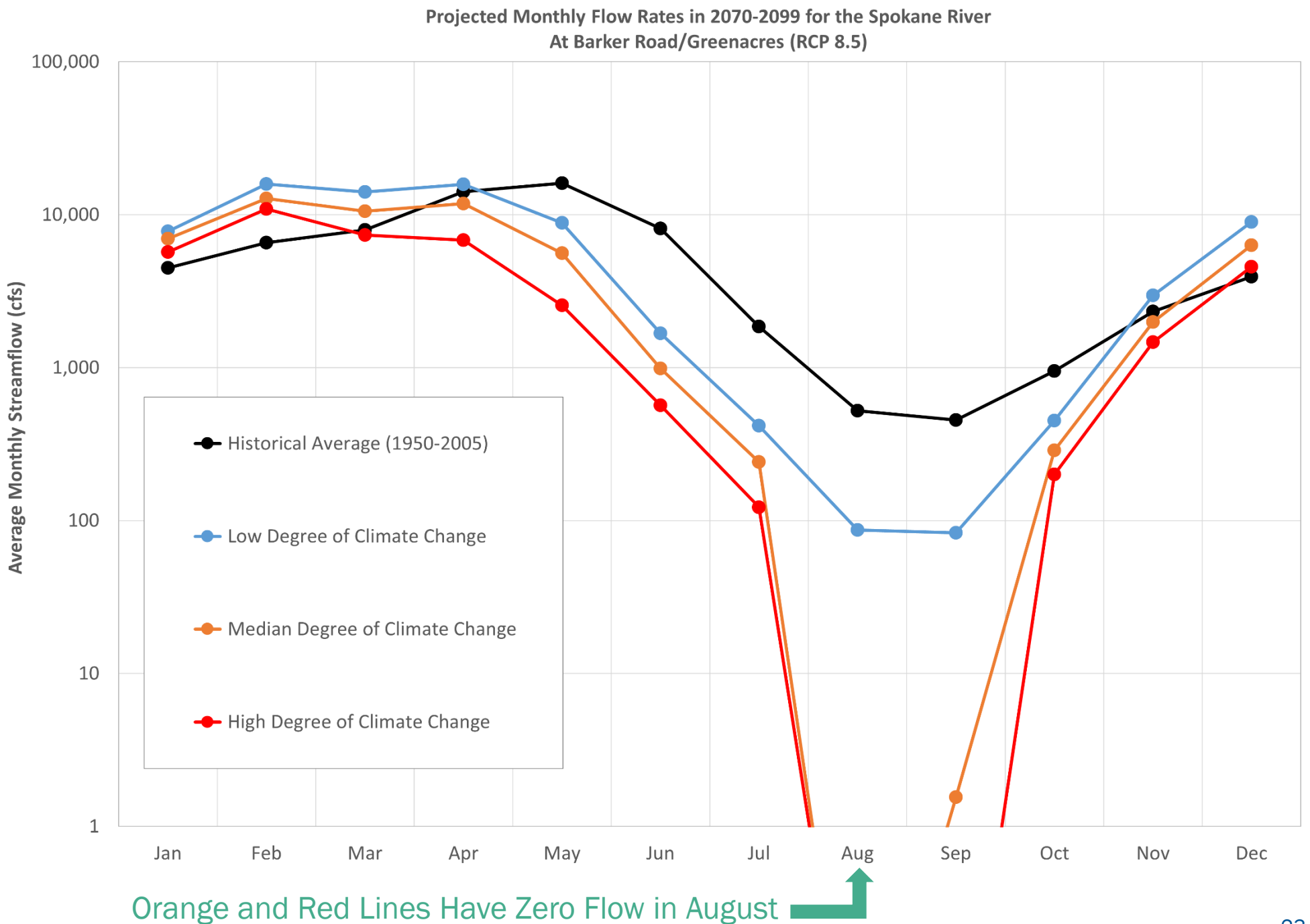

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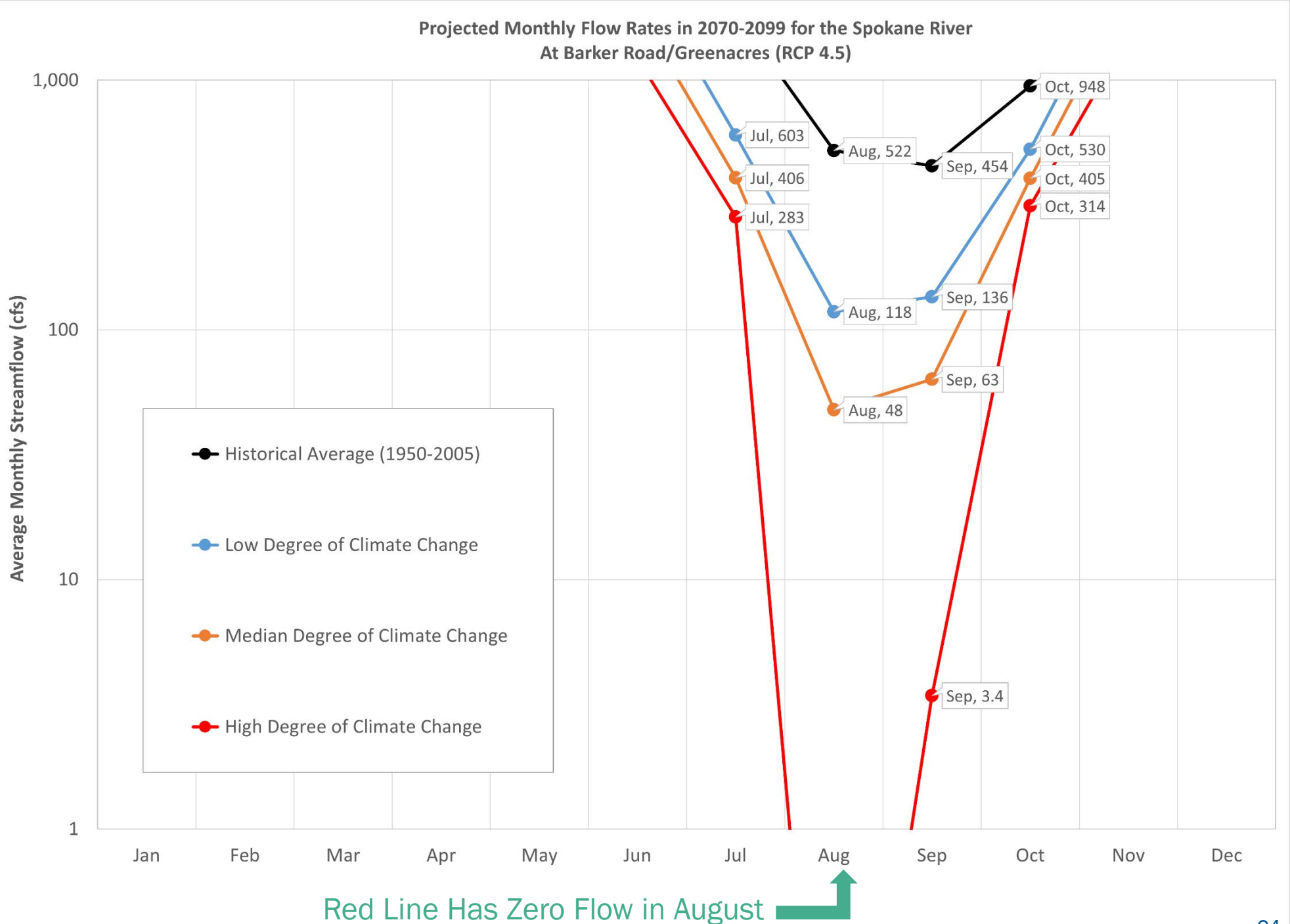

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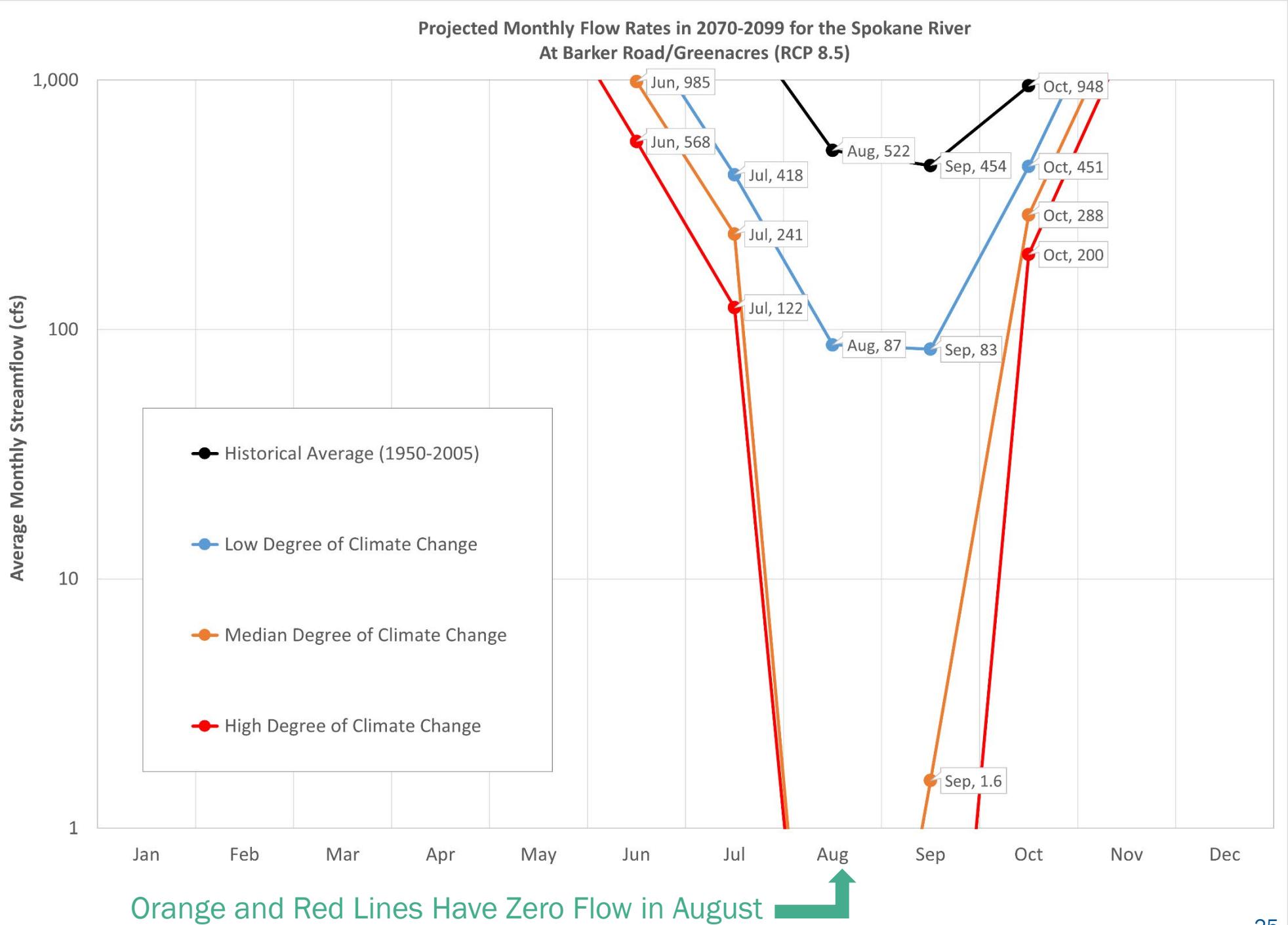

Orange and Red Lines Have Zero Flow in August

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Monthly Simulated Streamflows at Downtown Spokane

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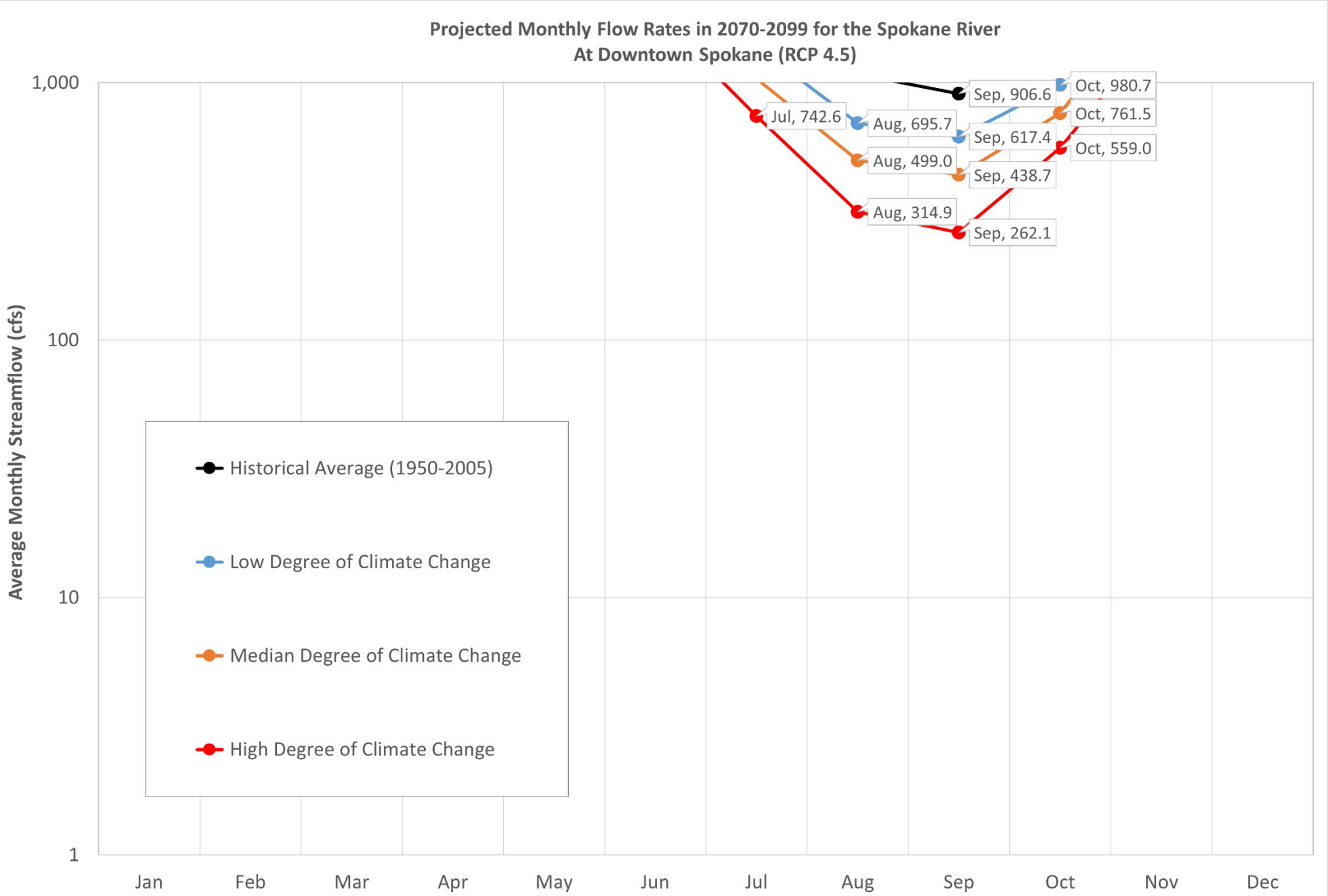

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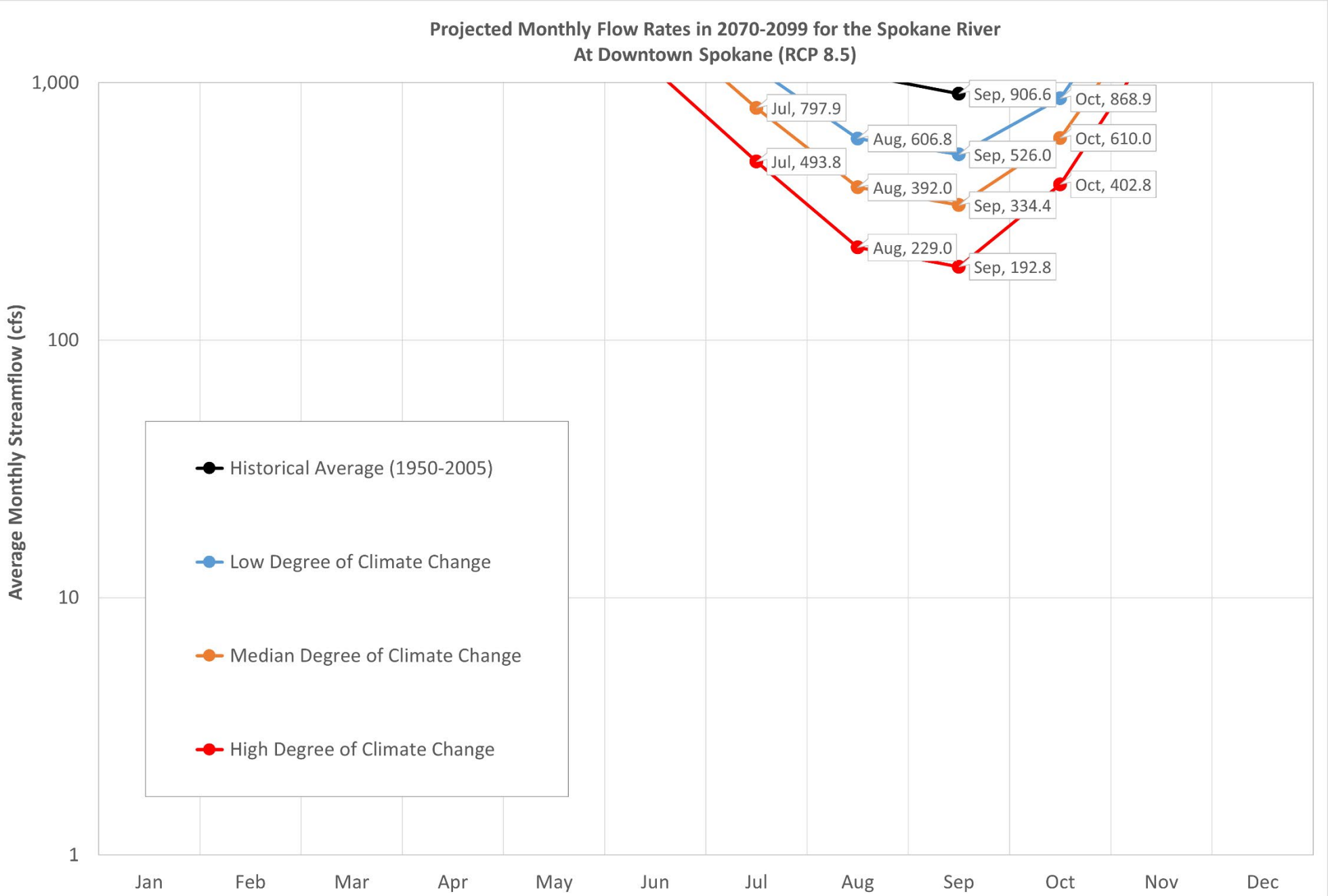

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Questions?

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Photo by John Porcello
Sept. 11, 2025