



Mill Brook Watershed Management Committee

Fall 2024 - Data Collection Update

12/11/2024 Select Board meeting

What is the Mill Brook Watershed Management Committee?

- Committee originally appointed by West Tisbury Select Board in 2014
- Charged by Select Board to design and field a comprehensive study of the Mill Brook Watershed, the data from which would form the basis of a Mill Brook watershed management plan.
- Results of initial study were published in 2018; available on West Tisbury Town [website](#)

Current committee members include:

- Tim Boland
- David Bouck
- Prudy Burt
- Kristen Geagan
- Angela Luckey
- Cynthia Mitchell
- Julie Pringle
- William Wilcox




Volunteer statistics

(in-person hours)

- Approximately 45 field days
- Nearly 340 hours of field work
- Approximately 80 hours of data management
- Over 300 hours of meetings
- Committee continues to collect water quality and flow data on an ongoing basis



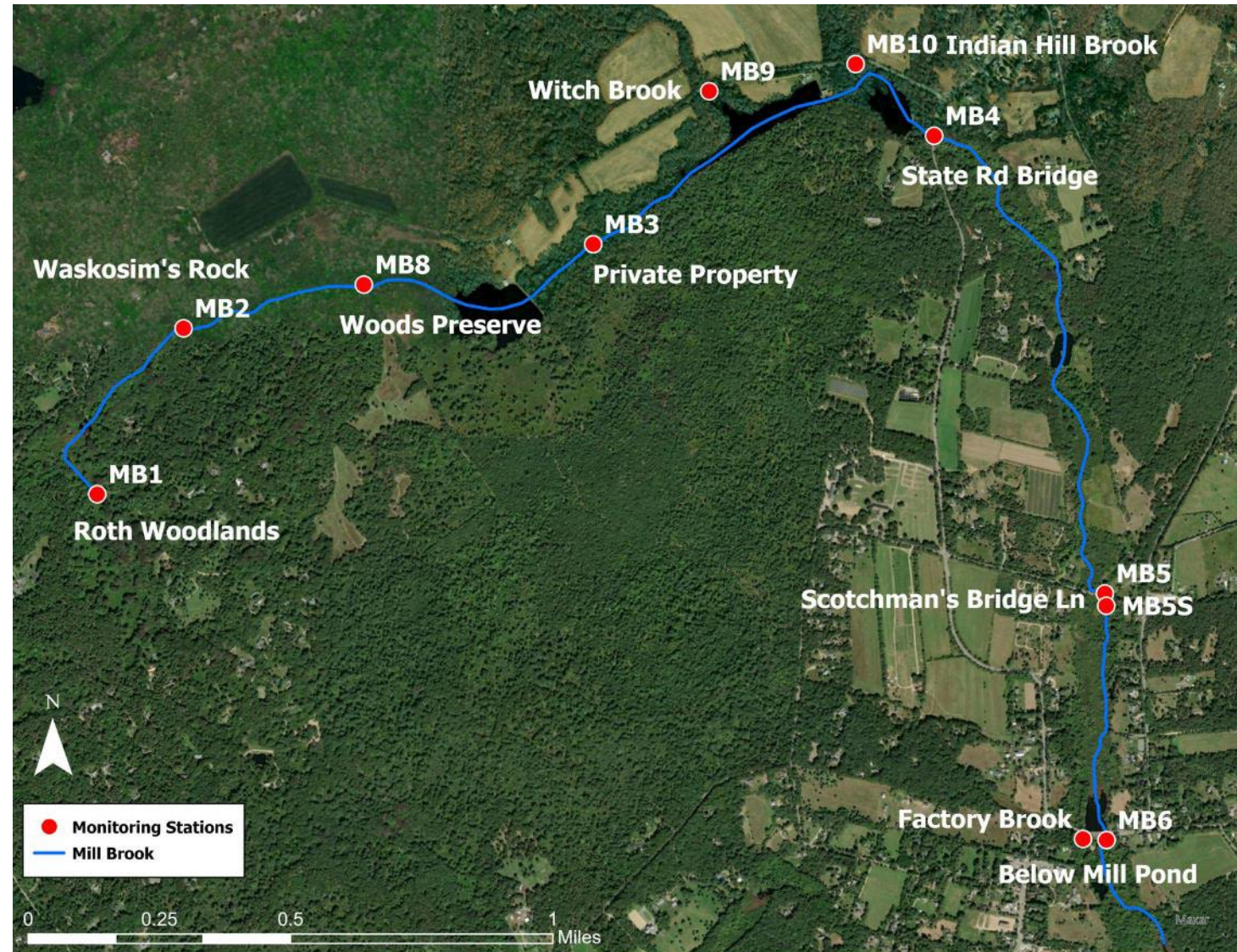


Goal

Collect baseline data throughout Mill Brook and its watershed to guide management decisions and improve the resource

2021 Water Quality Survey

- 9 sampling stations:
 - Nutrients (Nitrogen & Phosphorus)
 - Water Temperature
 - pH
 - Dissolved oxygen
 - Conductivity
- 13 dates throughout the year
- Continuously measure:
 - Temperature (6 stations in Mill Brook, 1 in Mill Pond)
 - Dissolved oxygen (1 station in Mill Pond)



Stream Flow Measurements

- 5 stream flow gauging stations
 - Pressure sensor continuously measured water level
 - 30 min intervals
- 30 dates from 2021-2024
 - >100 flow measurements
- In-field measurements calibrate the pressure sensors to calculate continuous flow at each location



Macroinvertebrate Survey

- 8 sampling stations along the Brook
- Focused on aquatic insects sensitive to water quality
- Monthly collections between 3/2022 and 2/2023
- Species were identified and enumerated by entomologist Greg Whitmore to assess stream habitat quality



Results – Macroinvertebrate Survey

- >20,000 specimens were identified
- 111 species
 - 39 new records for Mill Brook & 46 for Witch Brook
- Mill Brook experiences a shift from a cold-water fauna to a warm-water fauna within the span of a mile due to impoundments

Recommendations from Whitmore report:

- replace Roth Woodlands culvert
- remove all dams and impoundments
- work with landowners to maintain/increase riparian buffer vegetation and to minimize nutrient pollution
- Continued monitoring of water chemistry, discharge, and species diversity (macroinvertebrate and fish)



Results – Water Quality

- Data show that water quality is good
- Nutrient load calculation:
 - N= 3.054 kg/day
 - P= 0.517 kg/day
- Nutrients (N & P) are converted into excess biomass in the ponds
- Dissolved nutrients demonstrate that the system is limited by P availability
 - Total nutrients, including organic matter, indicate the system is not constrained by either nutrient

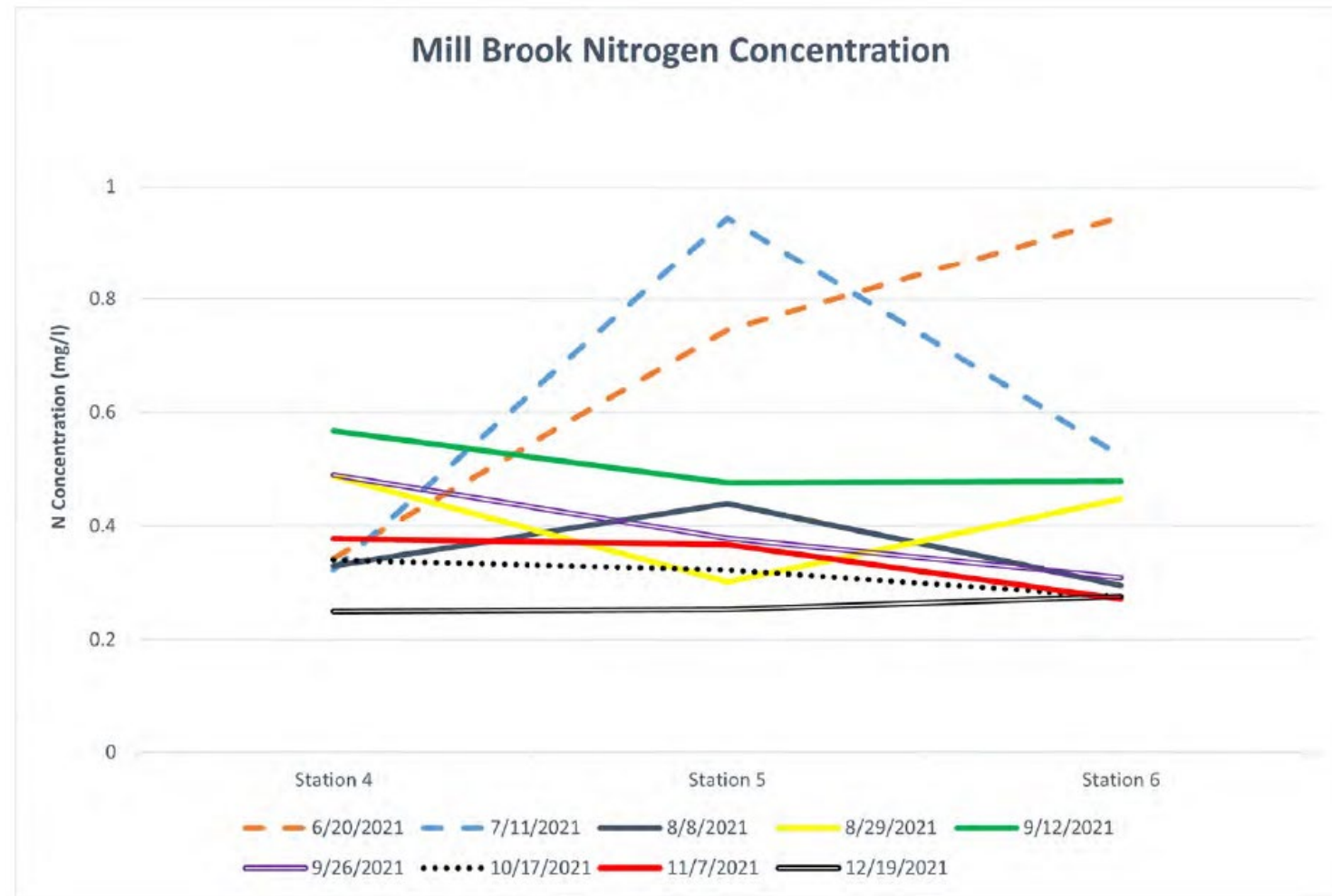
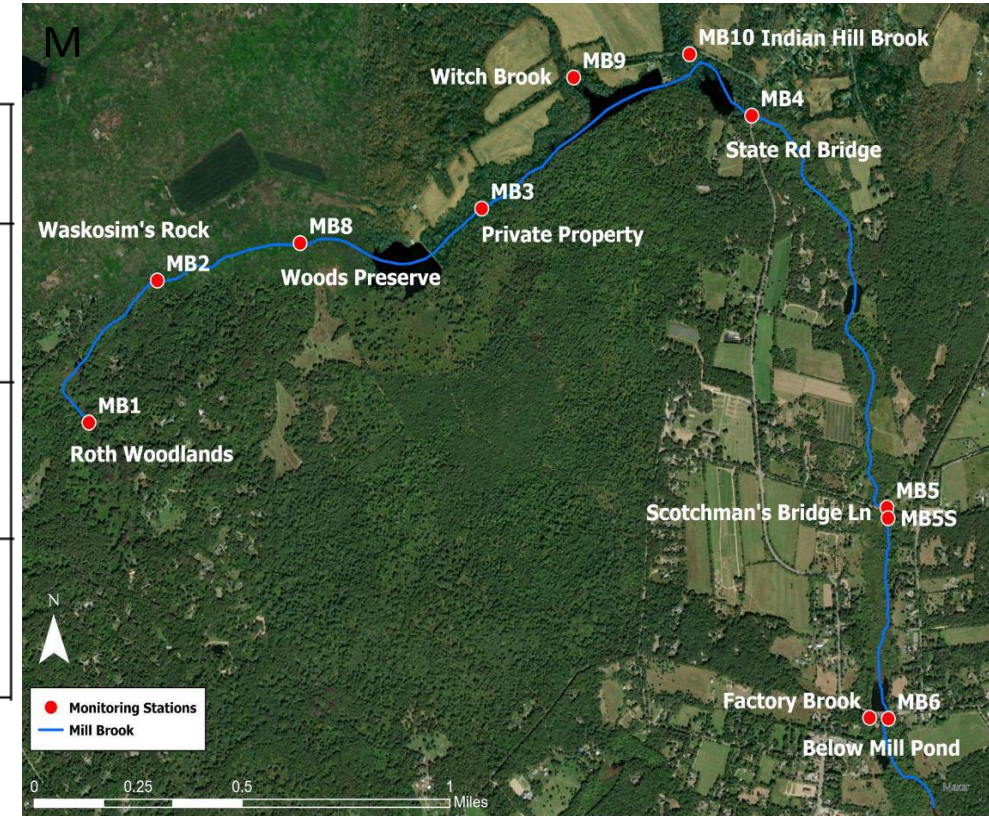


Figure 11 Mill Brook Nitrogen Concentration (mg/l)

Results – Stream Flow

	Station 2*	Station 8*	Station 3*	Station 4	Station 5	Factory Brook	Station 6
Min. discharge (CFS)	0.13	0.22	0.78	1.24	1.61	0.09	1.33
Max. discharge (CFS)	0.25	0.8	1.57	6.69	6.12	1.75	6.71
Mean discharge (CFS)	0.19	0.468	1.19	3.40	3.83	0.67	3.77

*Stations with five or fewer streamflow measurement dates



- Mill Brook gains flow from Stations 2 to 5
- Several factors related to the Mill Pond dam cause Mill Brook to lose flow between Stations 5 and 6

Results – Stream Flow

- Data enabled calculation of the relationship between water elevation and the volume of water flowing in the stream
- Flow increases downstream
- Flow drops below Mill Pond due to:
 - Loss to Factory Brook
 - Evaporation
 - Loss to groundwater due to elevated water head of the impoundment

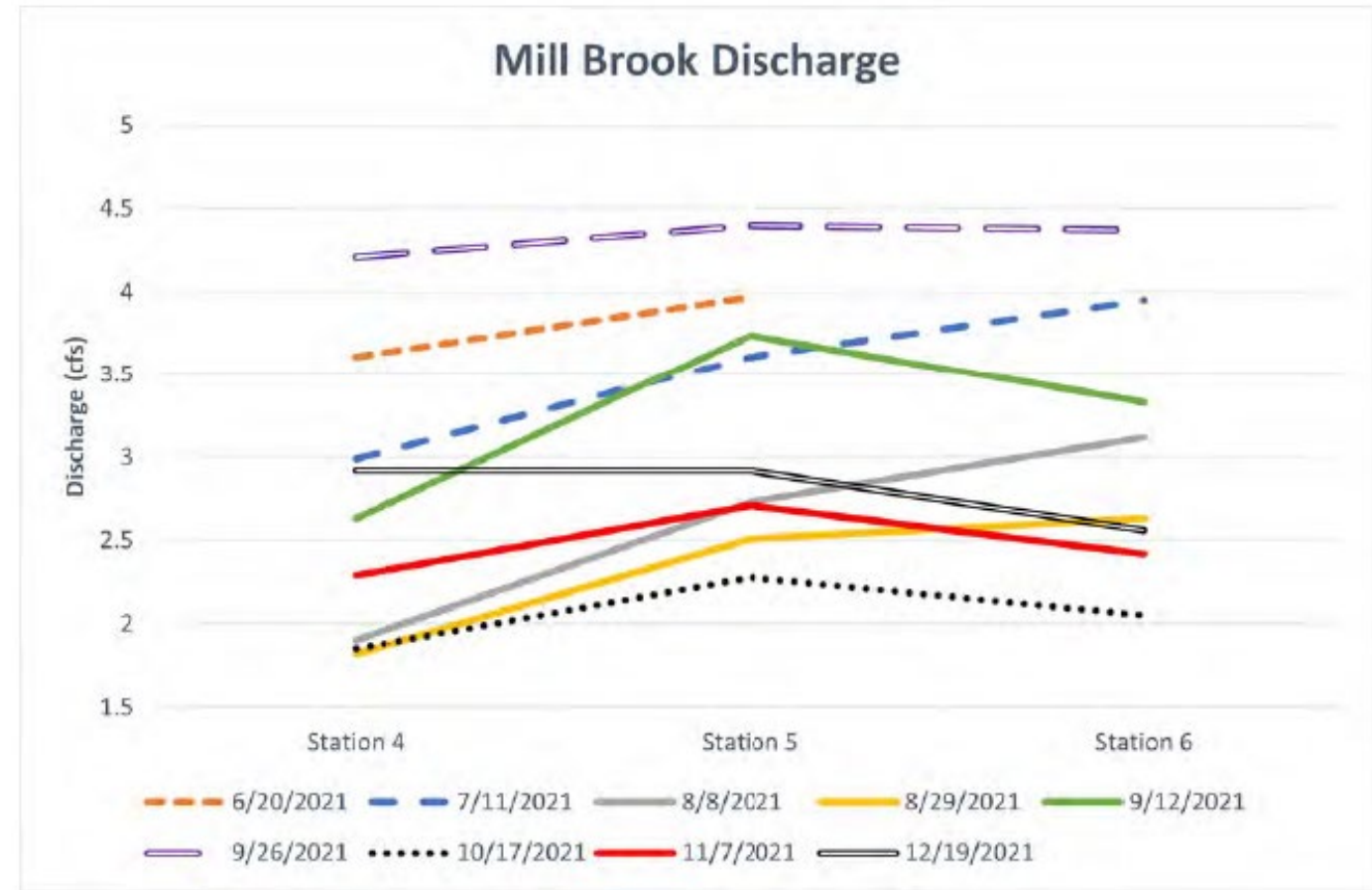


Figure 6 Mill Brook Discharge (cfs)

Results – Stream Flow

- Our stream flow data fits into the range of values measured over time for Mill Brook
 - Toward the lower end of the range for 2021 and 2022
- The stream responds quickly to rainfall
 - Direct response indicates the possibility of runoff from roads and lands with limited natural vegetation buffer

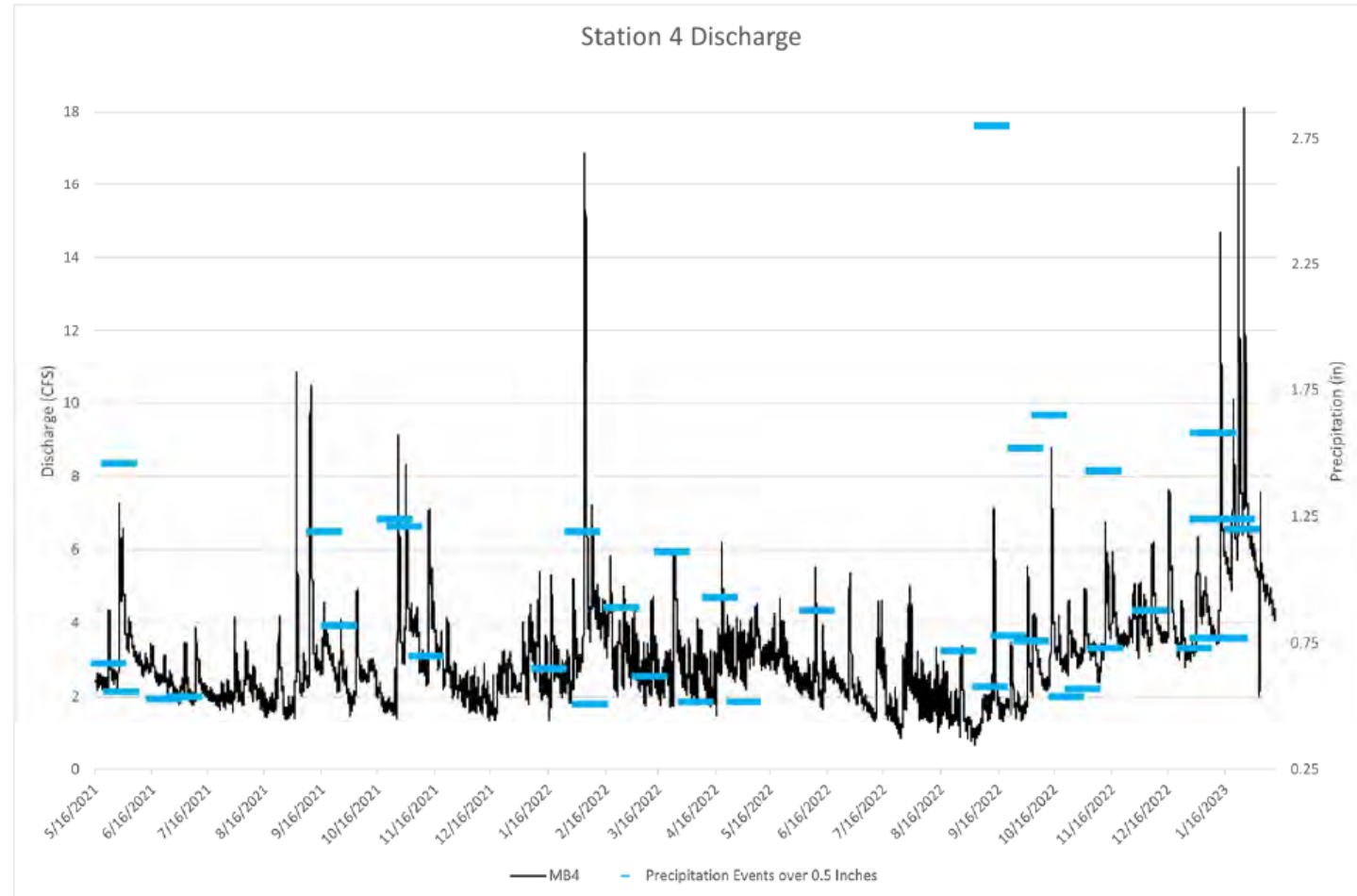
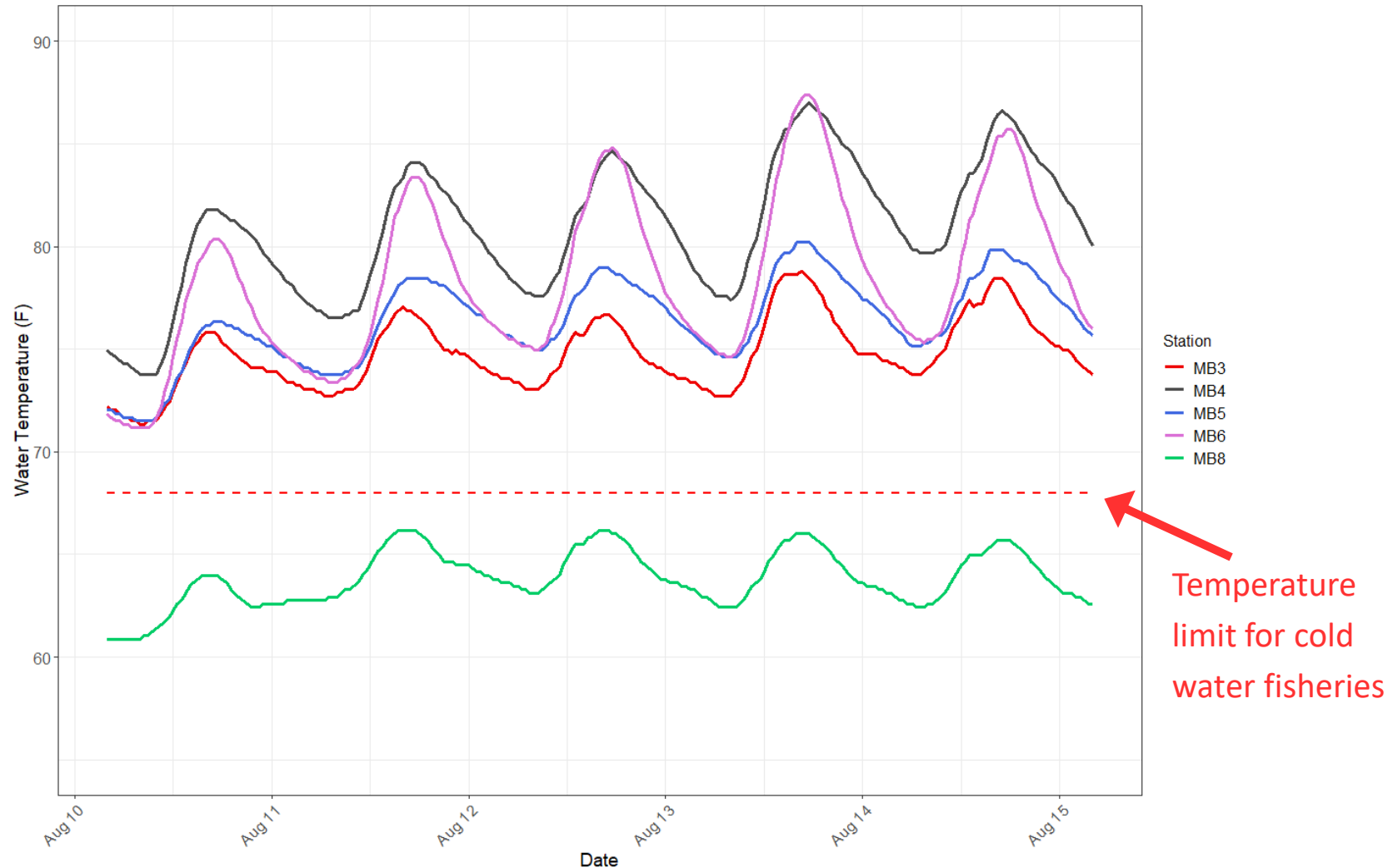


Figure 7 Station 4 Discharge Calculated from Stage-Discharge Relationship (cfs)

Results – Water Temperature in Mill Brook

“The temperature increase has a clear negative impact on temperature-sensitive species of macroinvertebrates. Those species adapted to coldwater streams are not able to survive the temperature increase induced by the ponds.”

-Whitmore report
(page 7)



Results – Water Temperature in Mill Pond

- Maximum temperature of 84°F
- Mill Pond seasonal temperature exceeds 68° for nearly the entire period between late June and mid-September 2023
 - 68° is temp limit for cold water fisheries
 - Warming effects of impoundments persist throughout Mill Brook system
- Extremely inhospitable for native coldwater fish (brook trout and brook lamprey, a threatened species) as well as many aquatic insect species

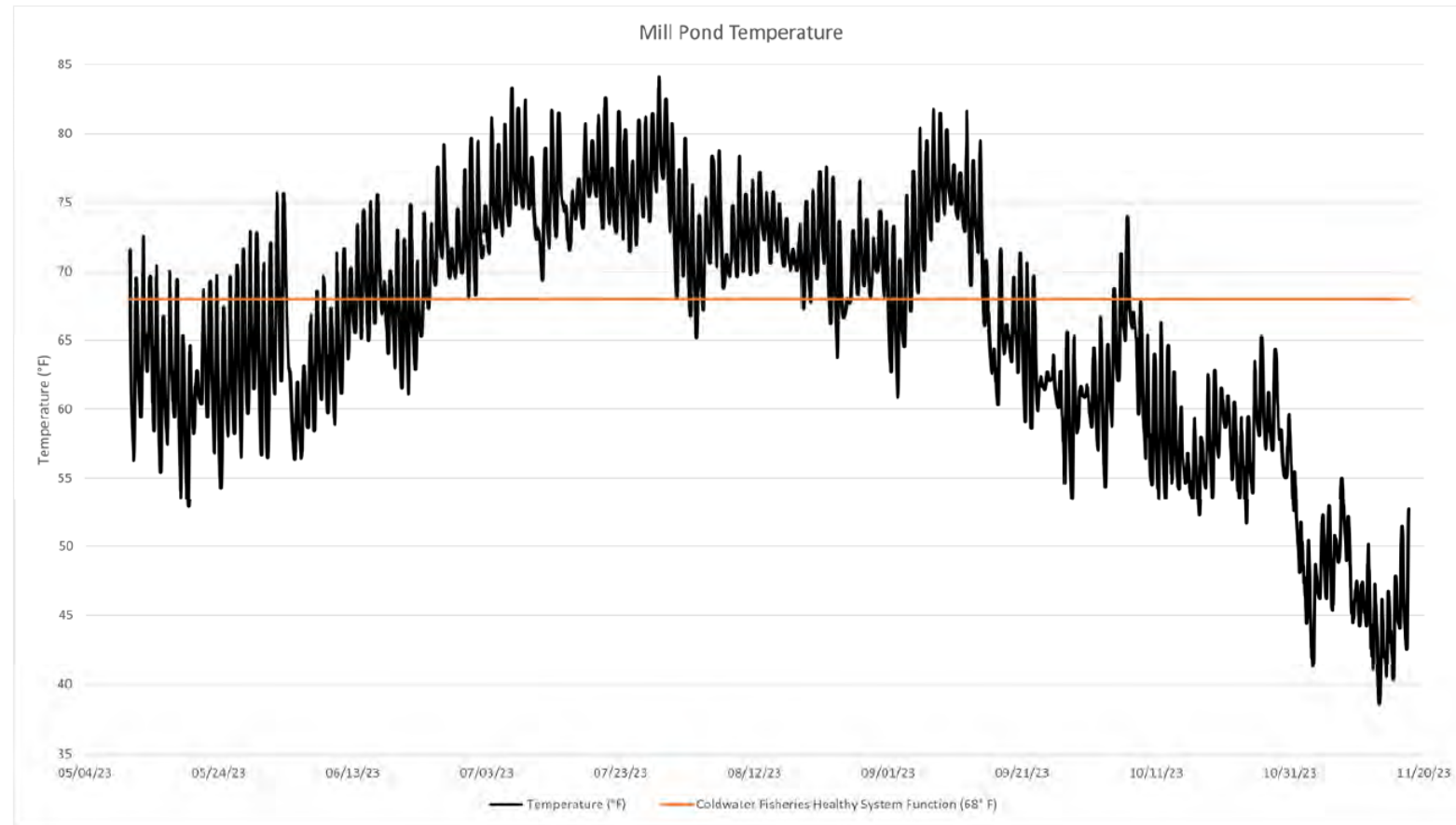


Figure 16 Mill Pond Temperature (°F)

Results – Dissolved Oxygen in Mill Pond

- Mill Pond summer dissolved oxygen is below acceptable levels one third of the time
- Levels fell below 2 mg/L numerous times overnight during 2023
- Ecosystem quality is largely determined by the period with the worst water quality regardless of what the averages are

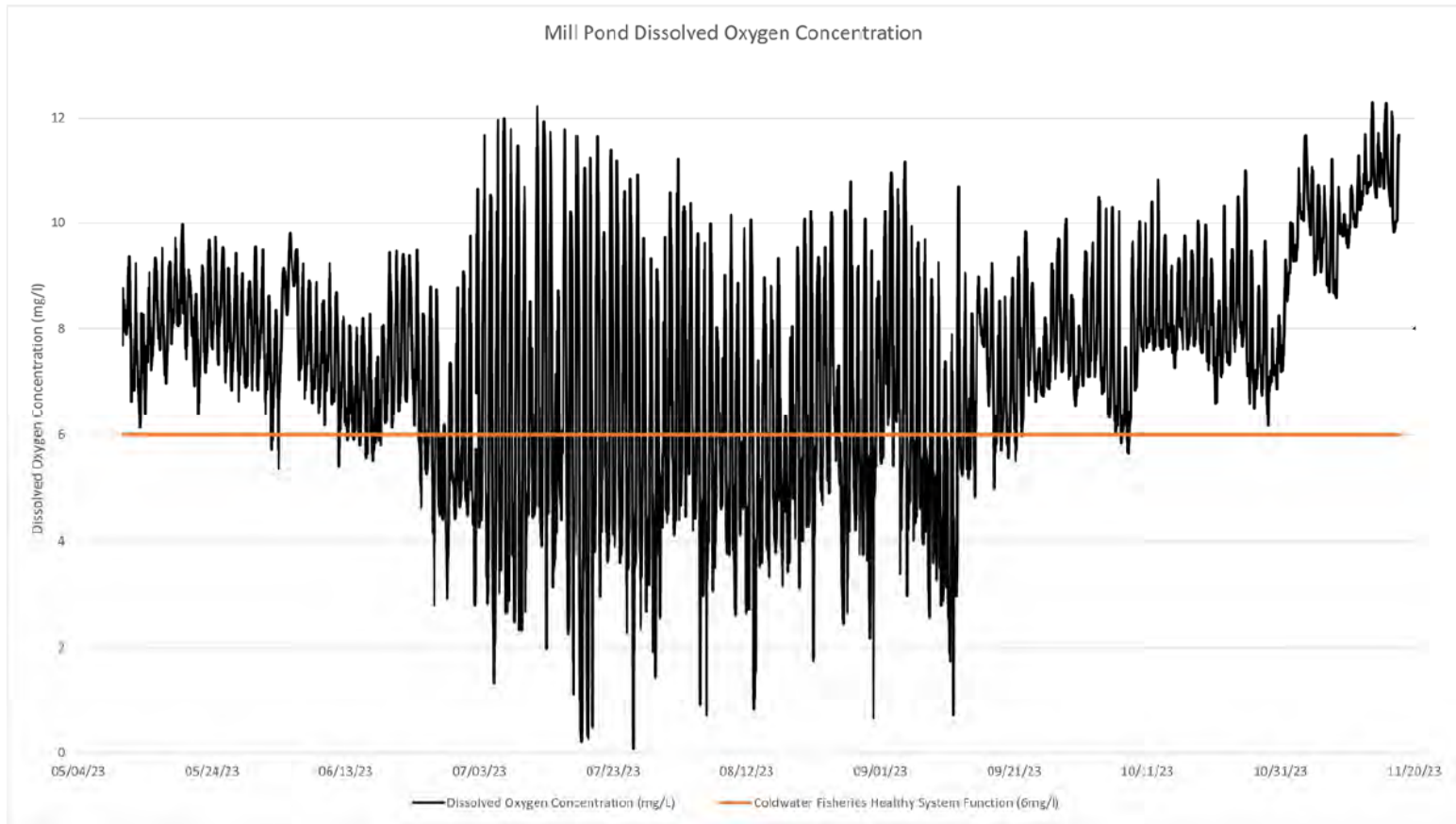
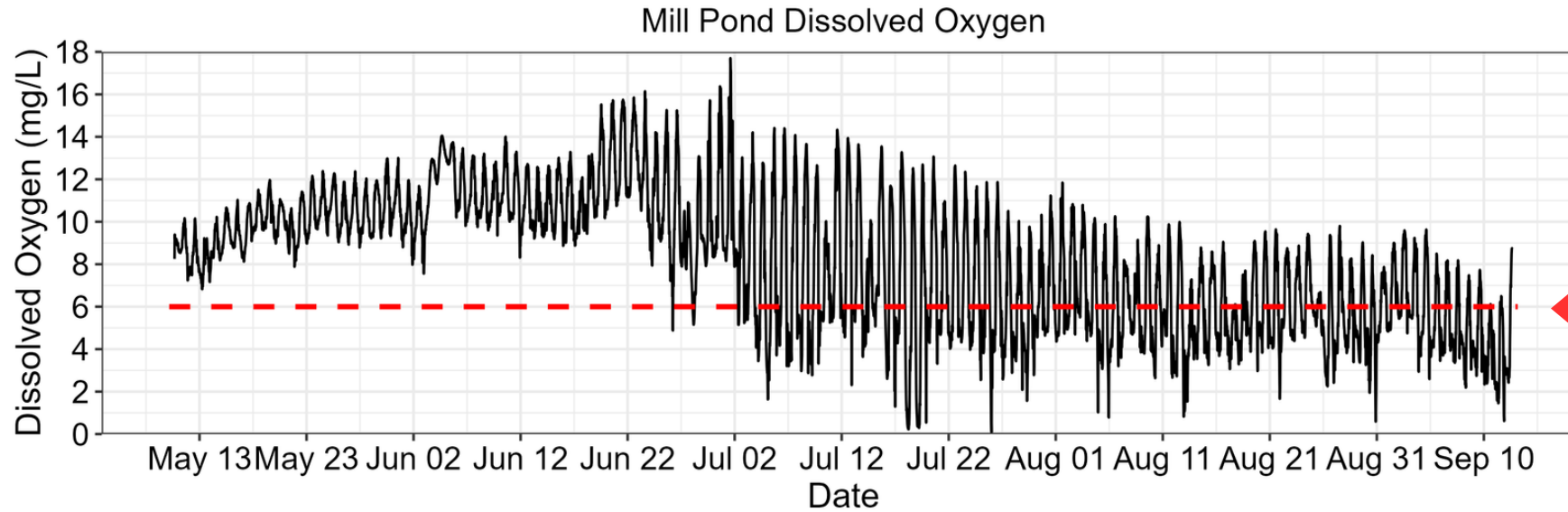


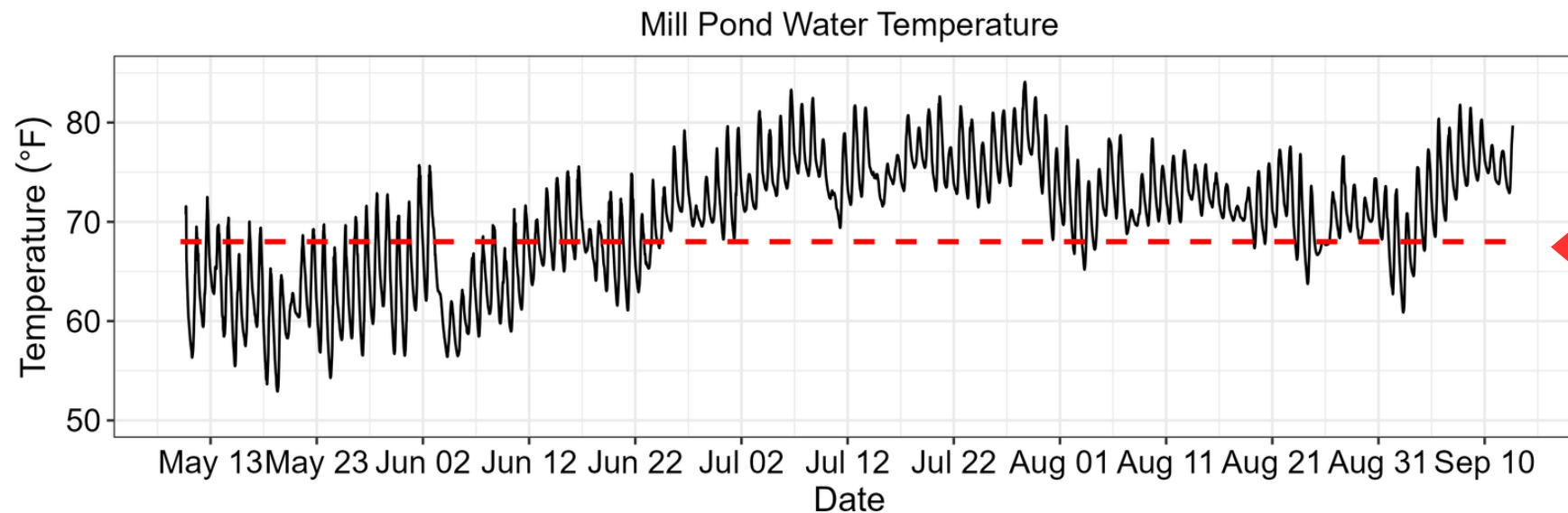
Figure 15 Mill Pond Dissolved Oxygen Concentrations (mg/l)

Continuous Measurements: temperature, elevation, dissolved oxygen



Massachusetts Surface Water Quality Standards for cold water fisheries:

Dissolved oxygen minimum is 6 milligrams per liter



Temperature maximum is 68°F

Directions for Future Management

1. The dams are a water and habitat quality problem. This is indicated by high temperature, low dissolved oxygen, low diversity of aquatic insect species as well as the excessive biomass in the ponds.
 - "Due to the documented water quality and habitat impacts... all impoundments along Mill Brook should be evaluated to determine the feasibility of dam removal" (Horsley Witten report, page 31).
2. Climate change will likely produce more intense precipitation. Undersized culverts at Witch Brook and Indian Hill Brook should be upgraded to meet current stream crossing standards.
3. Road runoff discharges are contributing unfiltered water to the brook at Mill Pond and below Priester Pond, as indicated by the rapid response of stream flow to rain events. These sites should be further investigated to discharge runoff into upland vegetation or into infiltration basins.
4. Coordinate efforts with adjacent landowners to remove invasive grey willow from the banks of Mill Pond and Mill Brook below the dam.
5. Continue to partner with organizations such as USGS, MA Division of Fisheries and Wildlife, MA Division of Ecological Restoration, SMF, MVLB, TNC, etc.
6. Continue water sampling and macroinvertebrate surveys at five-year intervals.