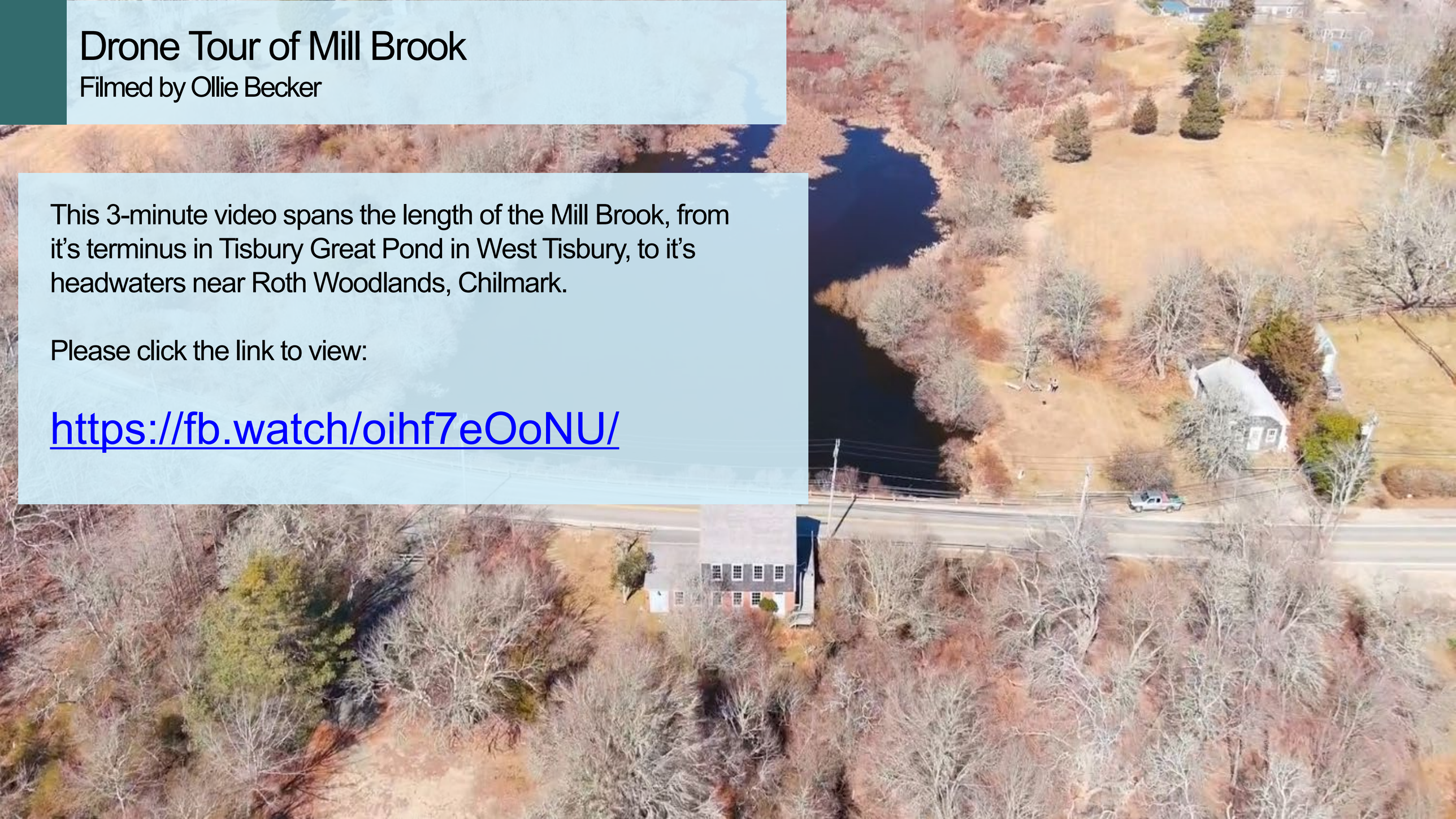
Mill Brook Watershed Management Committee Fall 2023 Data Collection Update

Drone Tour of Mill Brook

Filmed by Ollie Becker



This 3-minute video spans the length of the Mill Brook, from it's terminus in Tisbury Great Pond in West Tisbury, to it's headwaters near Roth Woodlands, Chilmark.

Please click the link to view:

https://fb.watch/oihf7eOoNU/

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

Current Operations and Objectives

Results of initial study provided many recommendations for future study and management goals

In 2018 residents voted at Town Meeting to allocate funds from the Community Preservation Act to fund a second study to address recommendations from previous study, as well as fill gaps and expand on existing dataset.

Current committee members began meeting to design and implement second study in 2019

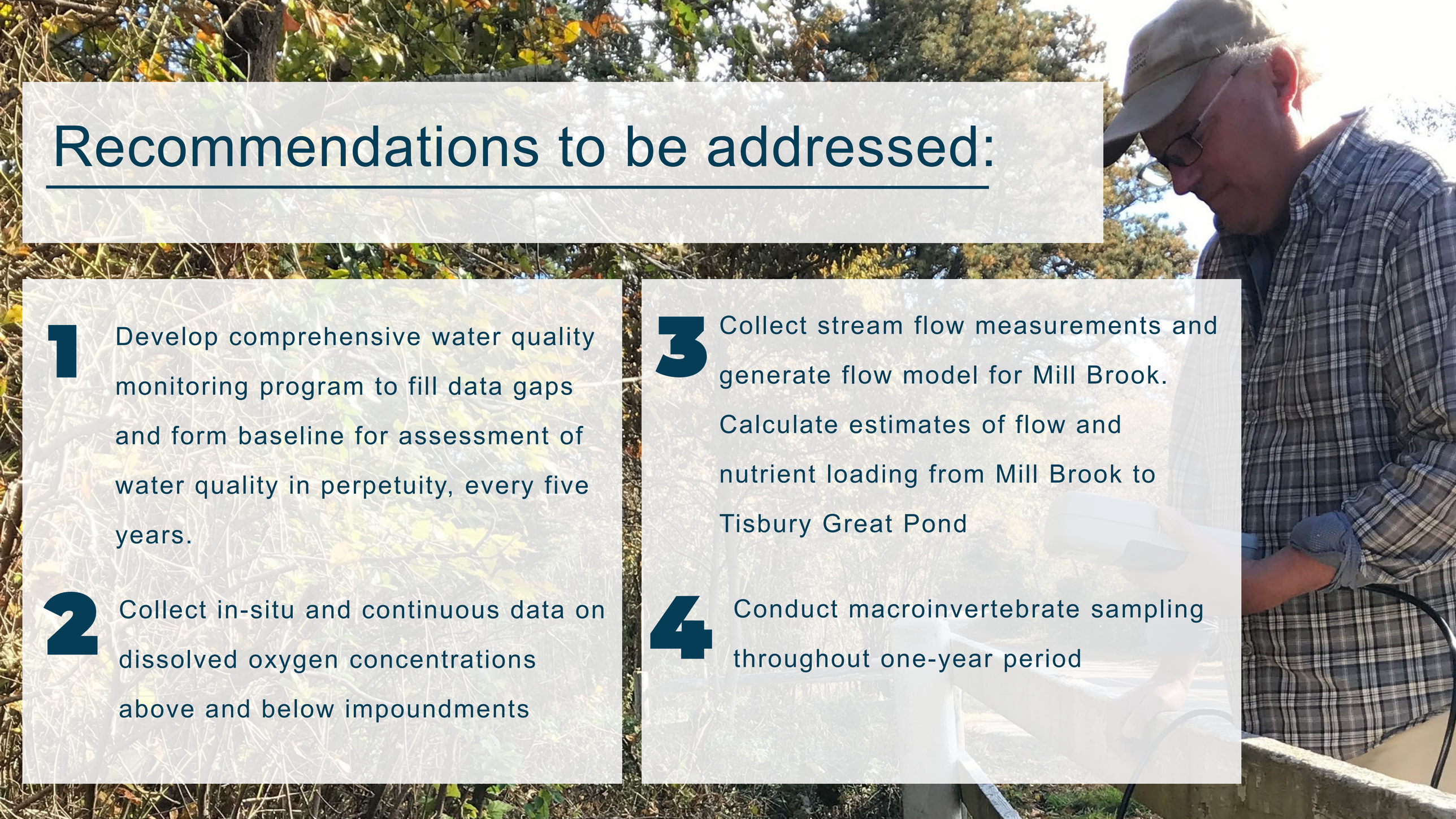
Recommendations to be addressed:

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



Goal

Collect baseline data to inform sound ecological and watershed management options for our community

Study Area: Mill Brook Watershed

- Total area: 2,928 acres
- Mill Brook is approximately 4 miles long
- Approximately 1.4 billion gallons average annual flow

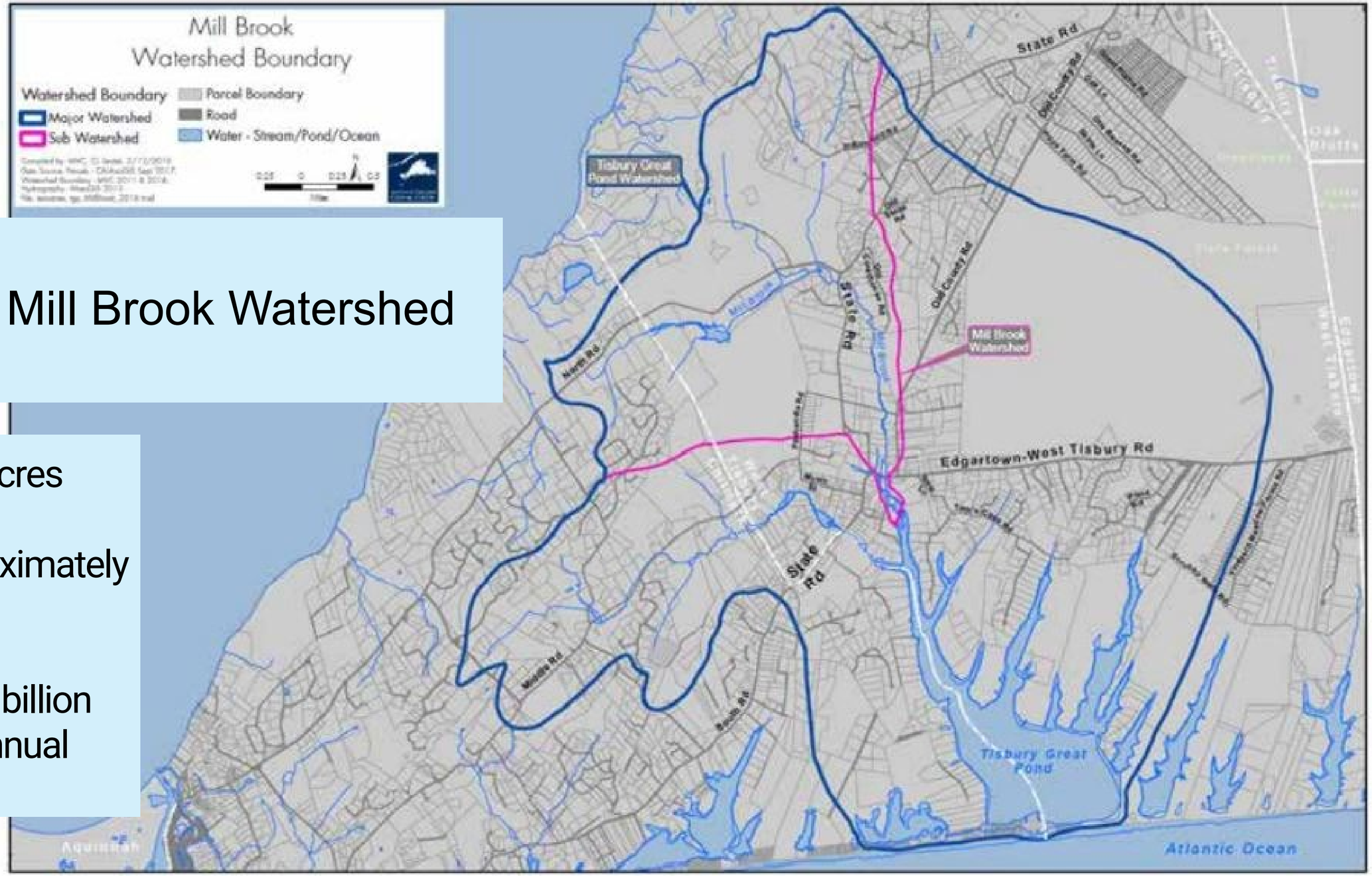
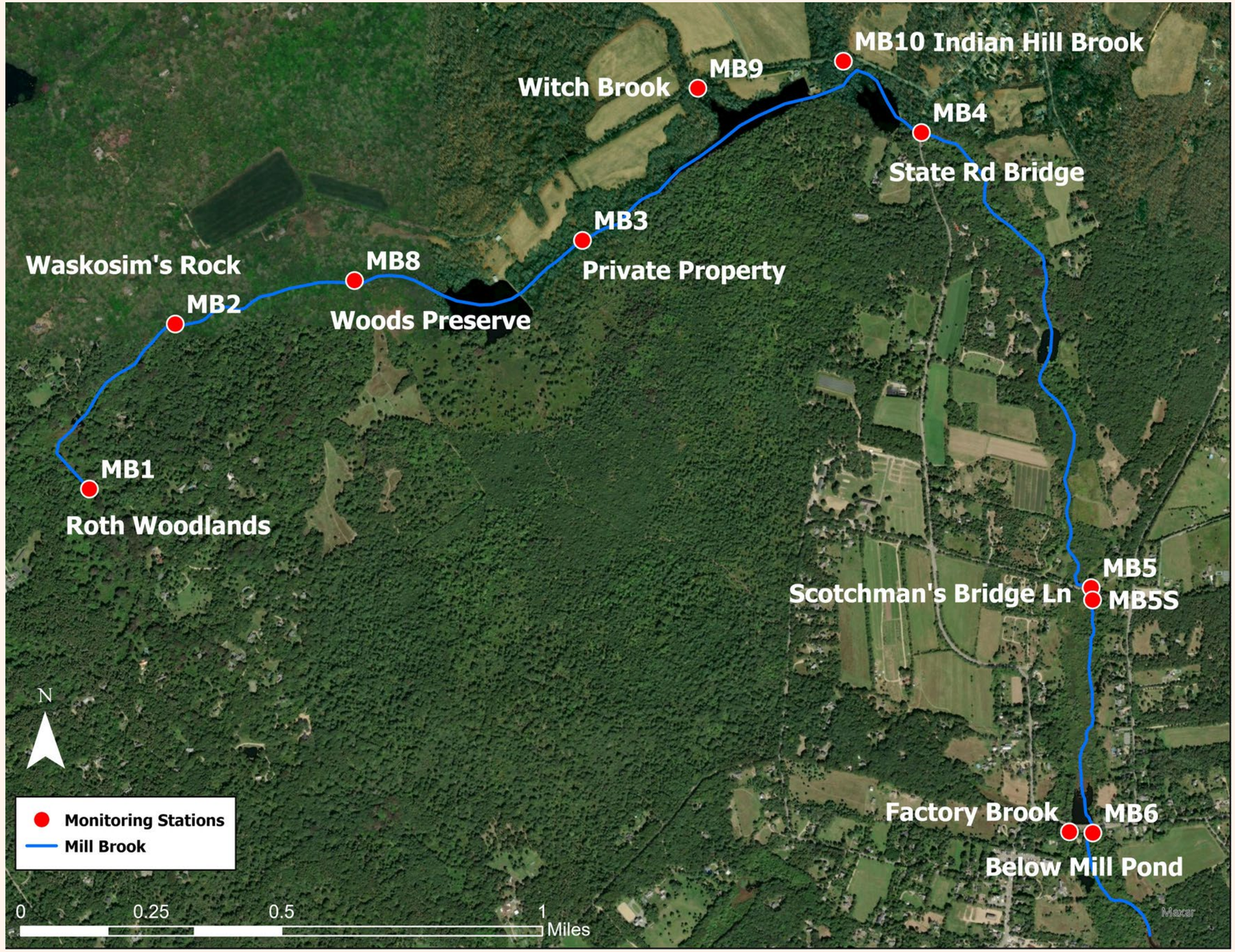


Fig. 3 Tisbury Great Pond Watershed outlined in blue, Mill Brook Watershed outlined in pink
Map by MVC-Chris Seidel

Mill Brook Monitoring Stations 2019 - Present

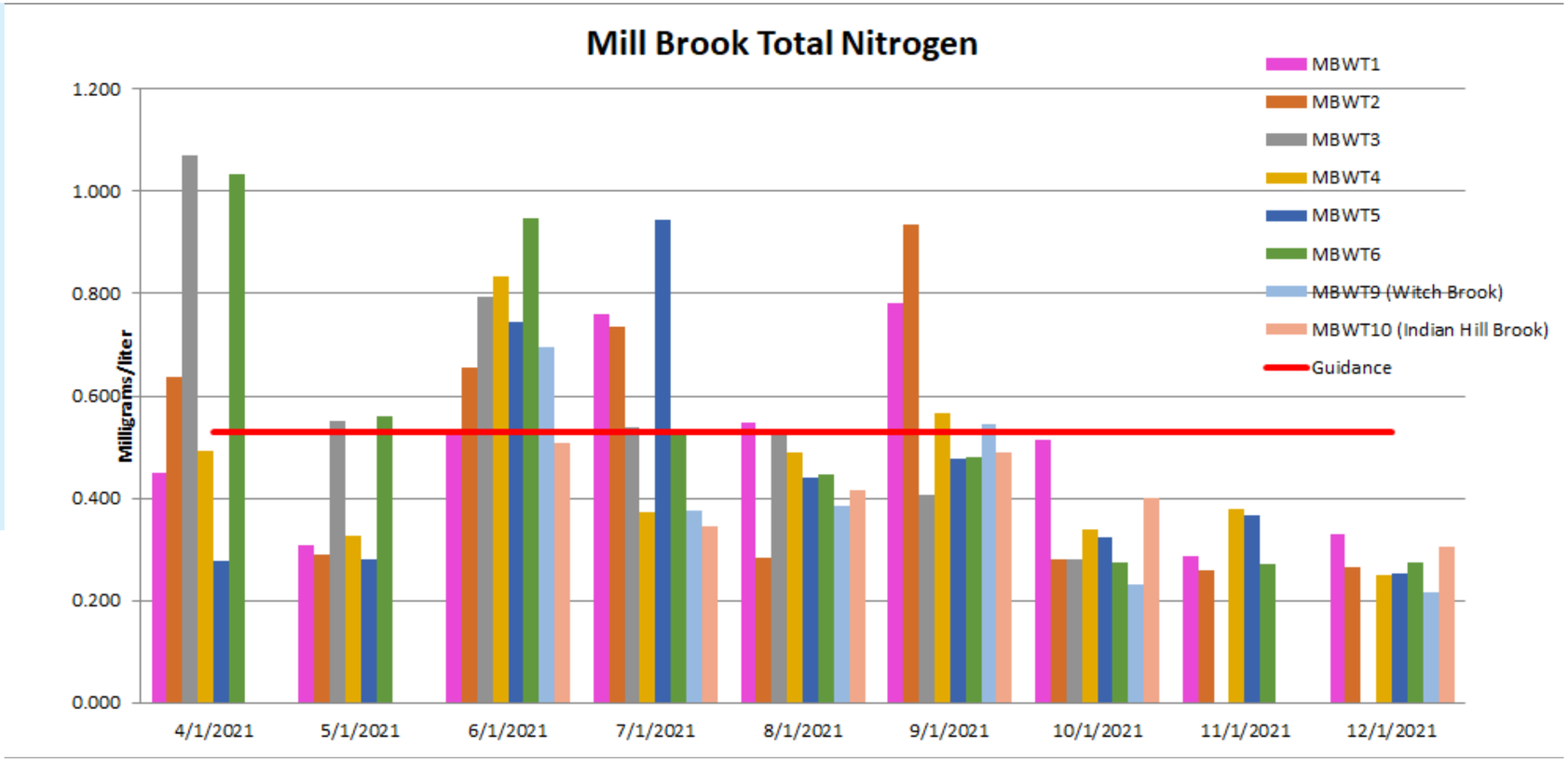
- 10 monitoring sites established
- Criteria for site selection:
  - Physical attributes or structures which may influence water quality
  - Adequate flow, width, and substrate for flow measurements
  - Historical monitoring locations
  - Access
- Flow data and continuous water elevation loggers collected at 6 stations
- Macroinvertebrate sampling conducted at 6 stations



Water Quality: Nitrogen Analysis

Total Nitrogen data for station MB1 at the head of Mill Brook, MB4 below Priesters Pond, MB5 at Scotchmans Bridge Ln, and MB6 below the Mill Pond.

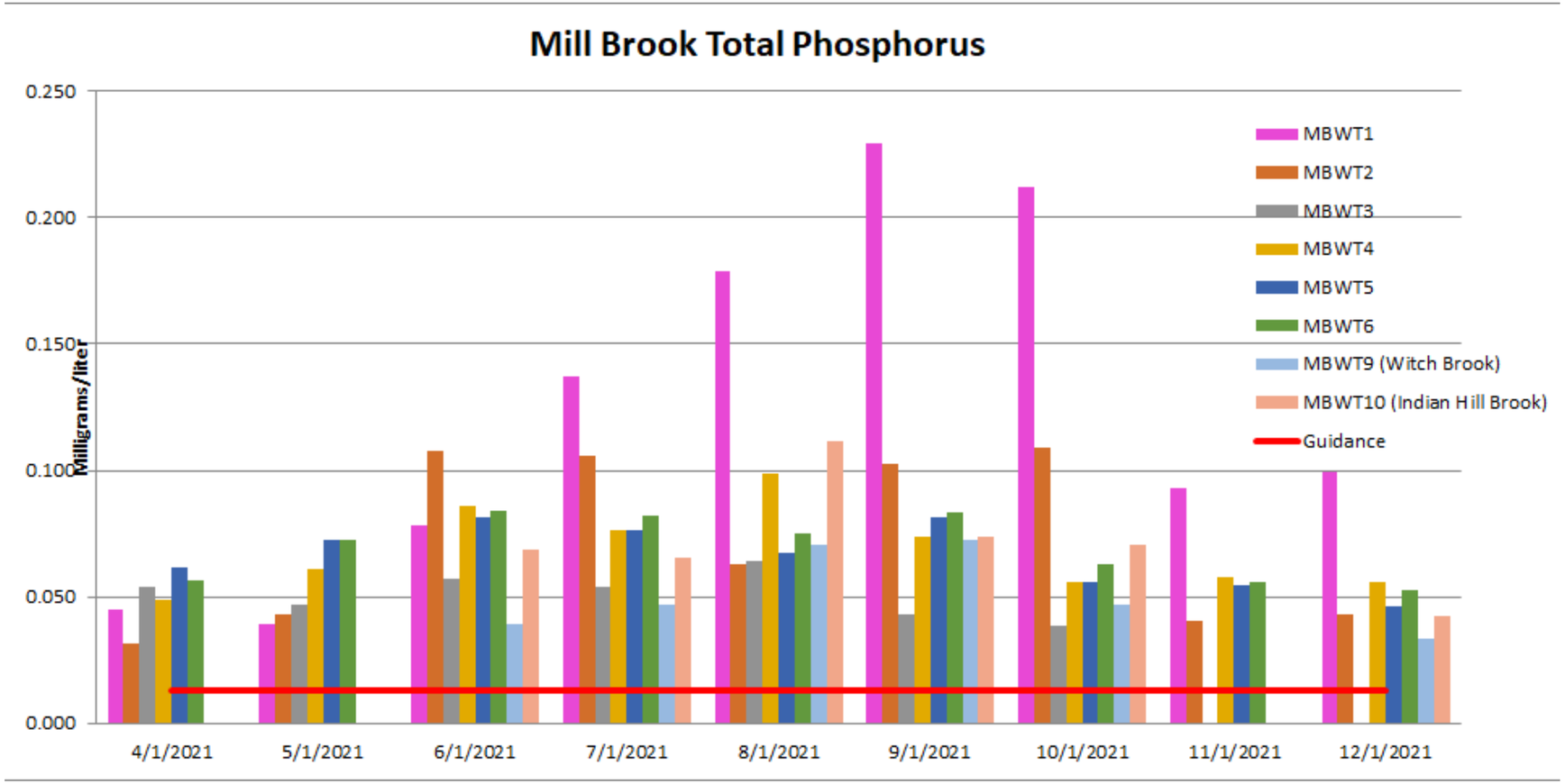
Total Nitrogen is the sum of dissolved organic nitrogen, particulate nitrogen, nitrite, nitrate and ammonium.

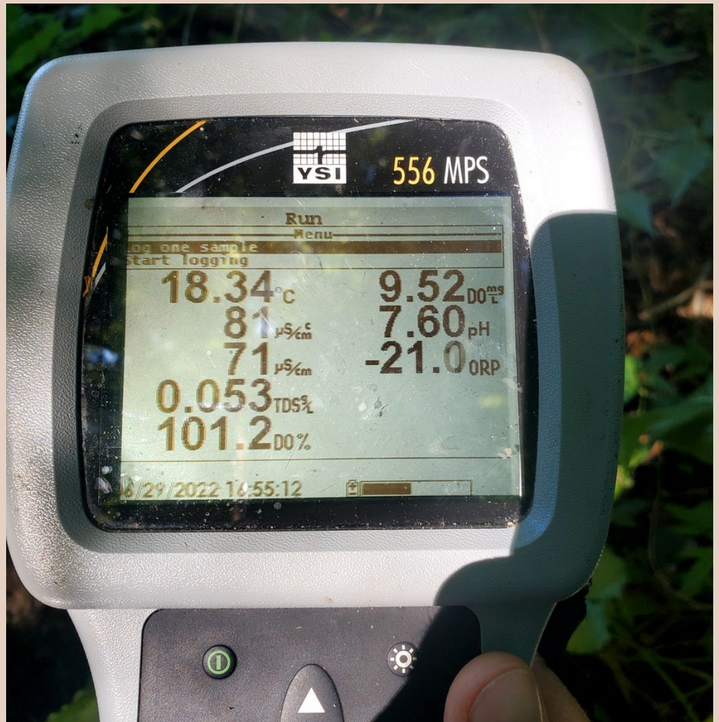


Water Quality: Phosphorus Analysis

Total phosphorus data for all stations. In fresh waters, phosphorus is typically scarce and when added can stimulate algae blooms.

Total phosphorus is the sum of orthophosphate, condensed phosphate, and organic phosphate





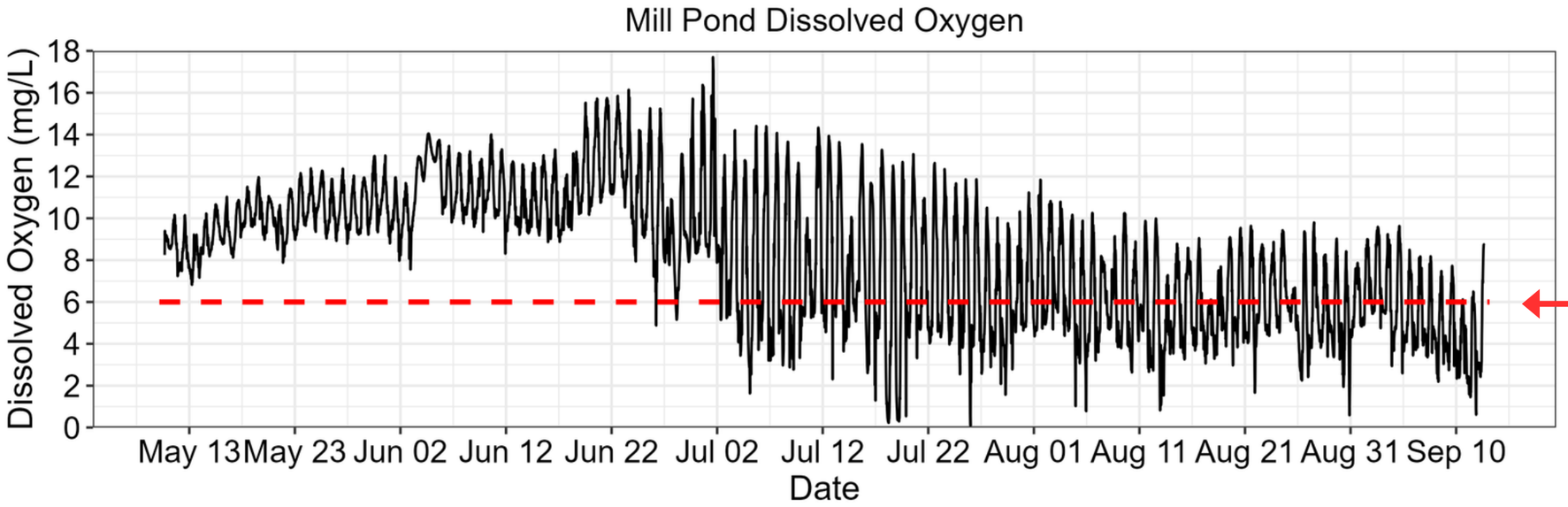
Water Quality Monitoring

- Used YSI 556 MPS handheld multi-meter to collect in-situ water quality data:
  - Temperature
  - Conductivity
  - Dissolved Oxygen
  - pH

- In addition to these field measurements, water samples were collected at 9 locations on 13 dates during 2021 and 2022 for lab analyses for:
  - phosphorus (2 parameters)
  - nitrogen (4 parameters)
  - organic matter
  - chlorophyll

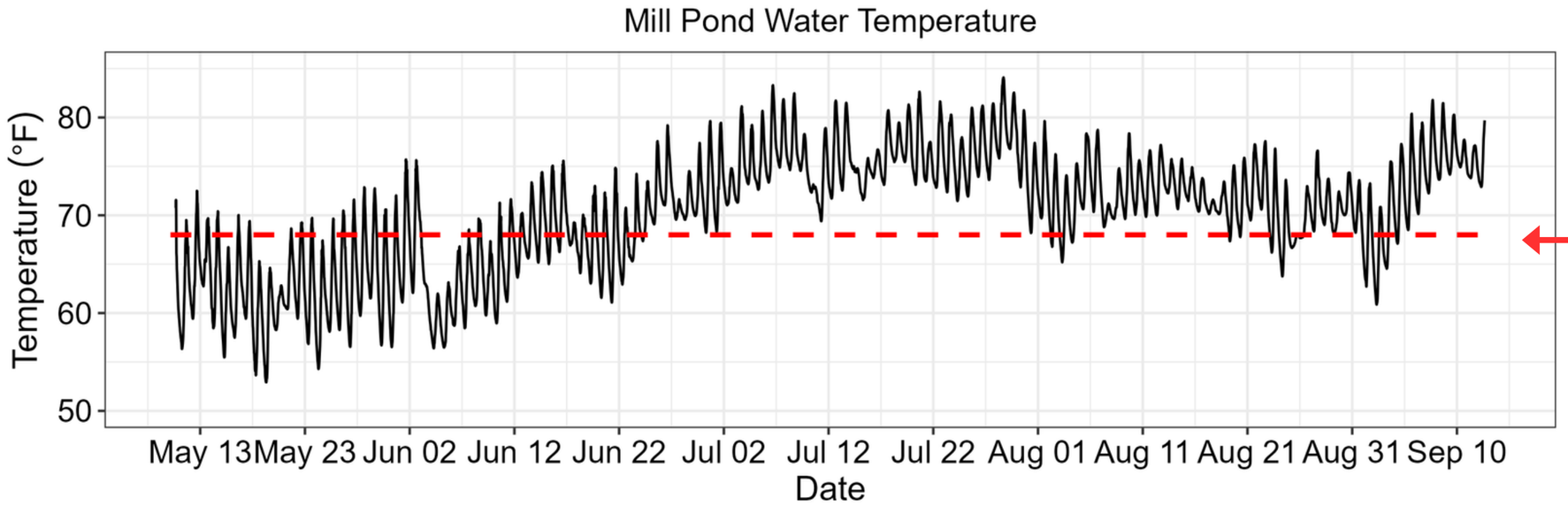
- When combined with the flow data, we can determine the annual nitrogen load from Mill Brook to Tisbury Great Pond.

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

Macroinvertebrate Sampling

- Macroinvertebrate surveys are commonly used to assess the quality of the stream habitat.
  - Short life cycle
  - Reduced mobility
  - Easy to catch
  - Vary in tolerance to pollution
  - Produces a snapshot of stream health at specific locations that can be tracked over time.

Sampling occurred at 6 sites once a month for a year.
Committee members plus additional volunteers conducted the sampling.
Samples were sent to Entomologist Greg Whitmore for identification and analysis.

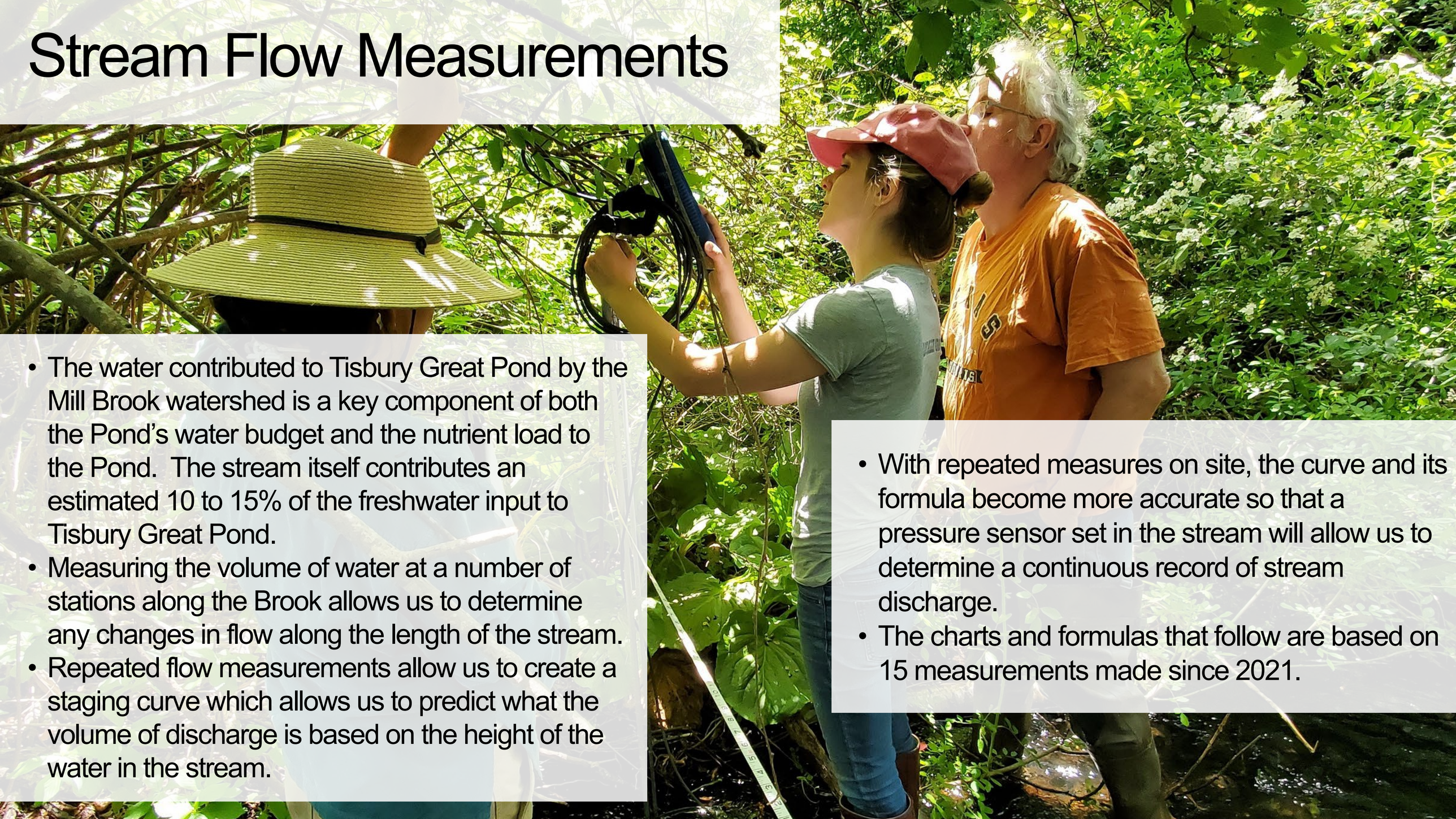
Water-Willow Stem Borer

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

Stream Flow Measurements



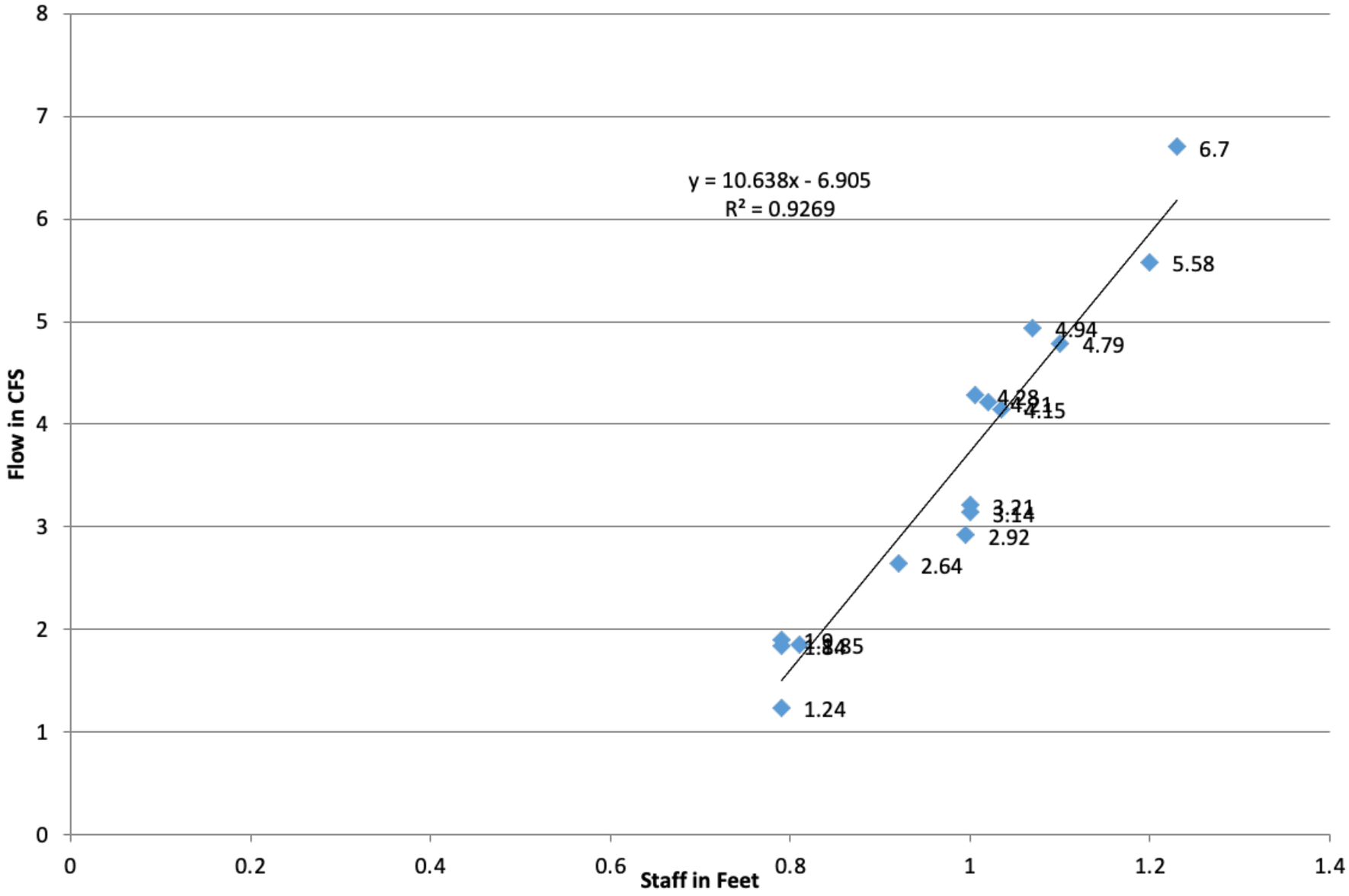
- The water contributed to Tisbury Great Pond by the Mill Brook watershed is a key component of both the Pond's water budget and the nutrient load to the Pond. The stream itself contributes an estimated 10 to 15% of the freshwater input to Tisbury Great Pond.
- Measuring the volume of water at a number of stations along the Brook allows us to determine any changes in flow along the length of the stream.
- Repeated flow measurements allow us to create a staging curve which allows us to predict what the volume of discharge is based on the height of the water in the stream.

- With repeated measures on site, the curve and its formula become more accurate so that a pressure sensor set in the stream will allow us to determine a continuous record of stream discharge.
- The charts and formulas that follow are based on 15 measurements made since 2021.

Flow velocity measured with a Hach Electromagnetic Flow Sensor

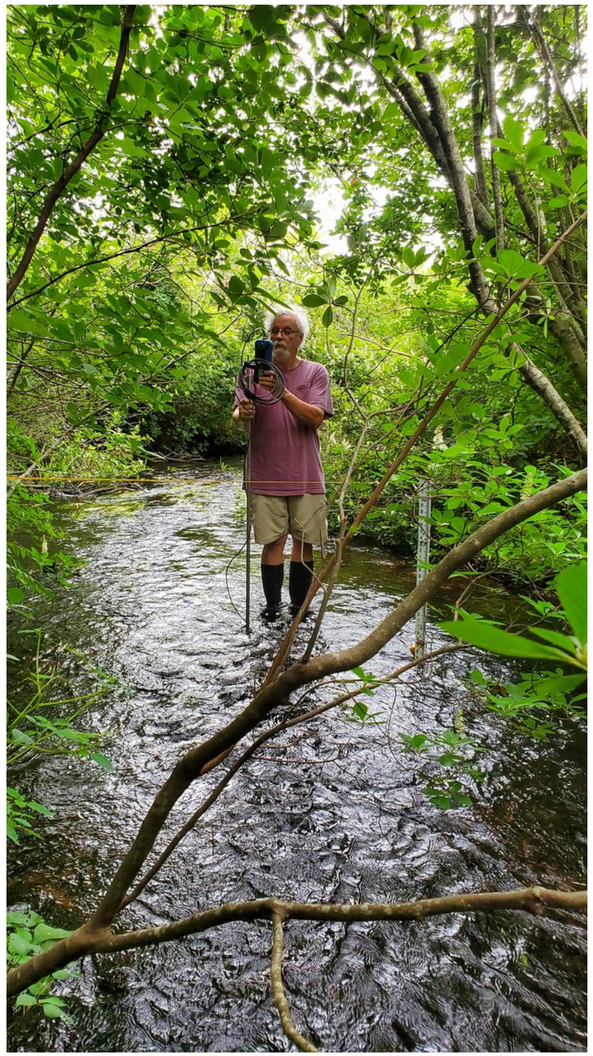
The Hach 950 records stream velocity and depth at regular intervals and the software converts that information into a stream volume in cubic feet per second.

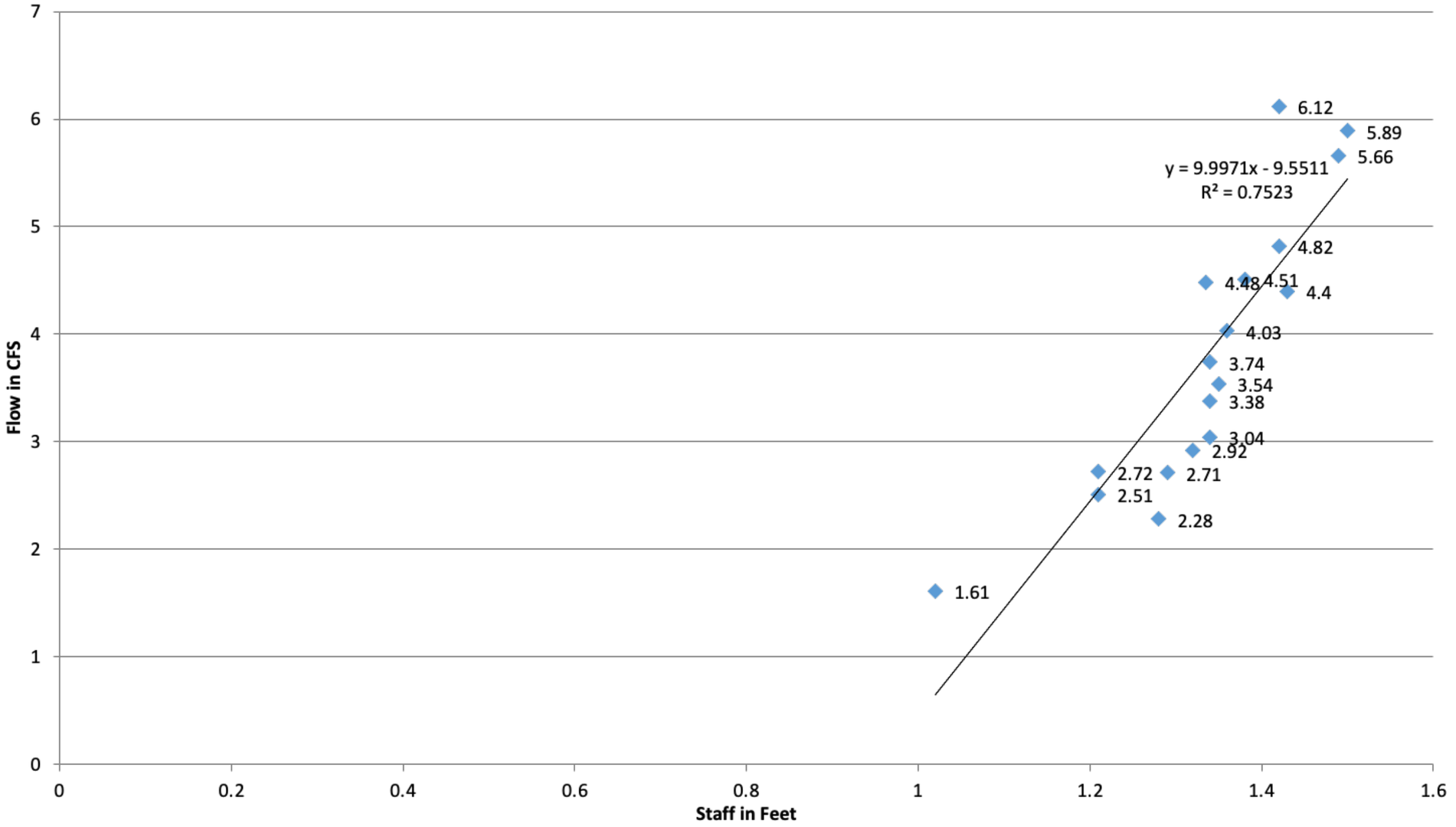
Stage-Discharge Curve
Mill Brook Station 4 – Just Below Priesters Pond



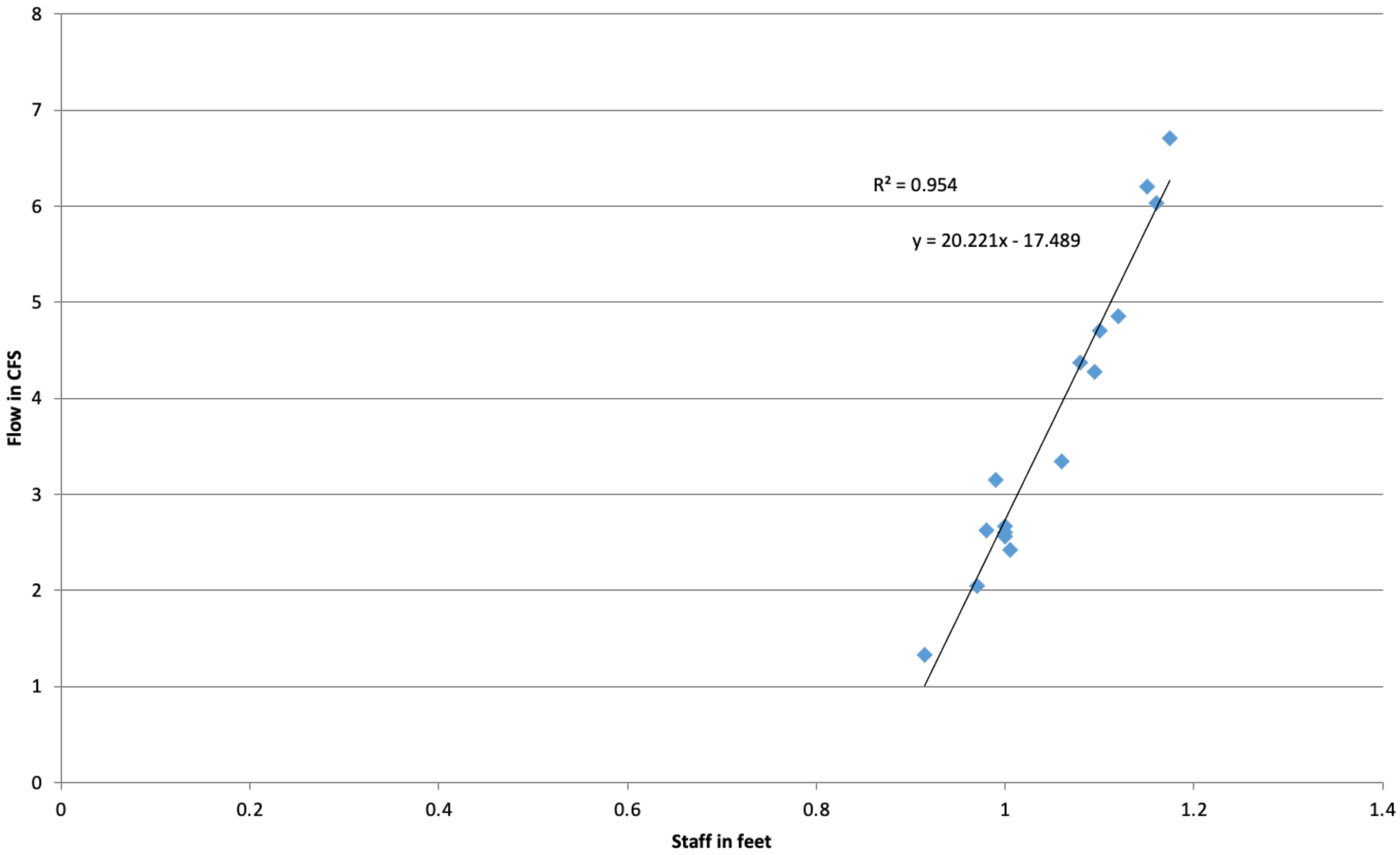
The field measurements of stream height and flow shown on these graphs create a formula that allows us to predict how much water is flowing at each station with only a height measurement. This formula can be used to develop annual water budgets for Mill Brook at each station and total flow into Tisbury Great Pond. This is a critical piece of information to more precisely determine the annual contribution of nutrients to the Great Pond.

Stage-Discharge Curve
Mill Brook 5 Scotchmans Lane





Stage Discharge Curve
Mill Brook 6 Just Below Mill Pond



Turning Field Measurements into a Continuous Flow

A recording pressure sensor is set into the stream to record pressure (determined by the height of the stream) every 30 minutes. Once these readings are linked to the Stage-Discharge Curve a continuous record of flow is made.

Volunteer statistics

(in-person hours)

- Approximately 40 field days
- Nearly 300 hours of field work
- Approximately 60 hours of data management
- Nearly 300 hours of meetings
- Committee continues to collect water quality and flow data on an ongoing basis

Next Steps

- Committee to review results of Horsley Witten report (pending).
- Committee to review results of Horsley Witten report along with 2018 study and recommendations with WT Select Board.
- Committee and Select Board to recommend management actions based on all previous reports and data.
- In 2024, Committee and Select Board will hold a public forum on study results and recommended actions.