

Badger Mill Creek Hydrologic Assessment

Badger Mill Creek Stakeholder Meeting

October 18, 2023

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BADGER MILL CREEK

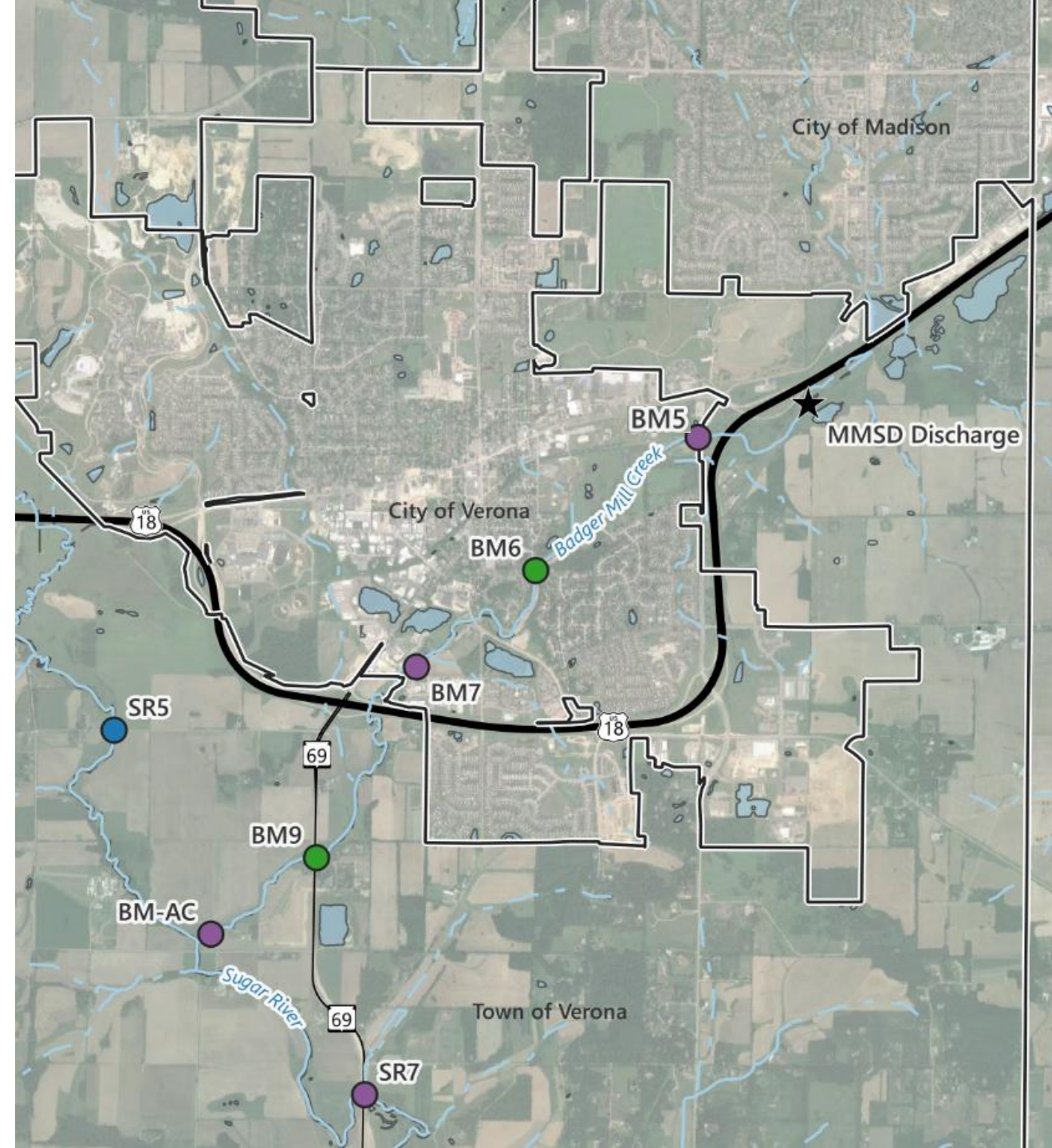
Class 2 trout stream

Cool (Cold-Transition) Main Stem natural community

- Cool to cold summer temperatures
- >3.0 cfs 90% exceedance flow
- Coldwater & transitional fishes

Cool-cold Index of Biotic Integrity good to excellent, except fair at Old PB

Habitat upstream of Lincoln St. lacks characteristics needed for spawning (Amrhein, 2017)



STUDY AREA

Monitoring locations

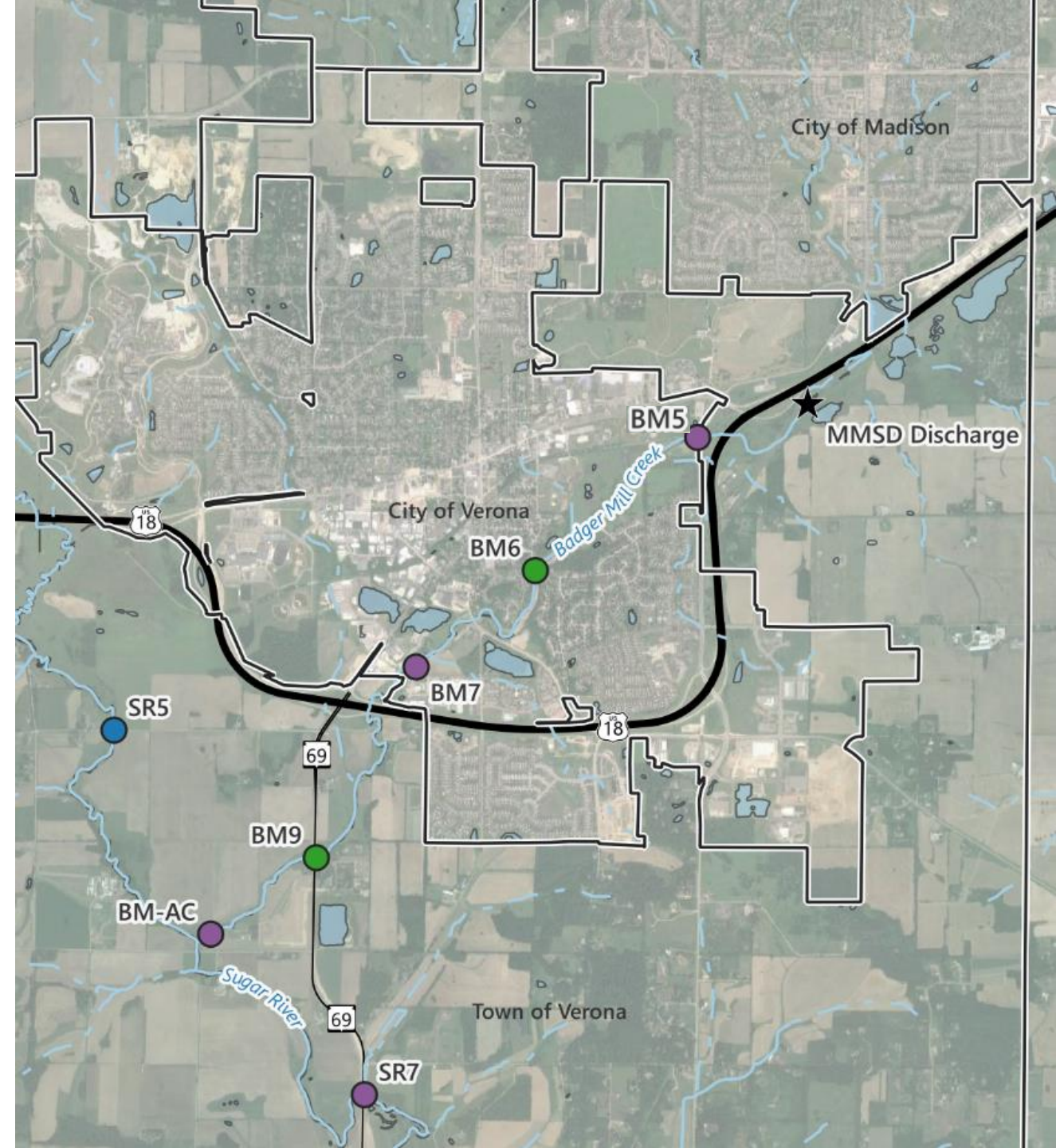
- 5 sites on Badger Mill Cr.
- 2 sites on Sugar R.

Measured

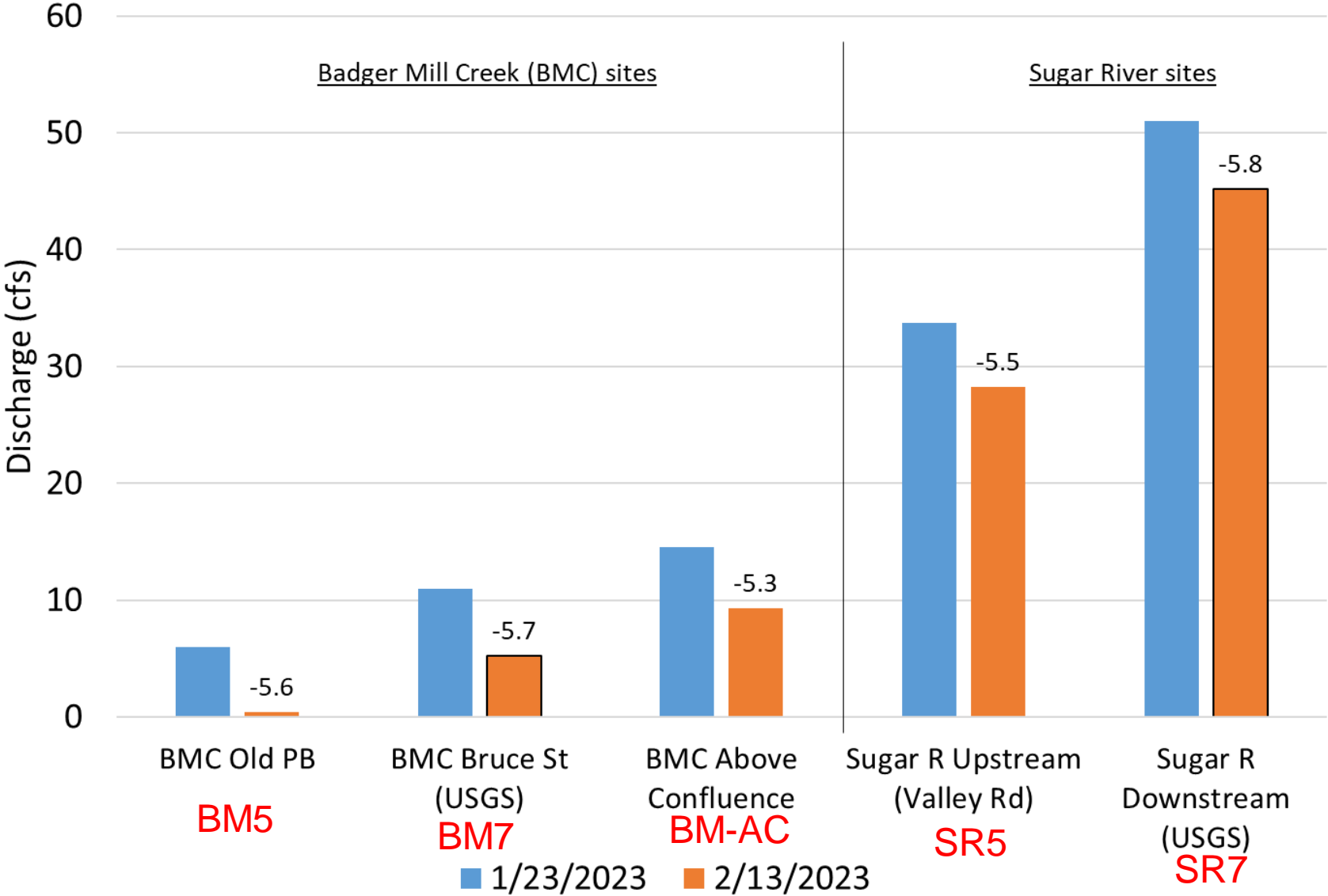
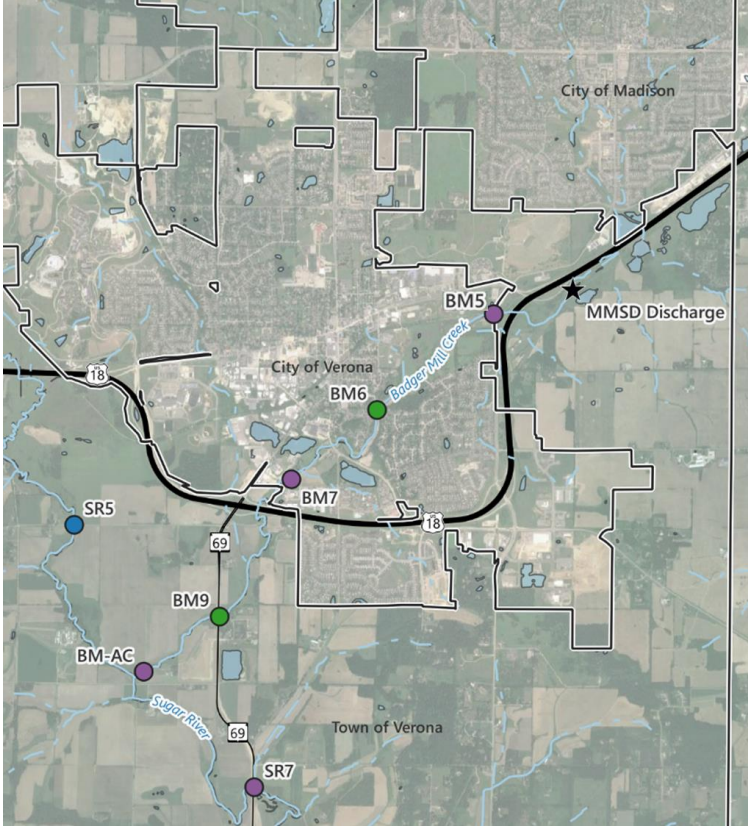
- baseflow
- velocity
- channel depth & width
- temperature

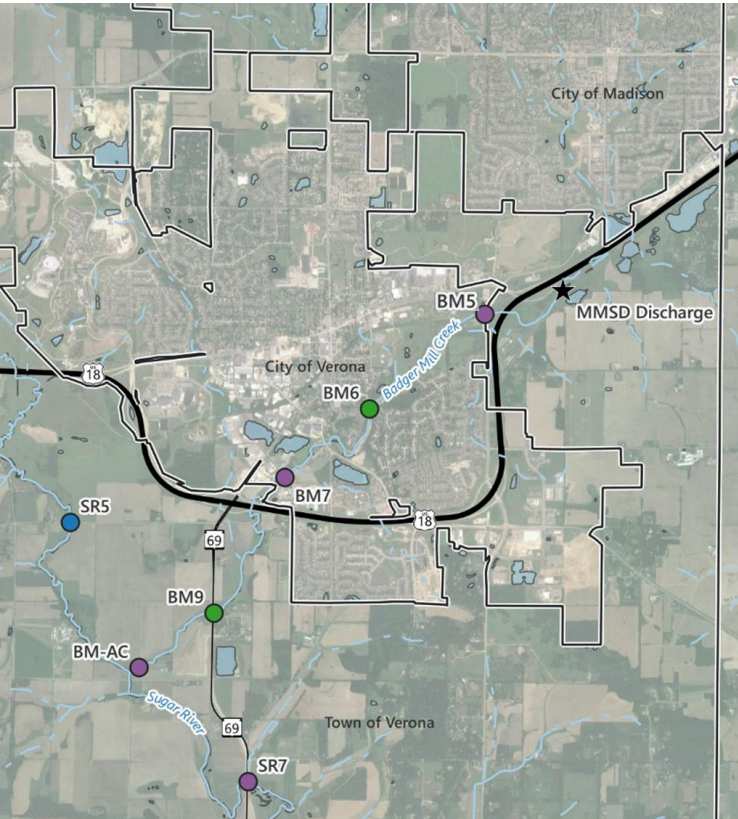
January 23, 2023 (normal effluent)

February 13, 2023 (zero effluent)



Flow Change during MMSD Return Flow Shutoff





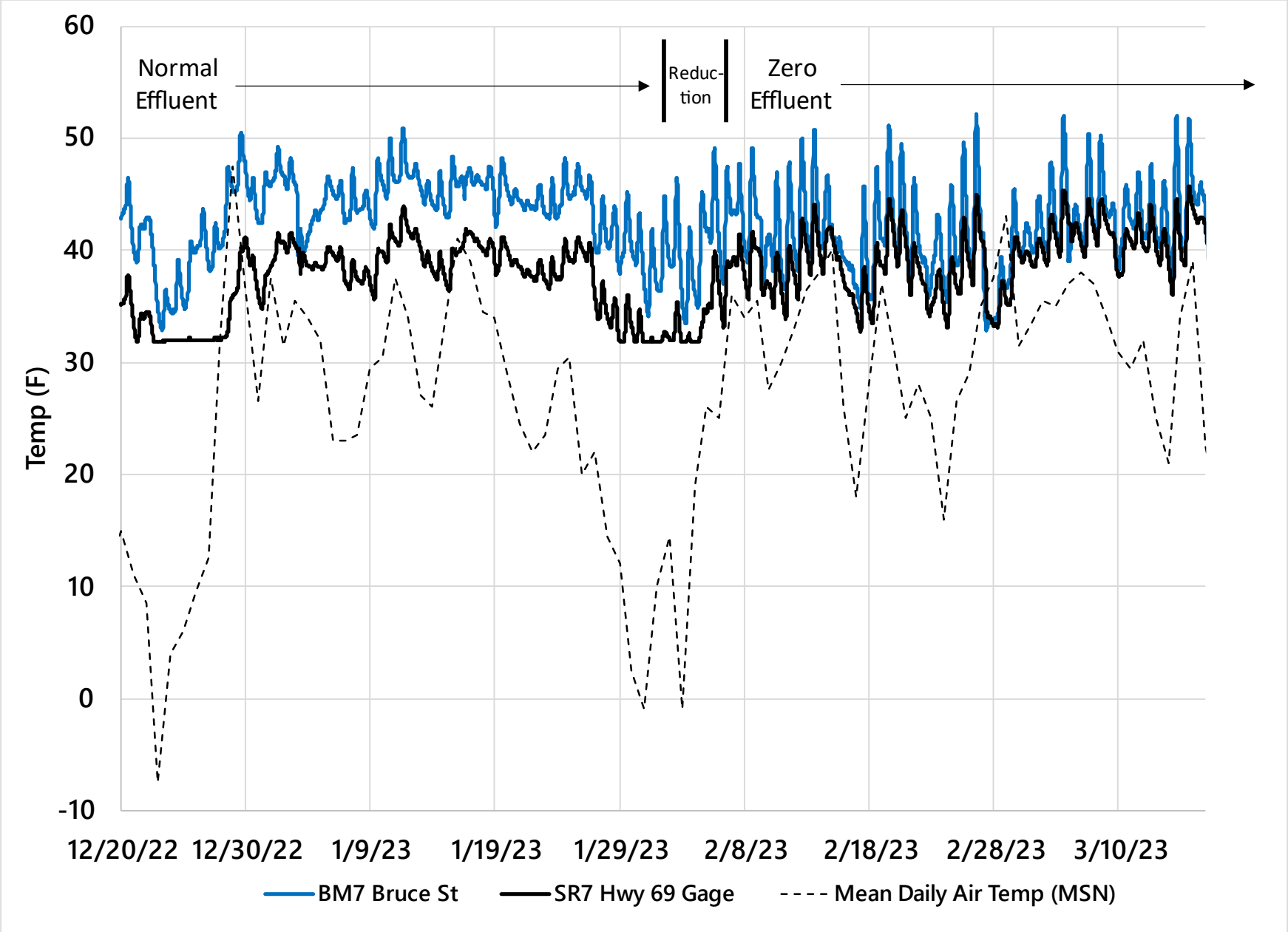
Site Name	Discharge change ¹ (cfs)	Wetted Width (ft)			Mean Depth (ft)		
		Survey #1	Survey #2	Change	Before	After	Change
BM5- Old PB	-5.6	21.0	18.9	-2.1	1.20	.78	-0.42
BM6 - Lincoln St.	NA	23.5	21.8	-1.7	0.39	0.23	-0.16
BM7- Bruce St.	-4.9	17.7	15	-2.7	0.59	0.42	-0.16
BM9- STH 69 ²	NA	21.1	21.1	0.0	1.44	1.27	-0.17
BM-AC – above Confluence	-5.3	20.3	20.3	0.0	0.45	0.37	-0.09
SR7 - STH 69	-5.8	35.0	35.0	0.0	1.12	1.04	-0.08

Velocity

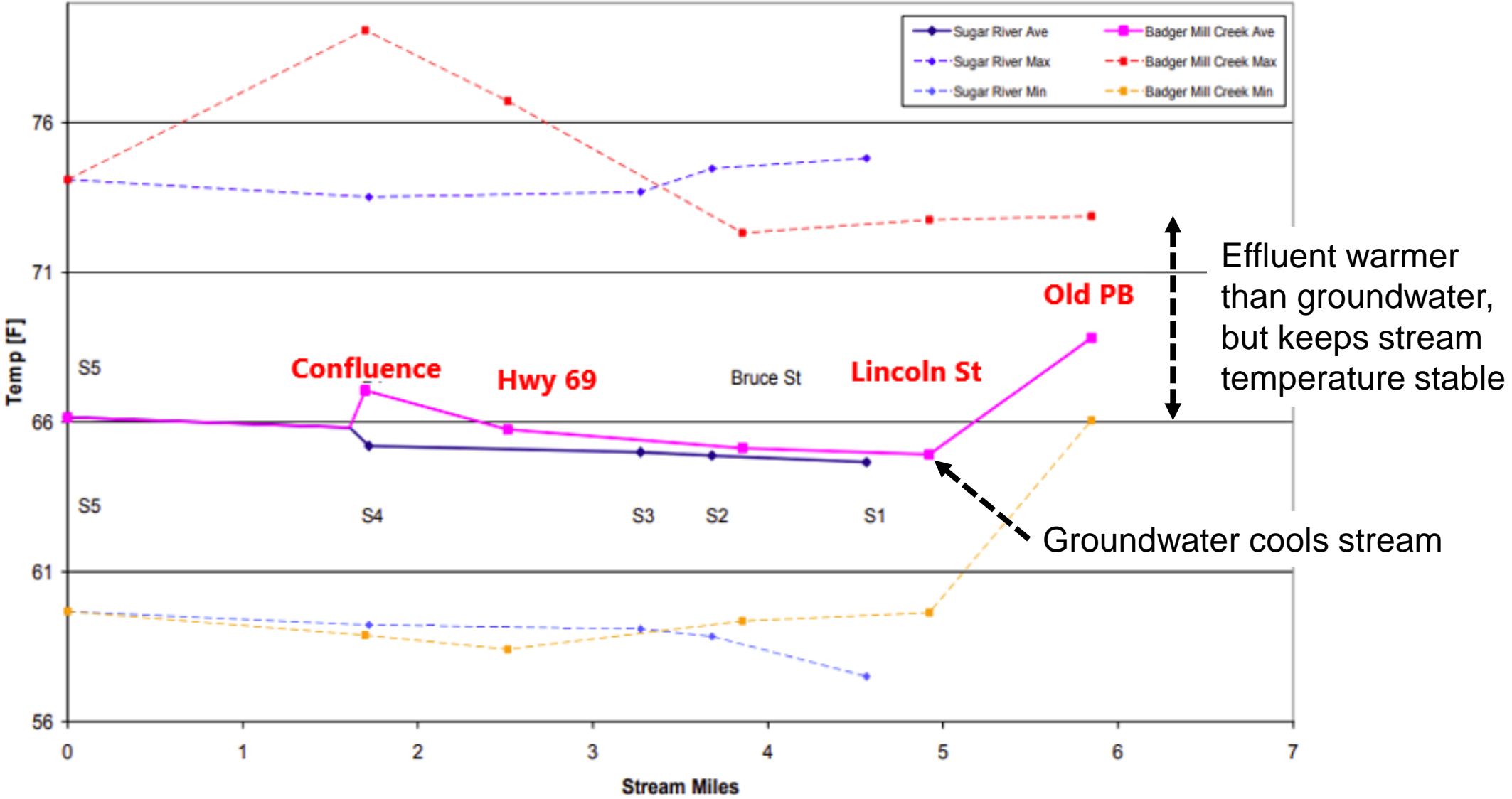
- Old PB – average dropped from 0.24 ft/s to 0.01 ft/s
- Decreases of 47% at Bruce St. and 36% at confluence.

STREAM TEMPERATURE

Badger Mill Cr. with effluent discharge was warmer & had less daily variation than without effluent.



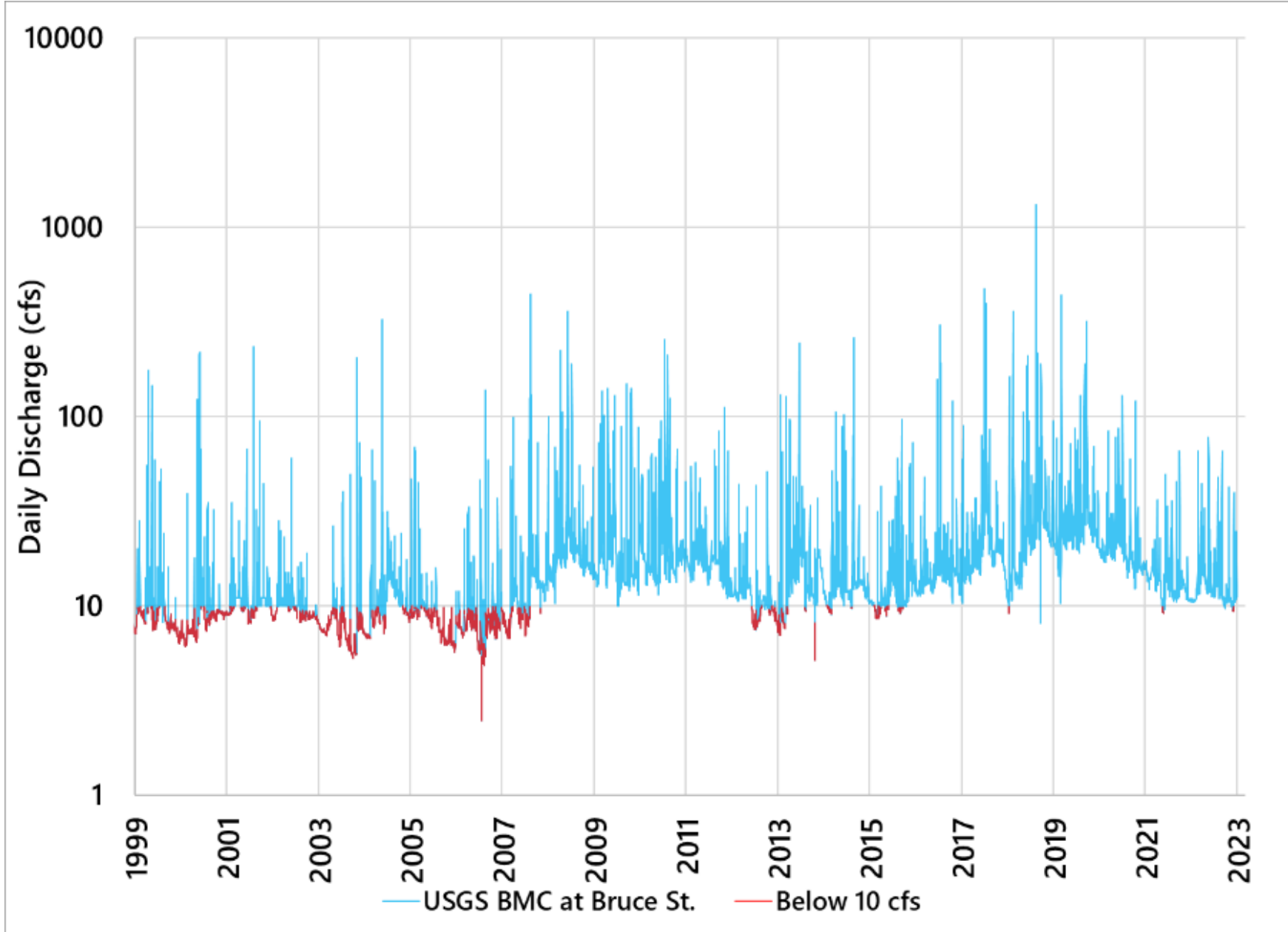
SUMMER TEMPERATURE IN 2007



STREAMFLOW TRENDS

Frequency of flows as low or lower than during study has decreased.

But 2023 was dry with more frequent flows below 10 cfs at Bruce St.



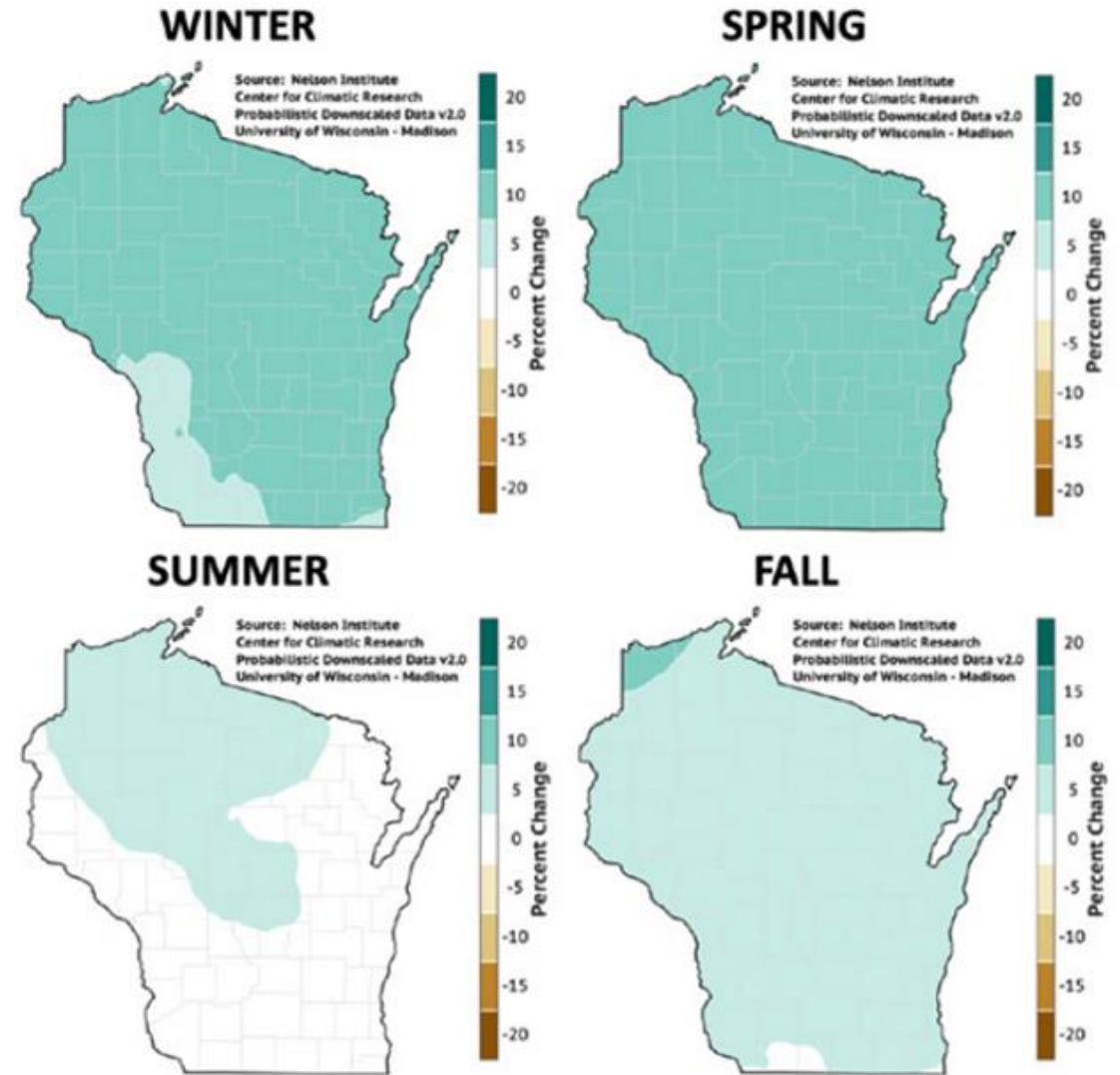
CLIMATE PROJECTIONS

Precipitation

- Increased total precipitation
- More variability (extended wet periods and droughts)

Streamflow

- Annual streamflow expected to increase



Projected seasonal changes in Wisconsin precipitation from 1981-2010 to 2041-2060 (WICCI, 2021).

IMPLICATIONS OF EFFLUENT SHUT-DOWN

- Baseflow will decrease (most pronounced in headwaters).
- Change in wetted width & depth will be small, except in headwaters at low flows.
- Natural community designation in headwaters (e.g. Old PB) will likely change to Cool (Cold-Transition) Headwater or Cool (Warm-Transition) Headwater.
- Velocity decrease could result in more sedimentation on spawning beds.
- Summer temperature likely to be more variable (stressful to trout). Average temperature may be cooler, especially in headwaters.
- Overall impact on fishery uncertain based on available information.

OPPORTUNITIES

Gather data on and/or model summer temperature without effluent

- Target key areas for improvement

Enhance low flows

- Stormwater
- Upstream drainage
- Increase groundwater input

Improve channel habitat

- Especially upstream of Lincoln St.
- Spawning substrate
- Pools and shade for lower summer temperature

