



**Mill Brook Watershed  
Management Committee  
Winter 2025 - Public Information Session**

2/23/2025 Public Info Session

# 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



# HISTORY OF MILL BROOK WATERSHED MANAGEMENT COMMITTEE

## Mill Brook Watershed Management Planning Committee 2014 - 2018

- Appointed by Select Board in June 2014 to meet voter directives dating back to 2010.
- Purpose Statement of Mill Brook Watershed study
  - Collect data to establish a baseline for determining the water quality and general health of the Mill Brook Watershed.
  - Data to serve as basis for drafting a Mill Brook Watershed Management Plan and on-going, Town-sponsored watershed monitoring.

## West Tisbury Town Meeting Votes Following the 2018 Study Results

- 2018 - West Tisbury residents voted to allocate funds from the Community Preservation Act to fund a second study to address recommendations from previous study, as well as fix data gaps and expand on existing data set.
- 2019 - West Tisbury residents voted to appropriate \$40,000 from the Community Preservation Open Space Reserve Fund to fund the first half of a two year implementation of the Mill Brook Watershed Management Plan.
- 2021 - West Tisbury residents voted to appropriate \$40,000 from the Community Preservation Open Space Reserve Fund to fund the second half the Mill Brook Watershed Management Plan.

# Recommendations to be addressed:

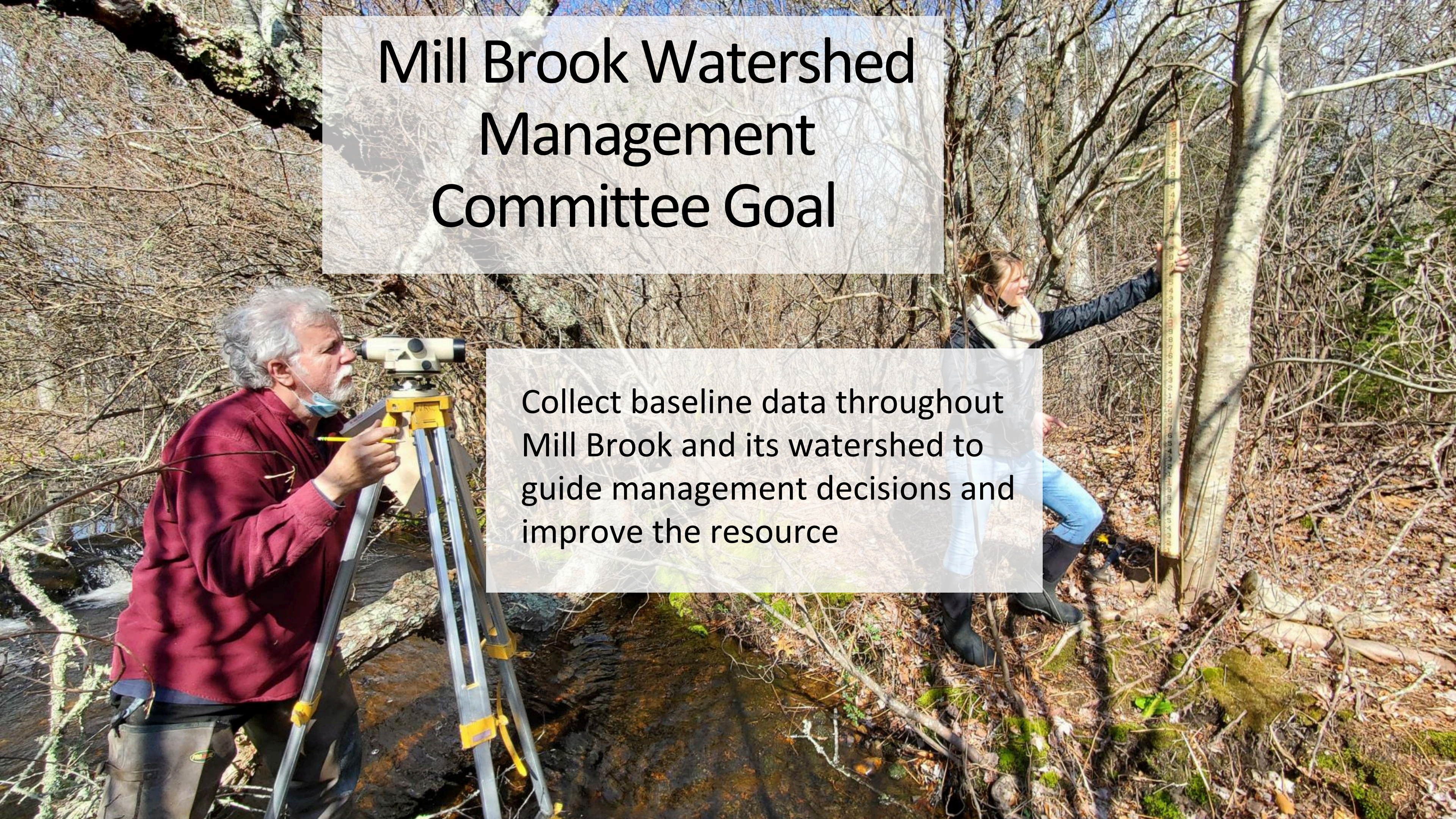
- 1** Develop comprehensive water quality monitoring program to fill data gaps and form baseline for assessment of water quality in perpetuity, every five years.
- 2** Collect in-situ and continuous data on dissolved oxygen concentrations above and below impoundments

- 3** Collect stream flow measurements and generate flow model for Mill Brook. Calculate estimates of flow and nutrient loading from Mill Brook to Tisbury Great Pond
- 4** Conduct macroinvertebrate sampling throughout one-year period



# Mill Brook Watershed Management Committee Goal

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



# Volunteer statistics

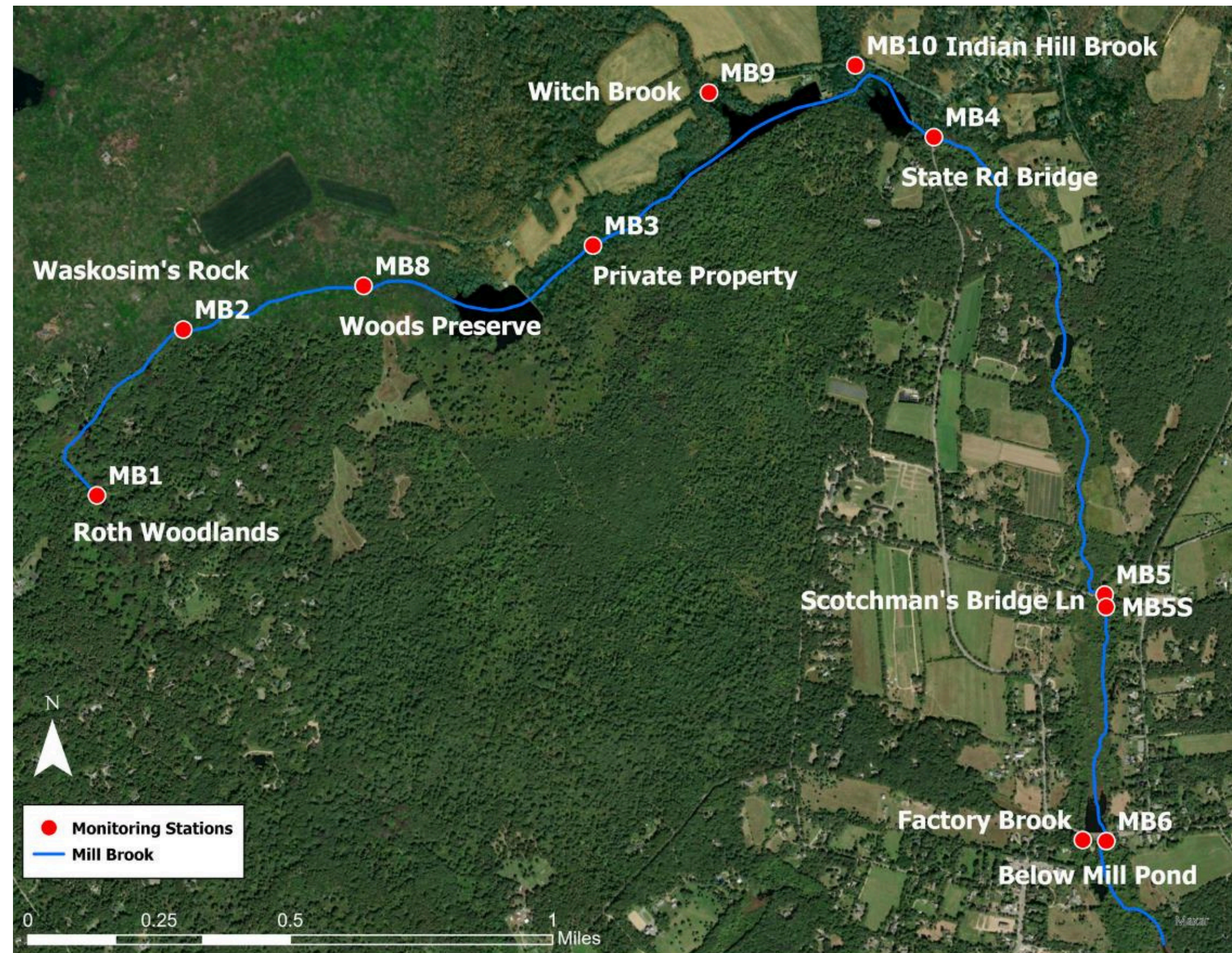
(in-person hours)

- Approximately 45 field days
- Nearly 340 hours of field work
- Approximately 90 hours of data management
- Over 300 hours of meetings
- Committee continues to collect water quality and flow data on an ongoing basis



# 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

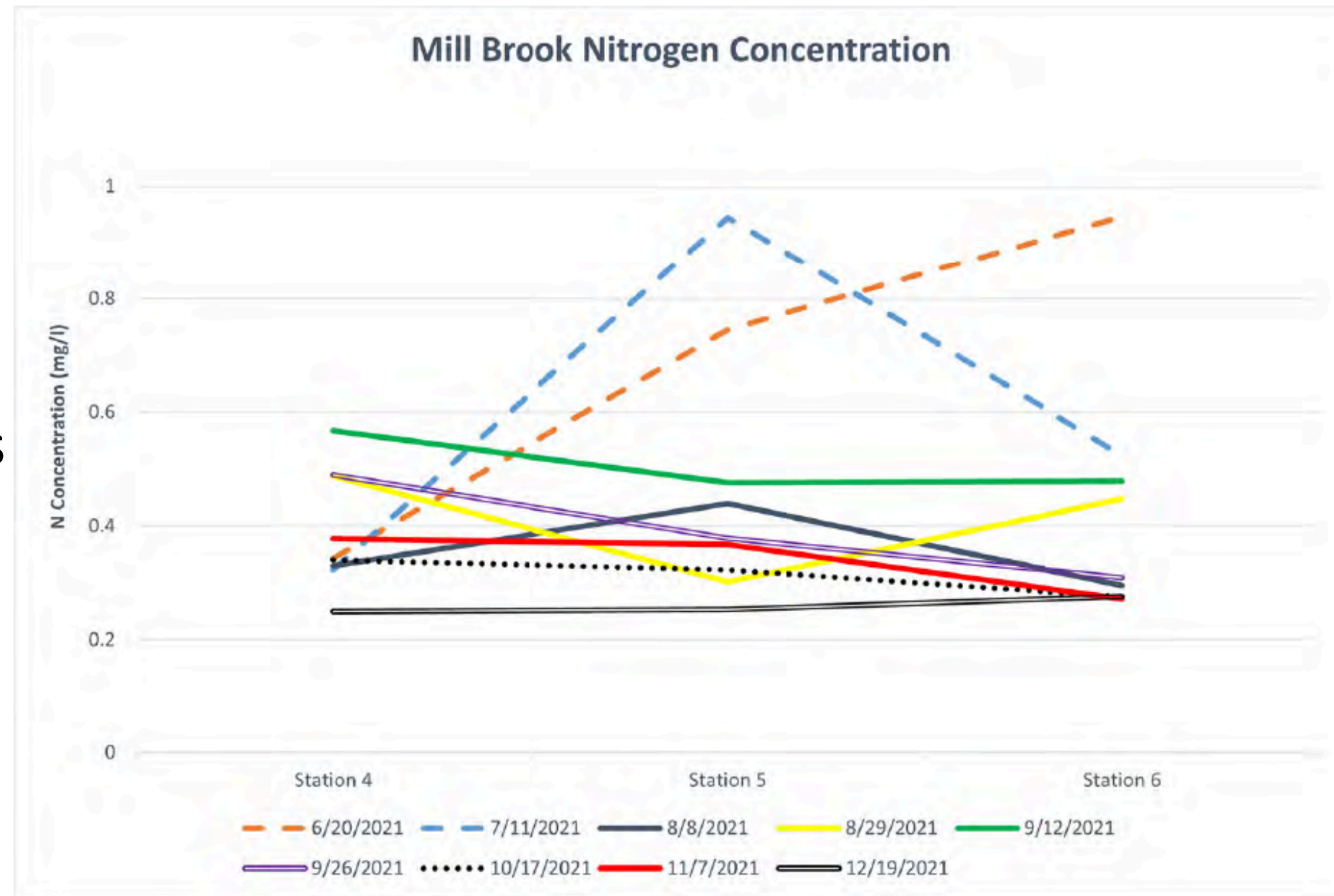
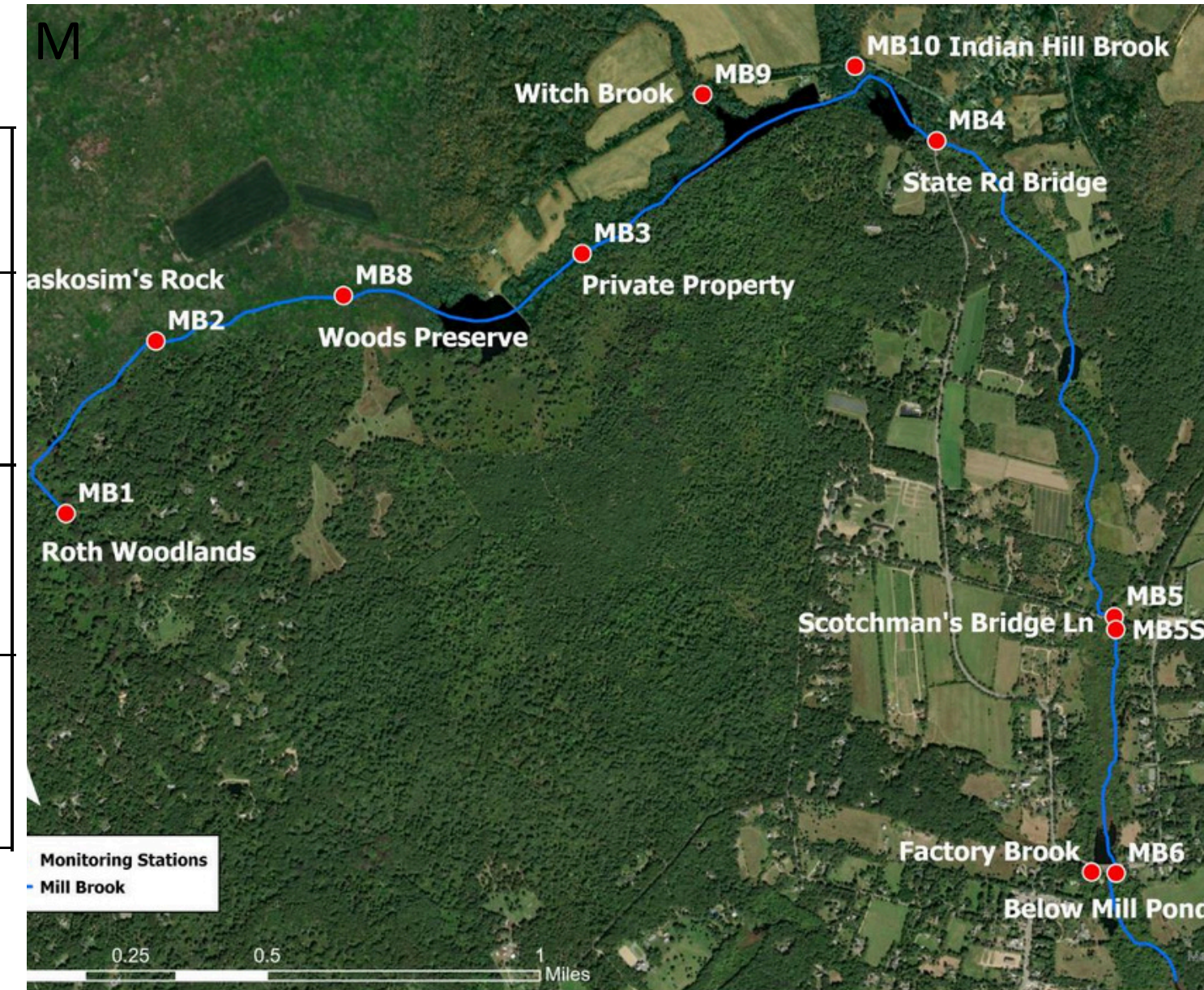


Figure 11 Mill Brook Nitrogen Concentration (mg/l)

# 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

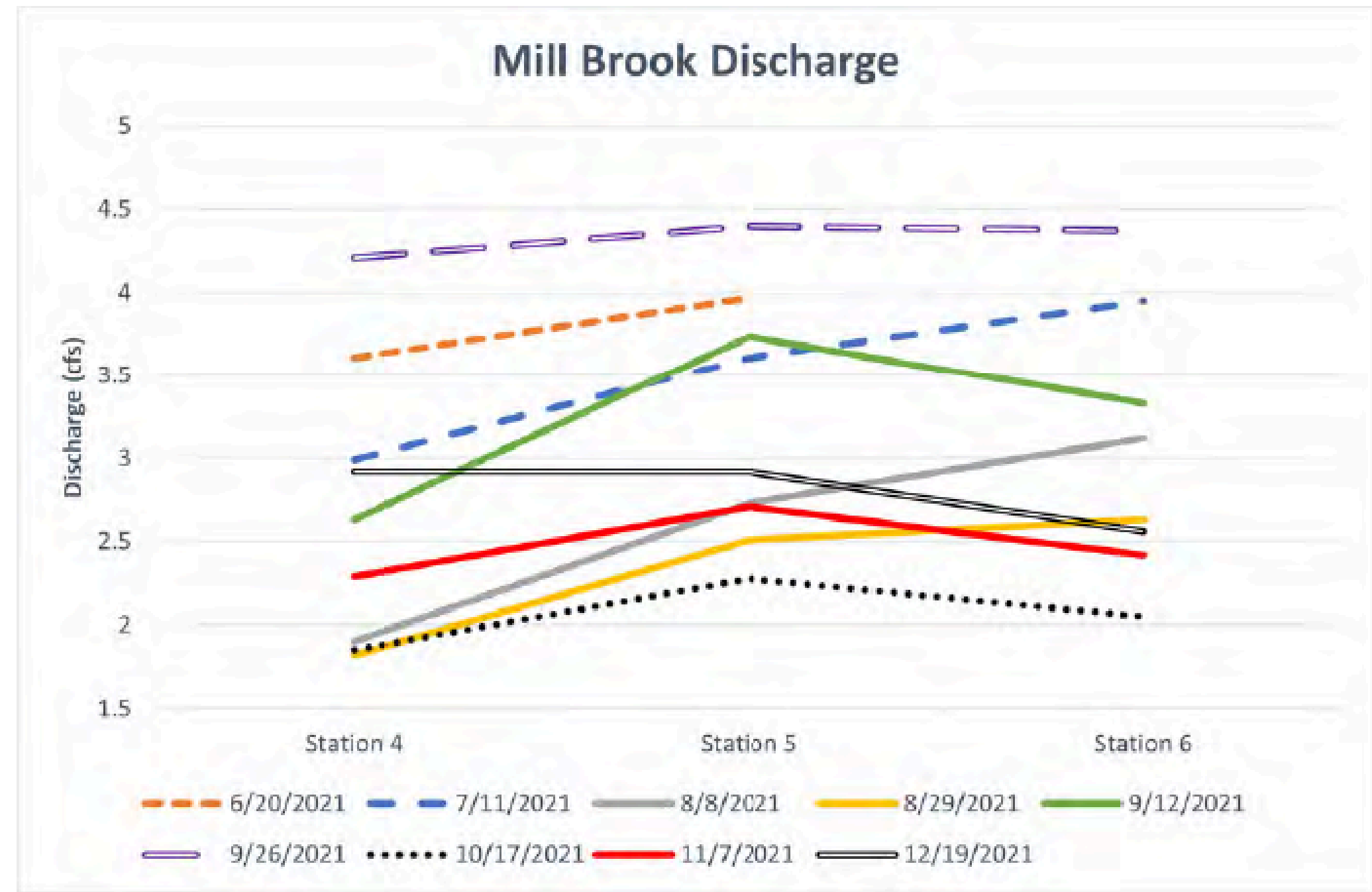


Figure 6 Mill Brook Discharge (cfs)

# 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

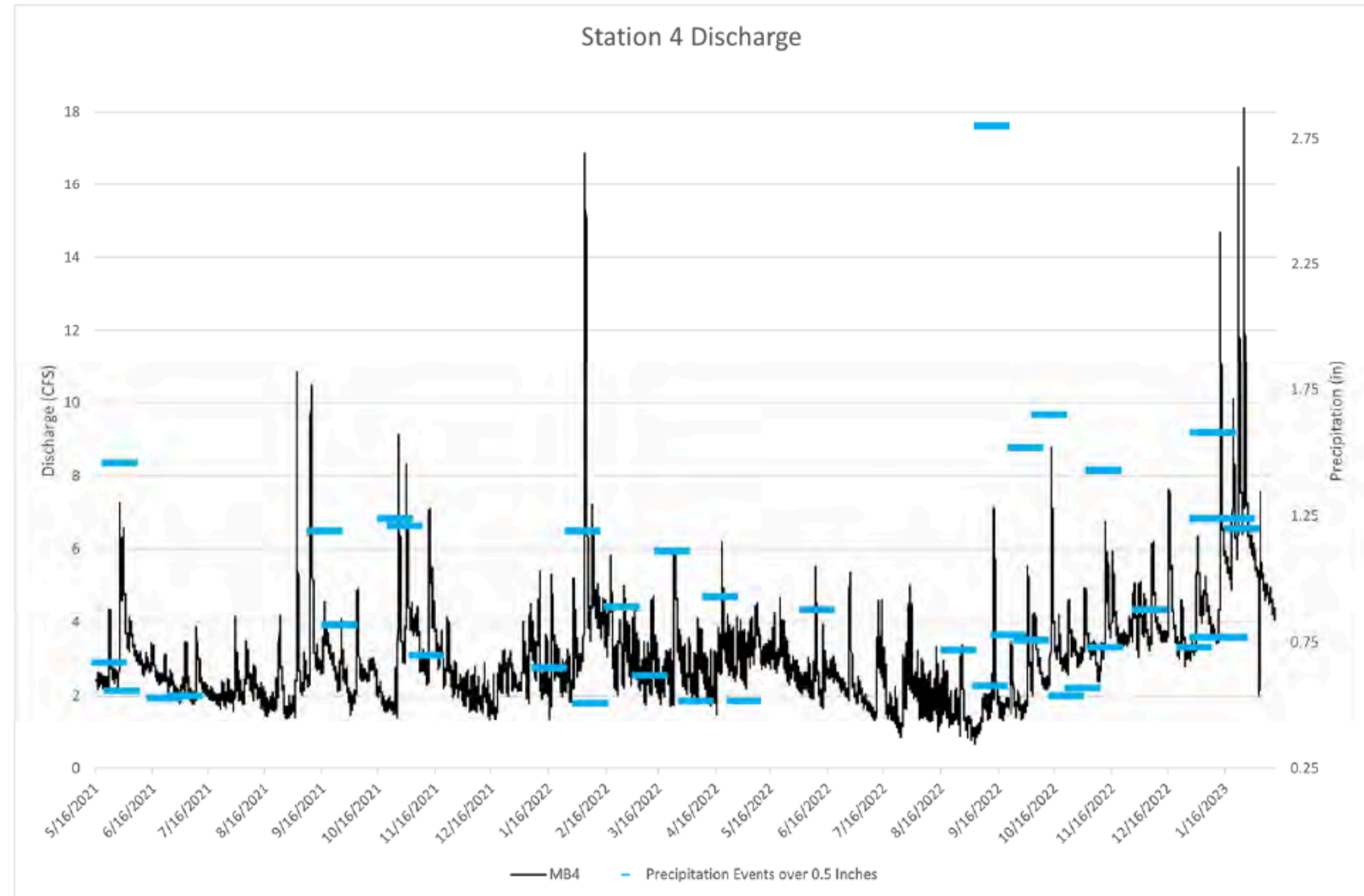
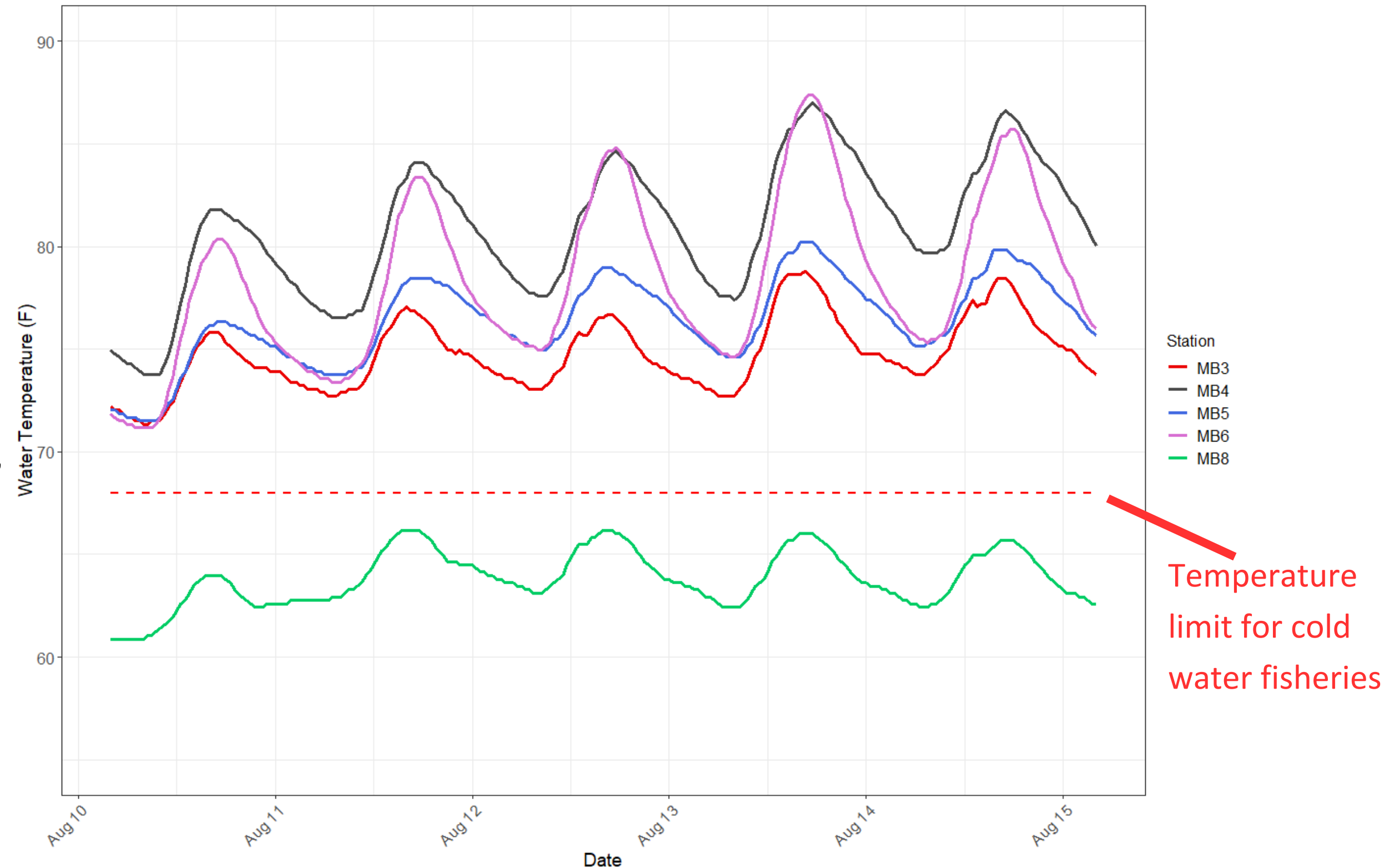


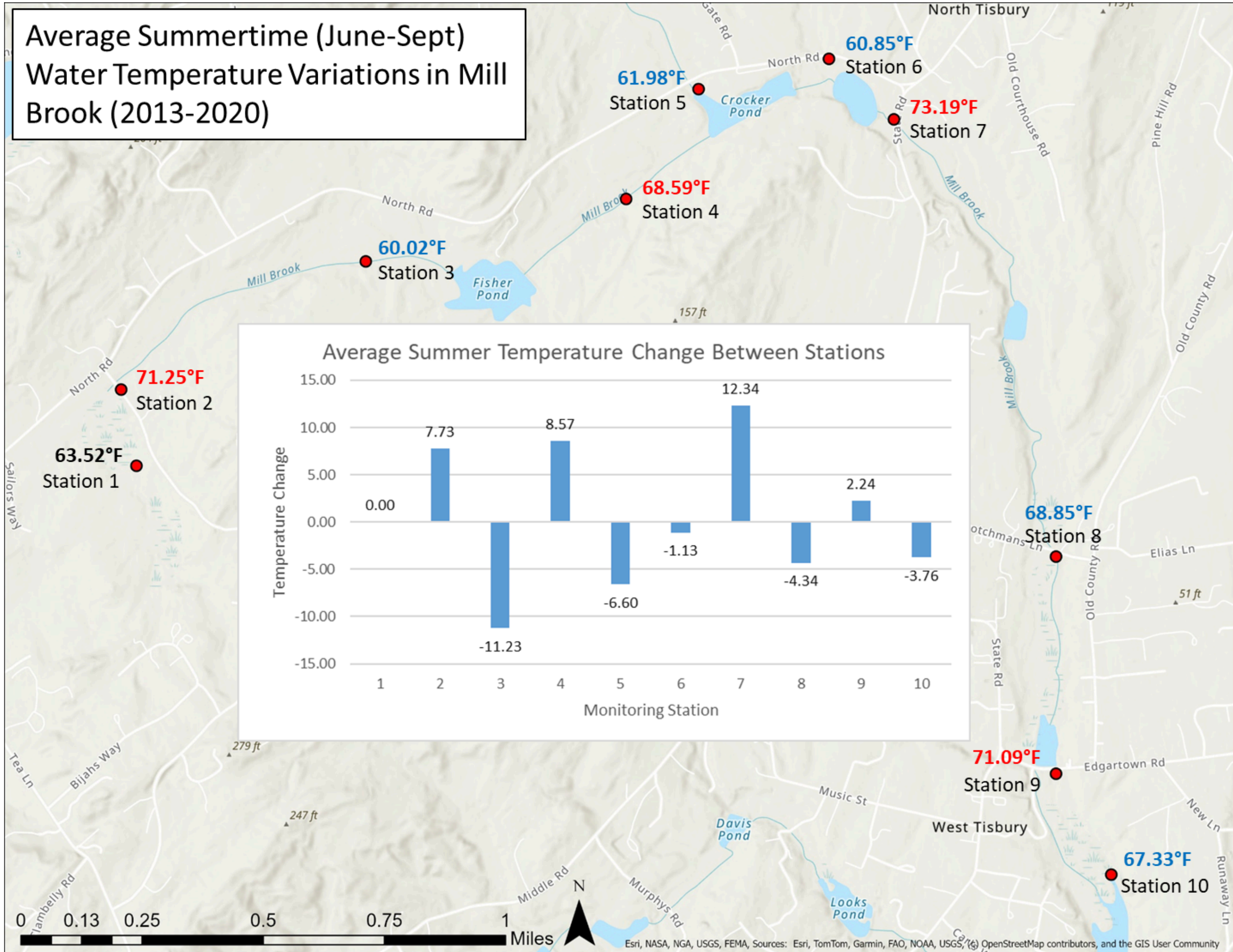
Figure 7 Station 4 Discharge Calculated from Stage-Discharge Relationship (cfs)

# 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)



# Average Summertime (June-Sept) Water Temperature Variations in Mill Brook (2013-2020)



Esri, NASA, NGA, USGS, FEMA, Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, OpenStreetMap contributors, and the GIS User Community

# 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

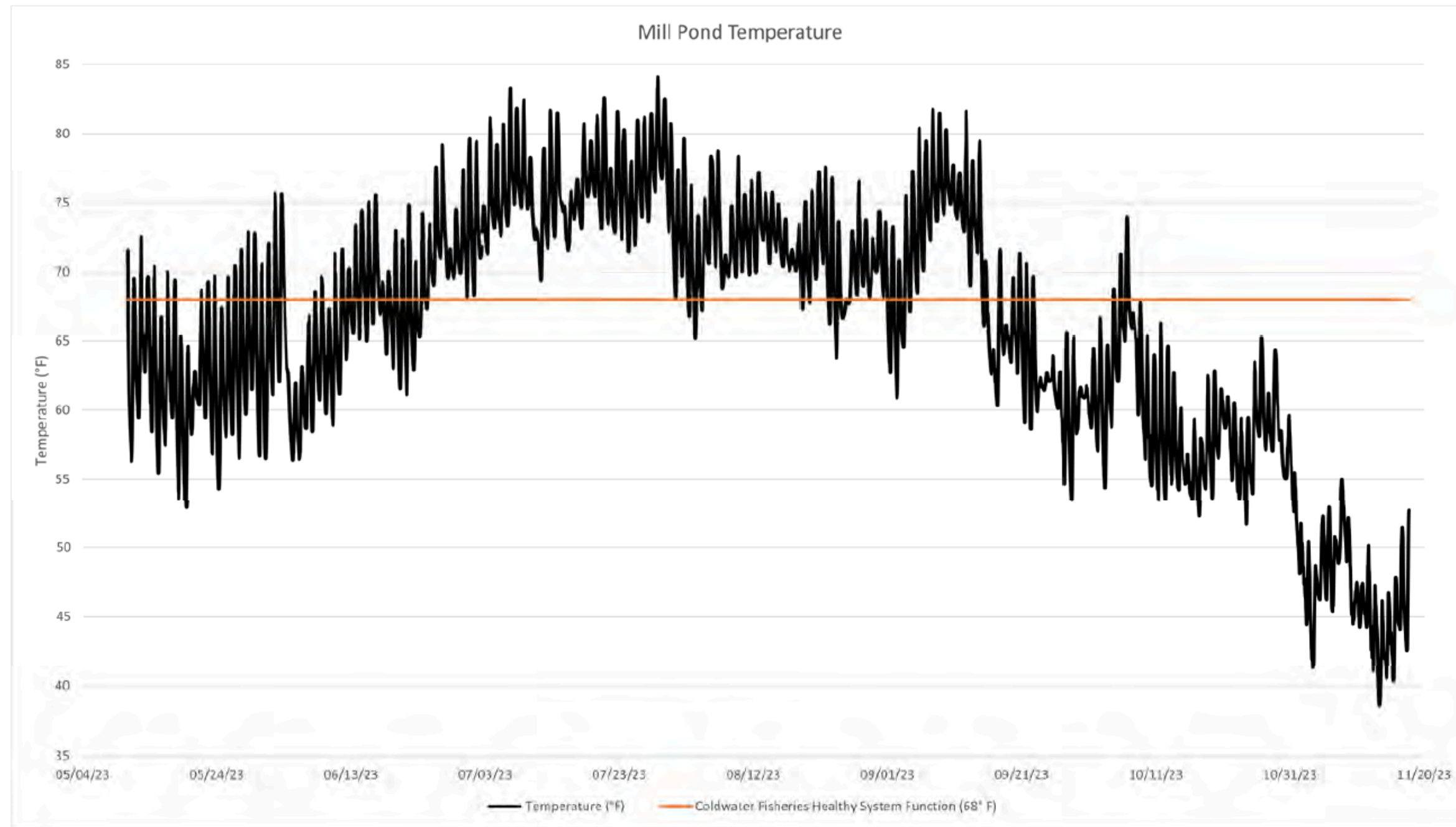


Figure 16 Mill Pond Temperature (°F)

# 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

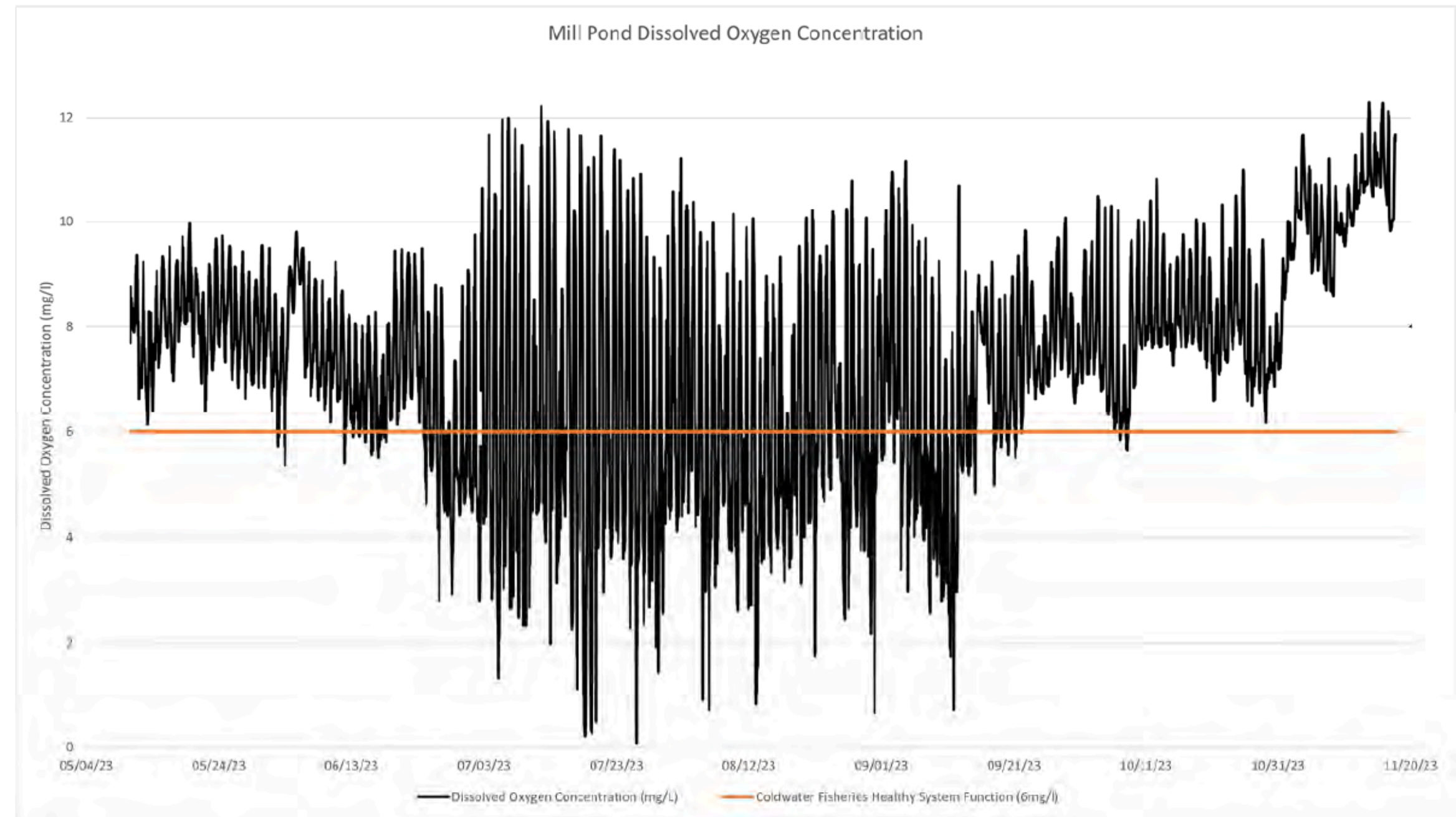
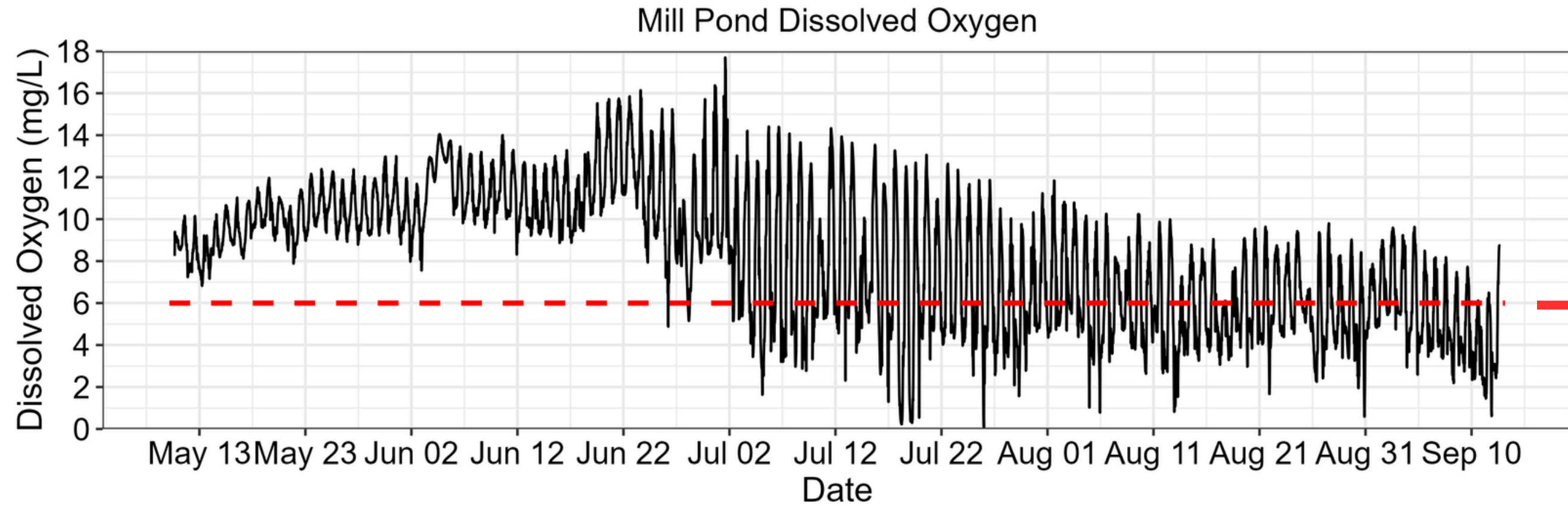


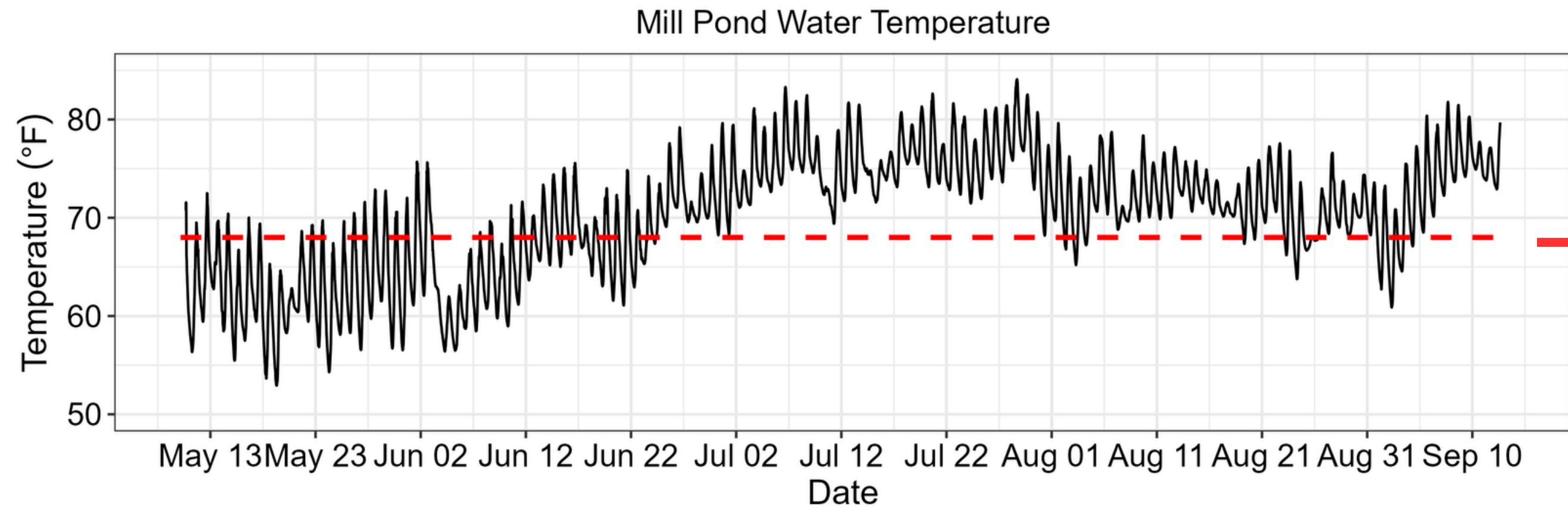
Figure 15 Mill Pond Dissolved Oxygen Concentrations (mg/l)

# 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. Dams negatively impact water quality and habitat. 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.

# DIRECTIONS FOR FUTURE MANAGEMENT: IMPOUNDMENTS AND DAMS

## IMPACTS OF IMPOUNDMENTS/DAMS ON ECOSYSTEMS

### Restrict Natural Flow

#### Increase water residence time

- Slow moving water allows for excess heating
- Promotes accelerated algal growth
- Excess heating and/or algal growth leads to decreased dissolved oxygen
- Degraded habitat and water quality

#### Prevent fish and wildlife passage

- Habitat fragmentation
- Disruption of life cycles
- Brook Trout, River Herring, Brook Lamprey, American Eel, White Perch

#### Road kill/Wildlife mortality



## MANAGEMENT SOLUTIONS

### Dam removal, restoration of natural streamflow

- Use Town funds to build/manage public space.

### Stream bypass

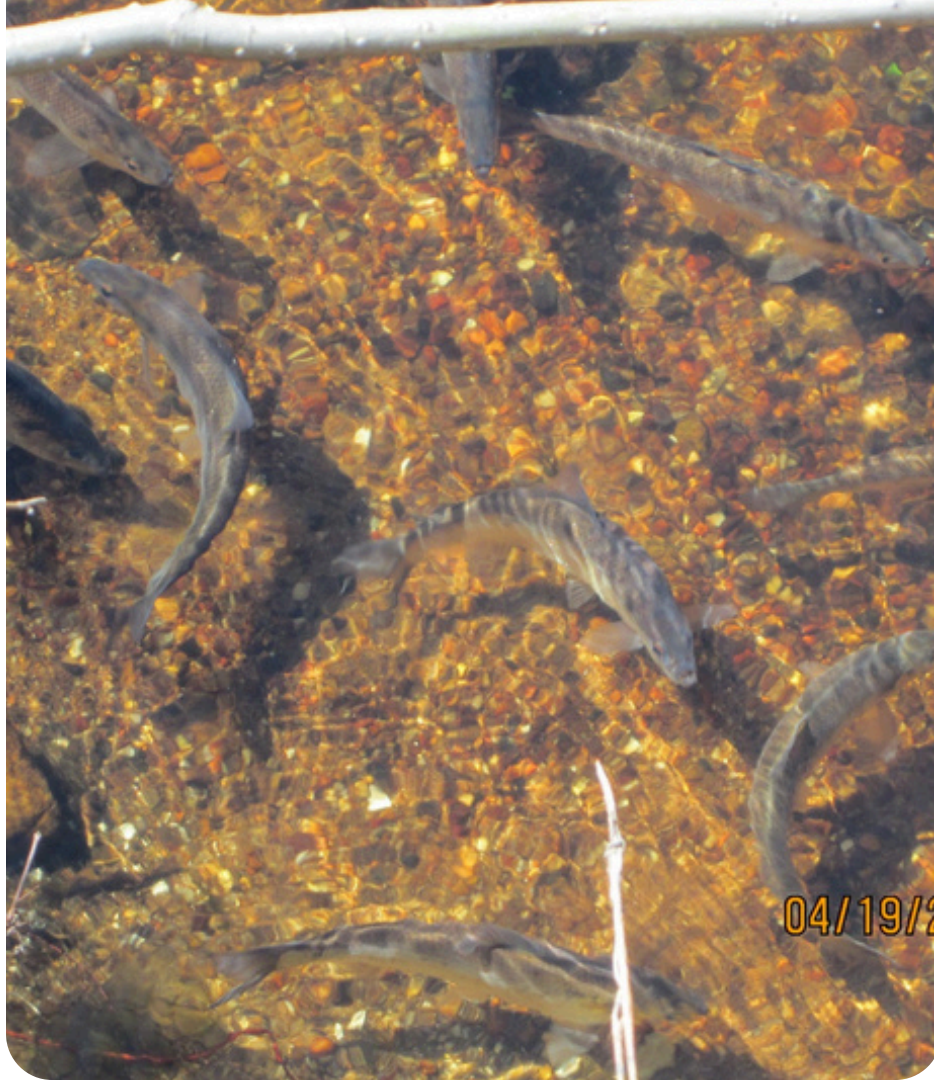
- Pursue engineering of separate pond-stream system to restore natural flow and wildlife passage

# Issues:

## Impoundment at Mill Pond

- Ecological Issues
  - Blocks fish and wildlife passage
  - Disrupts natural flow and habitat connectivity
  - Creates excess heat, degrading water quality and habitat
- Infrastructure
  - Maintenance of structure, spillway integrity, and road crossing
  - Stormwater runoff, climate change considerations
  - Dam safety inspections by qualified engineer every 5 years





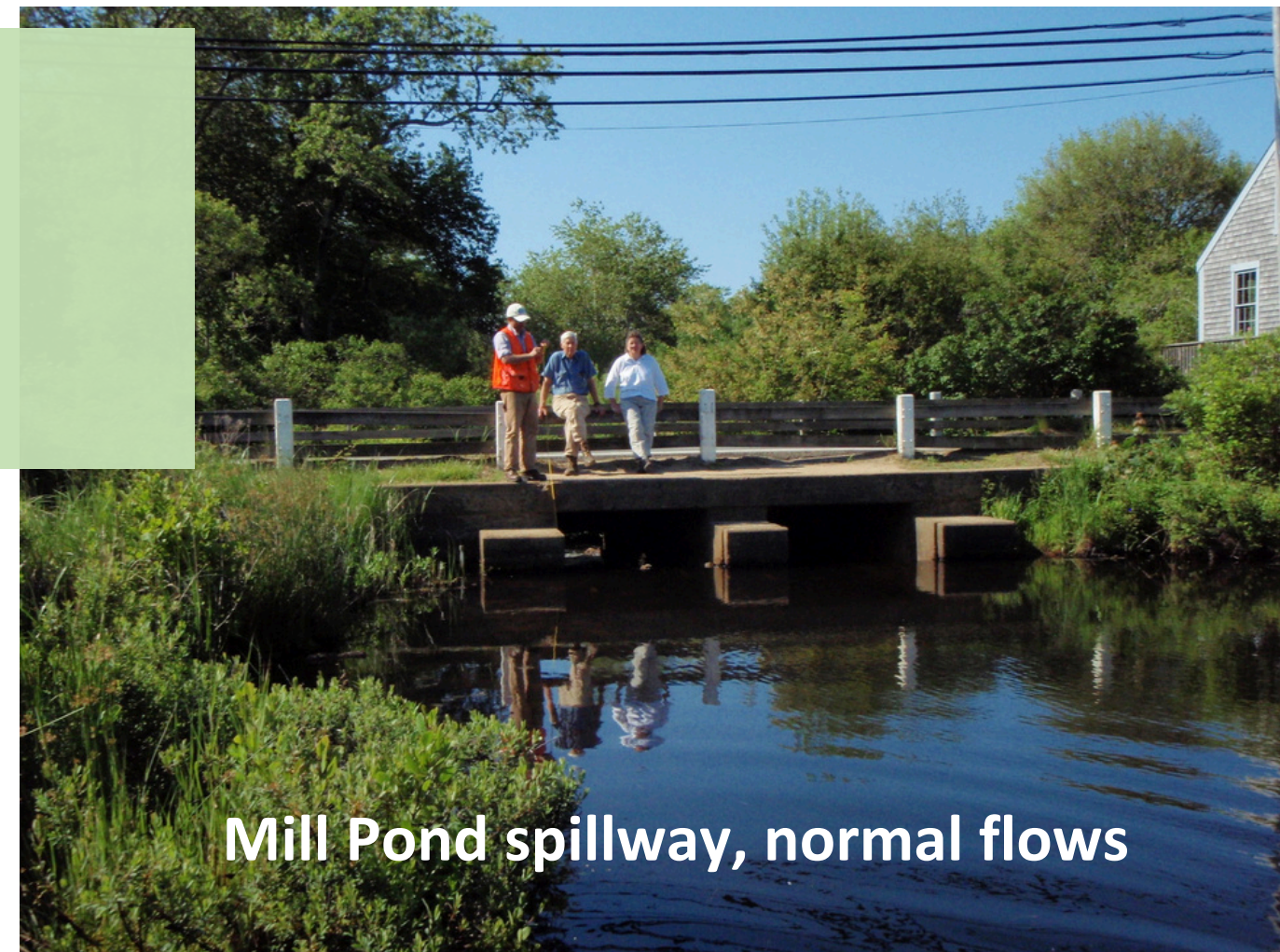
# Fish and Wildlife Passage:

- Habitat fragmentation
- Despite heroic efforts on the part of WT Herring Warden Johnny Hoy, migrating fish populations are unable to migrate upstream to reach suitable spawning habitat
- Additionally, excess heat during summer months creates a “thermal barrier” for cold water species, making Pond inhospitable and degrading downstream habitat
- River Herring are vitally important species for ocean food webs, populations are at all-time lows
- Other species: American eel, brook lamprey, brook trout
- Other types of wetland wildlife (otters, muskrats, turtles, snakes, frogs) are forced to cross West Tisbury-Edgartown road, resulting in a high incidence of roadkill



# Infrastructure and Climate Change Considerations

- Mill Pond Dam is classified as a “High Hazard” dam by MA State, due to its proximity to state highway
- Increased frequency and intensity of storms will threaten integrity of the structure
- Repairs and upgrades to the spillway will be necessary in the future



Mill Pond spillway, normal flows



Mill Pond spillway, 5" rainfall event

# Possible Town Management Options at Mill Pond

## Removal of Spillway Weir Boards

- Requires permitting, and some restoration work
- Would drain the existing pond and restore natural streamflow and help mitigate high temperatures
- Would remove a barrier allowing for fish and wildlife migration and restore habitat connectivity
- Provide better stormwater mitigation
- Space can be managed for habitat and public recreation

## Other Options

- Spillway upgrade to meet state stream crossing standards
- Storm water management

## Stream By-Pass

- Requires engineering, permitting, and construction/augmentation of the space
- Successful projects have been completed on the Cape
- Would establish a bypass stream and independent pond fed by groundwater
- Would restore natural stream function and eliminate the documented high water temperatures created by the impoundment
- Allow for fish and wildlife migration, restore habitat connectivity
- Provide better stormwater mitigation
- Maintain Mill Pond

## Mill Brook Watershed Management Committee Actions

- Investigate costs for weir board removal and stream by-pass.
- Engage with Conway School for visioning and site design mock-ups
- Continue to collect stream water quality and flow data

# Grey Willow Removal at Mill Pond

## Grey Willow - *Salix cinerea*

- Invasive deciduous tree or shrub native to Europe, West Asia, North Africa
- Grows rapidly in wetlands in dense thickets, re-sprouts from roots, branches.
- Outcompetes replaces native wetland plants, forming vast and dense thickets.
- Aggressive root system can disrupt wetland habitats, cause blockages, reductions in flow, alter natural hydrology, increase sedimentation rates.
- Removal via mechanical, targeted herbicide, or both.

## Mill Brook Watershed Management Committee Actions

- Work with local contractors to acquire a quote for removal
- Pursue funding

## Not to be confused with:

Water Willow or Swamp Loosestrife – *Decodon verticillatus*

- Native wetland species
- Habitat for Water-willow Borer – *Papaipema sulphurata*, a Threatened species in MA.



Grey Willow - *Salix cinerea*



Water Willow - *Decodon verticillatus*

# Water-Willow Stem Borer

Rare species survey was conducted on 10/1/21 at the Mill Pond for water willow stem borer, *Papaipema sulphurata*

The species was observed and reported to Massachusetts Natural Heritage and Endangered Species Program



This data is important for vegetation management recommendations

# DIRECTIONS FOR FUTURE MANAGEMENT: CULVERT UPGRADES

## UNDERSIZED/UNDERPERFORMING CULVERTS

### Restrict Natural Flow

- Erode stream beds and stream banks
- May increase flood risk in high rainfall events
- Upstream sedimentation
- Habitat degradation

### Prevent fish and wildlife passage

- Habitat fragmentation
- Disruption of life cycles



### Road infrastructure and public safety considerations

- Inadequately-sized culverts may cause localized flooding during storm events
- Damage or undermining of road

# CULVERT UPGRADES - NORTH ROAD

A photograph of a concrete culvert structure with a large circular opening, partially obscured by a thin tree branch. The water is dark and still.

WITCH BROOK  
CULVERT

- Does not meet MA Stream Crossing Standards
- Forms a hydraulic constriction on Witch Brook
- Moderate barrier to fish and wildlife passage

A photograph of a concrete culvert structure with a large circular opening, similar to the one in the first image. The water is dark and still.

UNNAMED  
TRIBUTARY  
CULVERT

- Does not meet MA Stream Crossing Standards
- Forms a hydraulic constriction on Unnamed Brook
- Moderate barrier to fish and wildlife passage

A photograph of a stream with water flowing over rocks. The water is dark and reflects the surrounding trees and sky. There are many fallen leaves on the banks and in the water.

COMMITTEE/TOWN  
ACTIONS

- Apply for State grants to engineer culvert replacements
- Continue water quality monitoring

## Directions for Future Management

# Storm Water and Road Runoff

### Impacts on Ecosystem Health

- Elevated water temperature
- Sedimentation
- Chemical pollution
- Degradation of water quality and habitat
- Increased stream flow and velocity

### Areas of Concern

- Scotchman's Bridge Lane
- Mill Pond
- State Road Culvert, North Tisbury

### Possible Town/Committee Actions

- Investigate funding for stormwater assessments and engineering
- Work with roads/highway departments to implement stormwater best management practices at areas of concern
- Town of West Tisbury already seeking amendments to fertilizer bylaws to comply with Conservation Commission standards

# Continued Monitoring of Brook and Wider Watershed

## Long-term monitoring of Mill Brook

- Maintain water flow and water quality monitoring sites at key locations throughout the brook
- Work with State, Town, and private partners to pursue management options and habitat/infrastructure improvements
- Continue macroinvertebrate and water quality data collection at 5-year intervals

## Tisbury Great Pond Watershed

- Contribution of Mill Brook data to long-term planning, management, and restoration efforts for Tisbury Great Pond
- Flow, nutrient, and other water quality data help to refine models for TGP
- Provide baseline data for wastewater management planning processes

## Tiasquam River

- Conduct flow, water quality, invertebrate monitoring throughout Tiasquam River

---

# THANK YOU

QUESTIONS  
DISCUSSIONS  
MORE INFORMATION



# Resources and Informative Links

- [Mill Brook Watershed Management Committee Public Info Session Recording - MVTV, 2/23/2025](#)
- [Mill Brook Water Quantity and Quality Assessment Summary - Horsley Witten Report, 2024](#)
- [Mill Brook Aquatic Biomonitoring 2022-2023 - Greg Whitmore, 2023](#)
- [2018 Mill Brook Watershed Study Report and Recommendations - Town of West Tisbury, 2018](#)
- [2018 Mill Brook Study Appendix A - Town of West Tisbury](#)
- [MA Division of Ecological Restoration: Small Dams Have Large Impacts on Water Quality](#)
- [Upper Childs River Restoration Project, Post-Construction Report - Falmouth Rod and Gun Club, 2023](#)
- [MA State Stream Crossing Standards - MA Division of Ecological Restoration](#)
- [MA Stormwater Handbook and Stormwater Standards - MA Department of Environmental Protection](#)