Protecting a Great Pond: Watershed Management Strategies to Control Nutrient Pollution

A Collaboration Between Fall River, Westport, Tiverton, and other Public and Private Partners

Woodard & Curran

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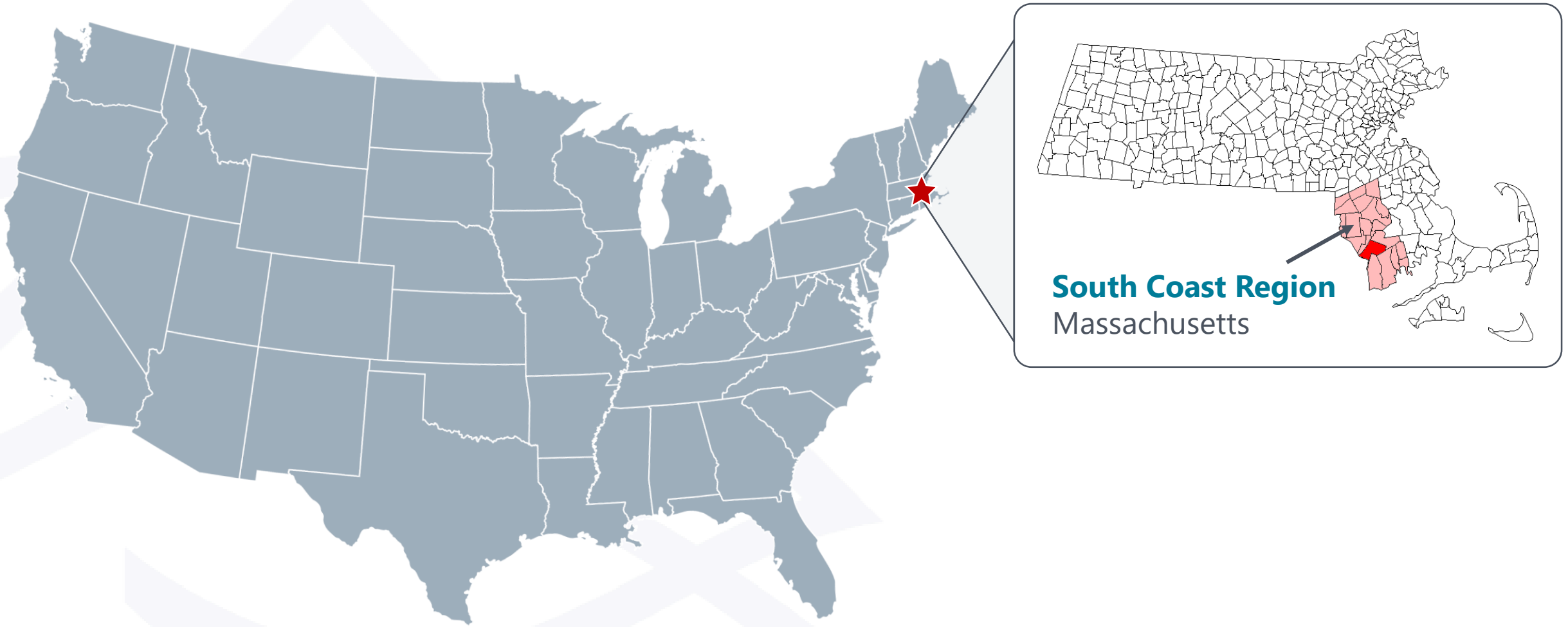
NEW ENGLAND WATER ENVIRONMENT ASSOCIATION
NEWEA
WORKING FOR WATER QUALITY

Presentation Overview

- Regional Background & Community Partnerships
- Watershed Assessment
- Internal Pond Assessment
- Next Steps

Regional Background & Community Partnerships

Where Are We?



Community Partnerships

UMass Dartmouth

BayCoast BANK

MVP
Municipal Vulnerability Preparedness

TOWN OF WESTPORT · MASSACHUSETTS · INCORPORATED A.D. 1787

TIVERTON
FOUNDED IN MASSACHUSETTS IN 1694 . FOUNDED IN RHODE ISLAND IN 1747

CITY OF FALL RIVER
Community Utilities
WATER & SEWER SYSTEMS

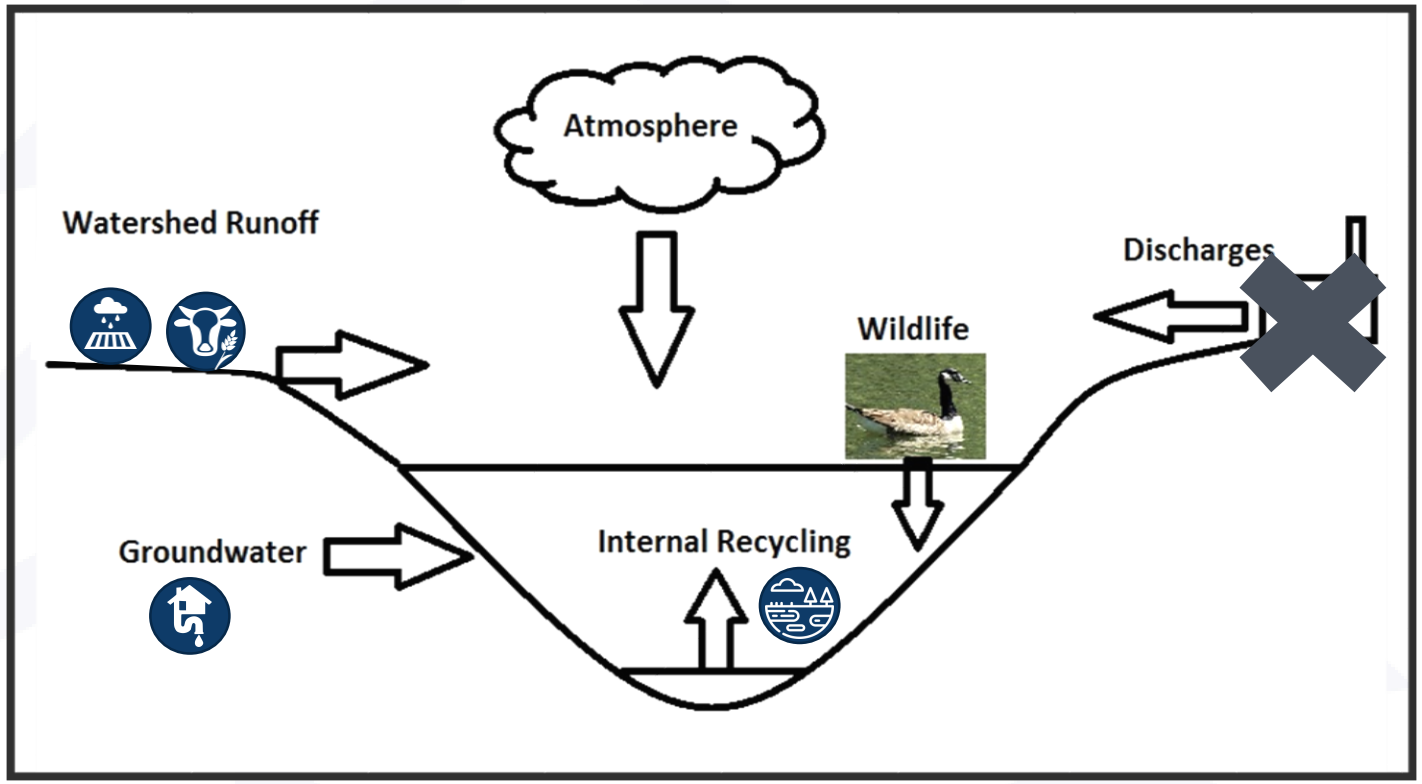
Representative
Paul A. Schmid, III
Democrat,
8th Bristol

Senator
Michael J. Rodrigues
Democrat, First Bristol and Plymouth

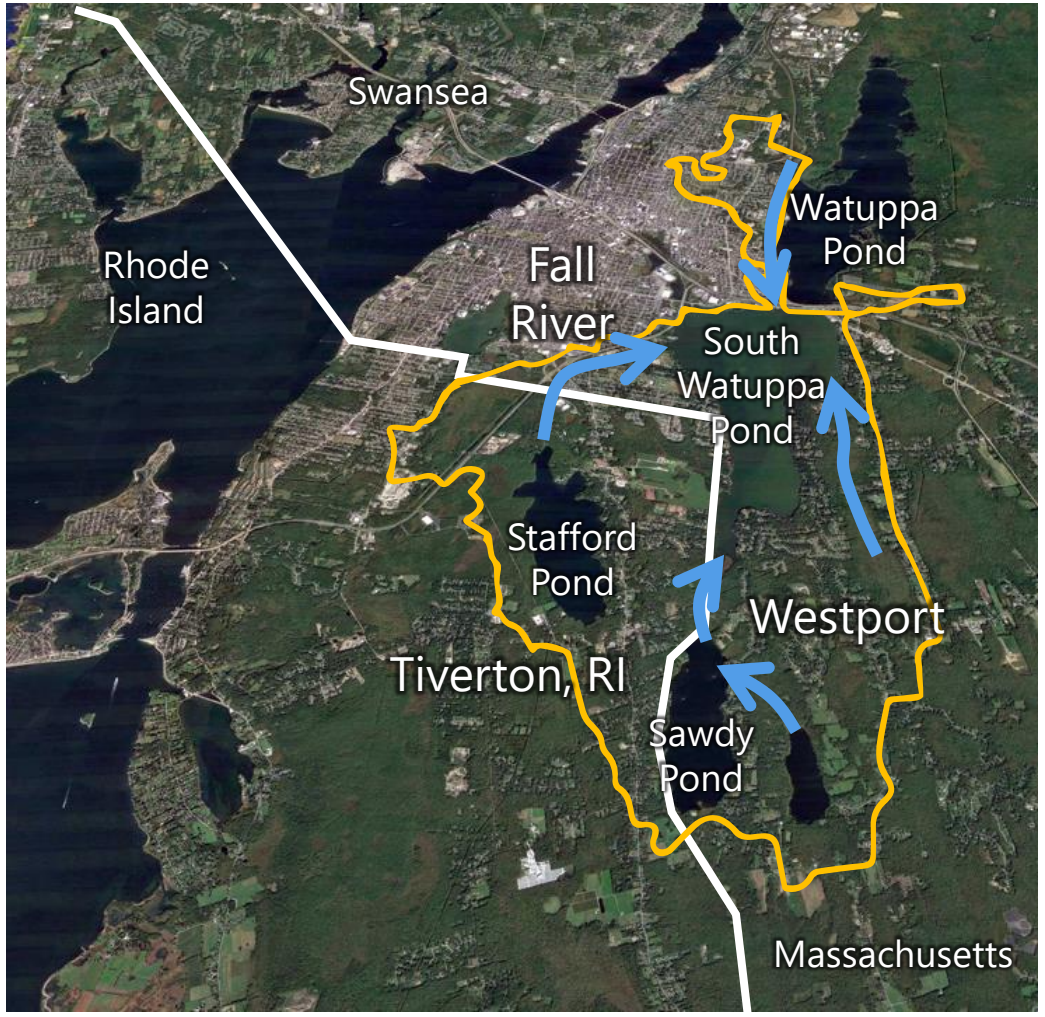
Representative
John G. Edwards
Democrat, District 70
Portsmouth and Tiverton

Watershed Assessment

Nutrient Sources in the Watershed

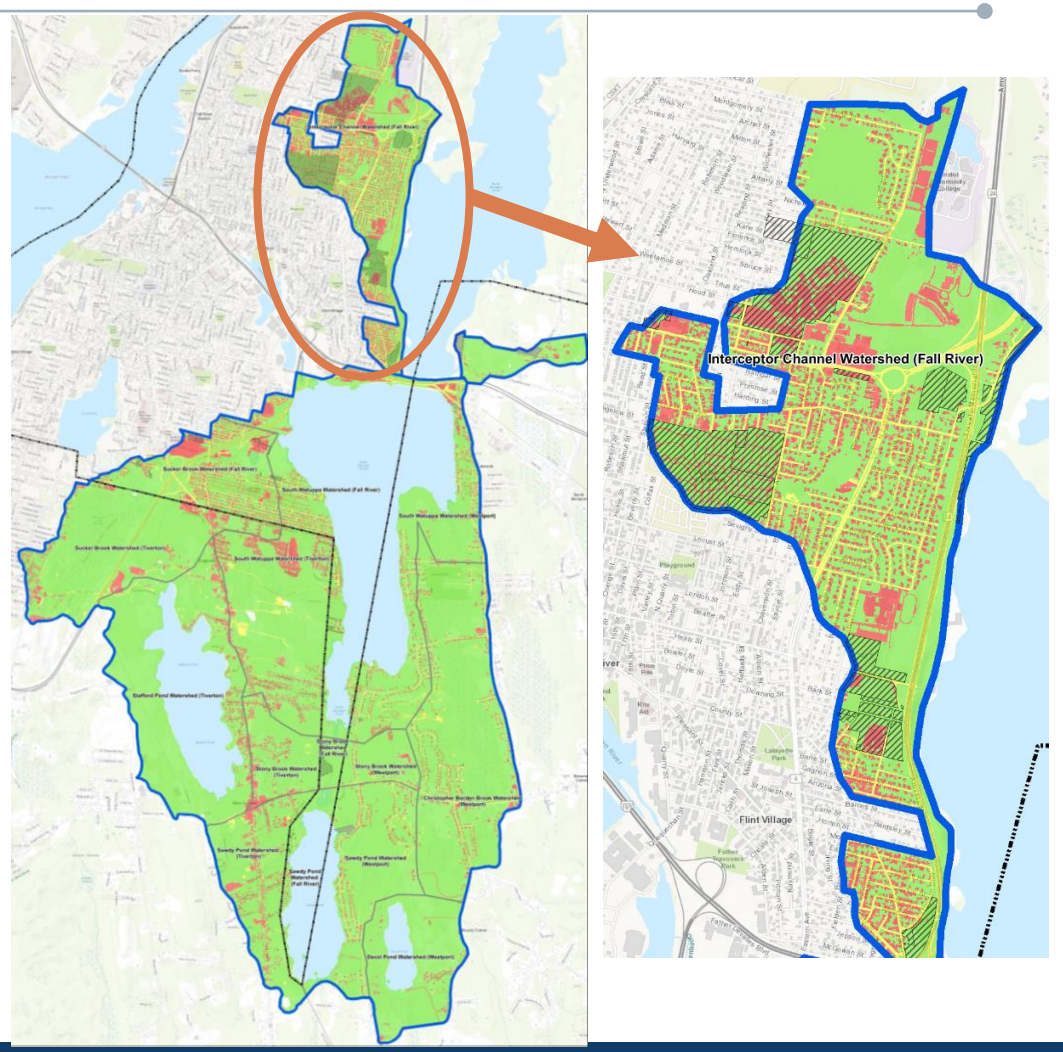


https://www.youtube.com/watch?v=2e60gGBssf0



Watershed Runoff, Agriculture & Wildlife, Groundwater, & Atmosphere

- Watershed Runoff:
  - Estimated phosphorus loads using MA MS4 General Permit Appendix F guidance
- Agriculture & Wildlife: Minor
  - 7.6% of watershed area in Tiverton
  - 1.2% of watershed area in Westport
  - 0.0% of watershed area in Fall River
- Groundwater:
  - Fall River sends wastewater to their treatment facility and has very few septic systems in the watershed. Westport and Tiverton have septic in the watershed.
- Atmosphere: Minor



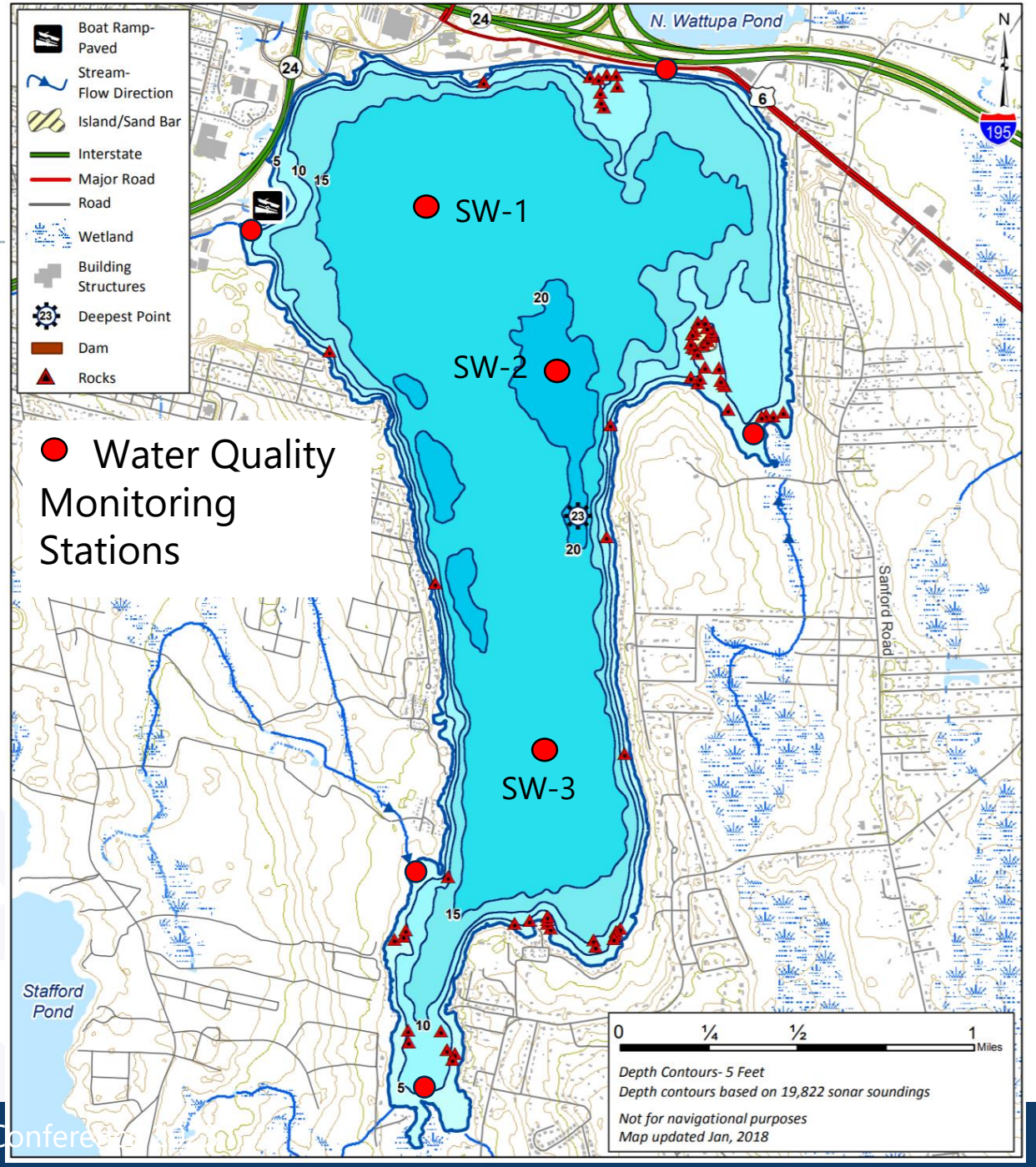
Watershed Results

- Progressing 4 stormwater management projects within the watershed

Internal Pond Assessment

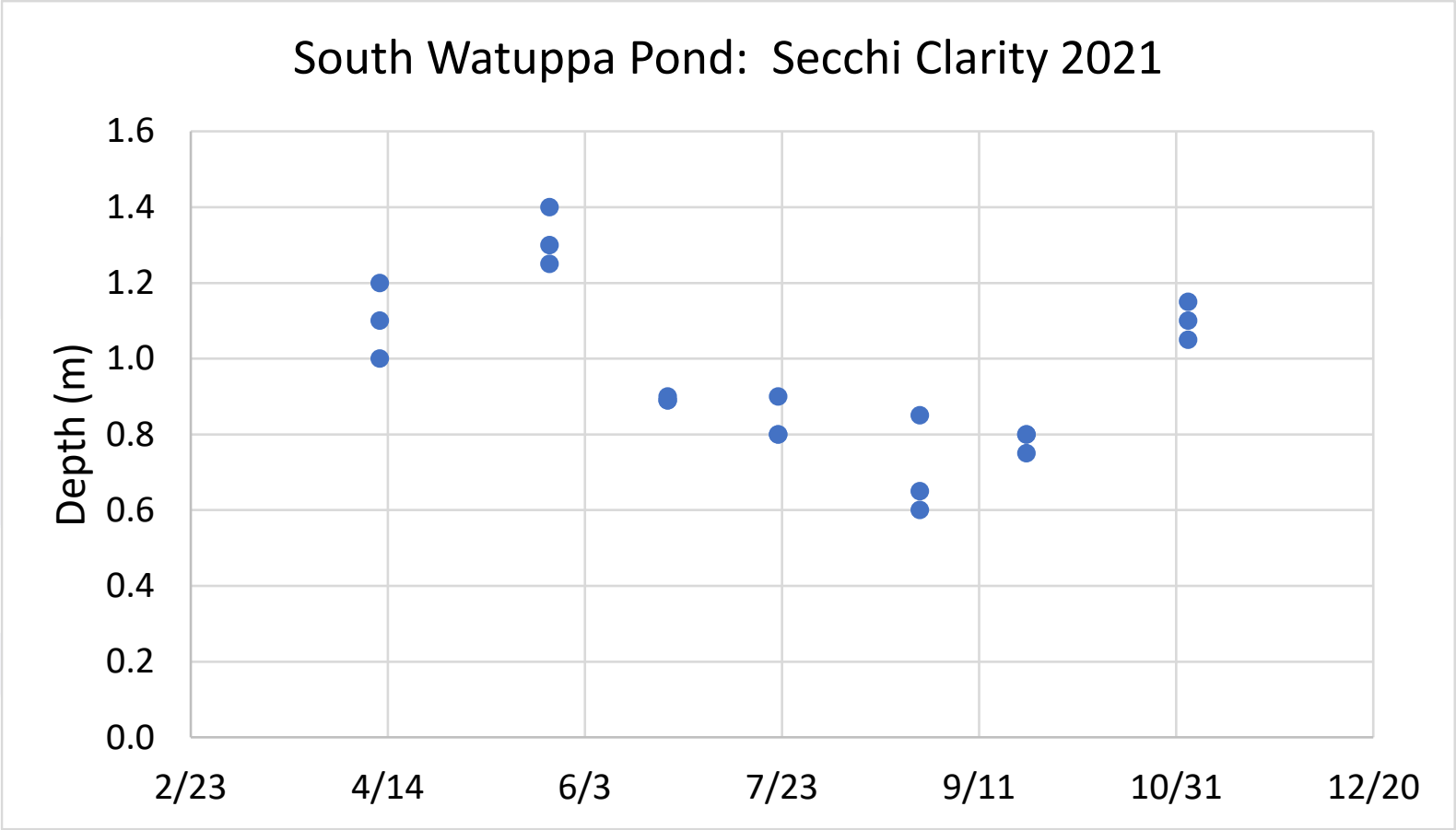
Internal Recycling

- Goal:
  - Assess pond water quality and nutrient related health by monitoring nutrients, clarity, dissolved oxygen, temperature, and chlorophyll



Internal Recycling

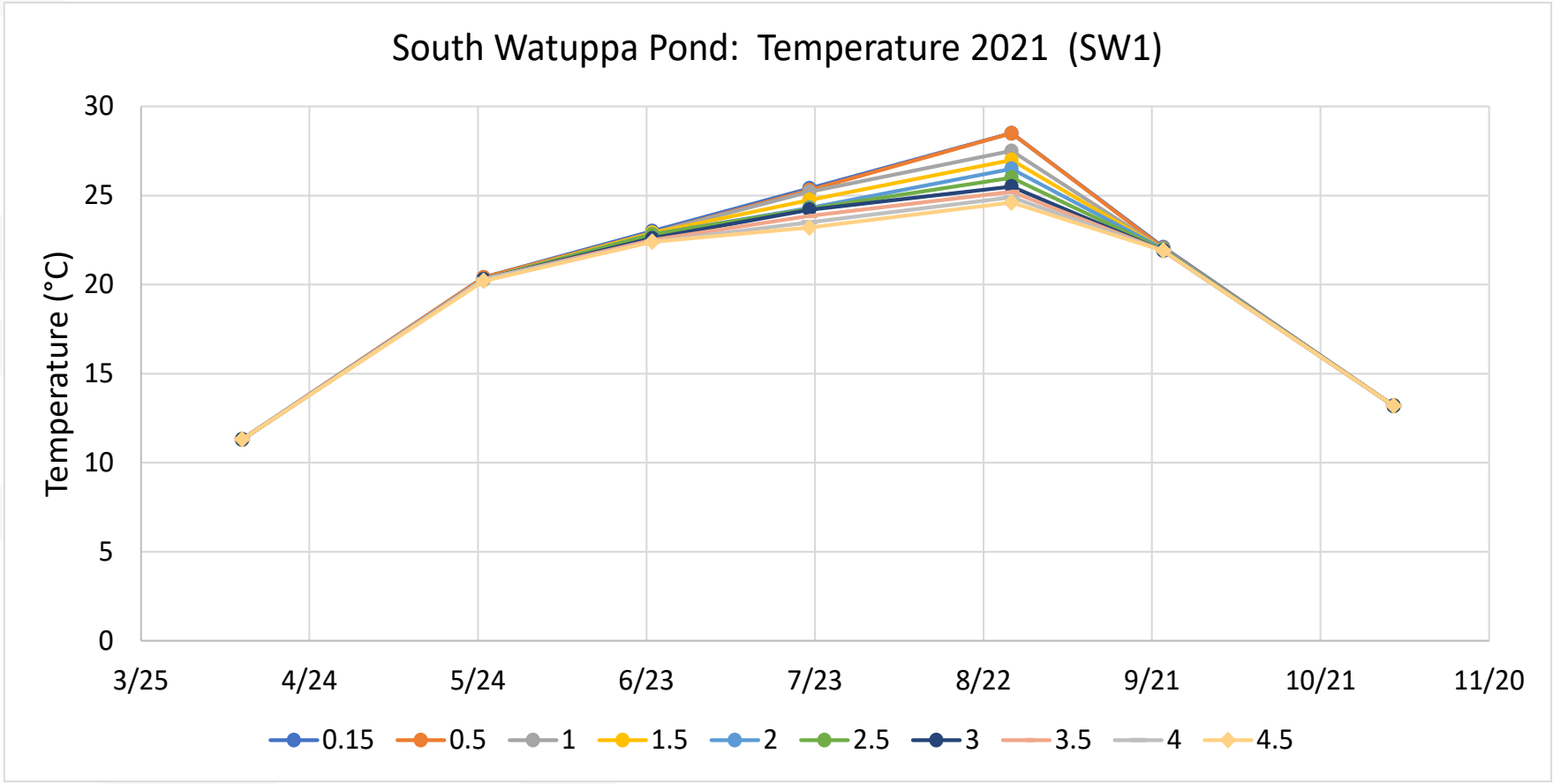
- Clarity only 15%-25% of water column
- Decrease of approximately 0.5 m between May and June
- Continued to decrease through August, before beginning recovery in September
- Primary source of clarity loss is typically increase in phytoplankton



Internal Recycling

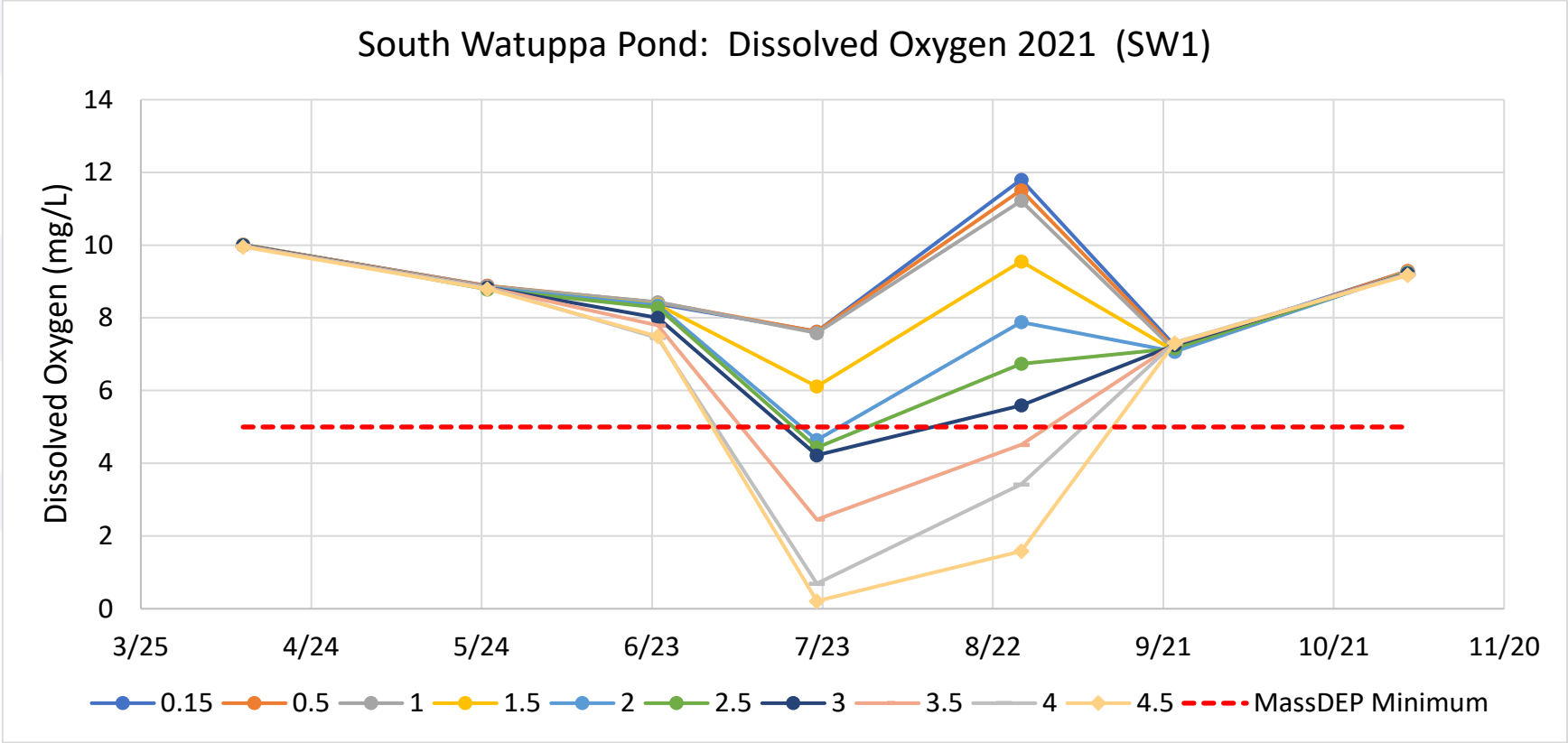
→ Well mixed in the early spring, but slight layering begins in June and strengthens in July and August

- August layering at was strong enough for stratification, but only marginally
- Returned to well mixed conditions in late September through the Fall



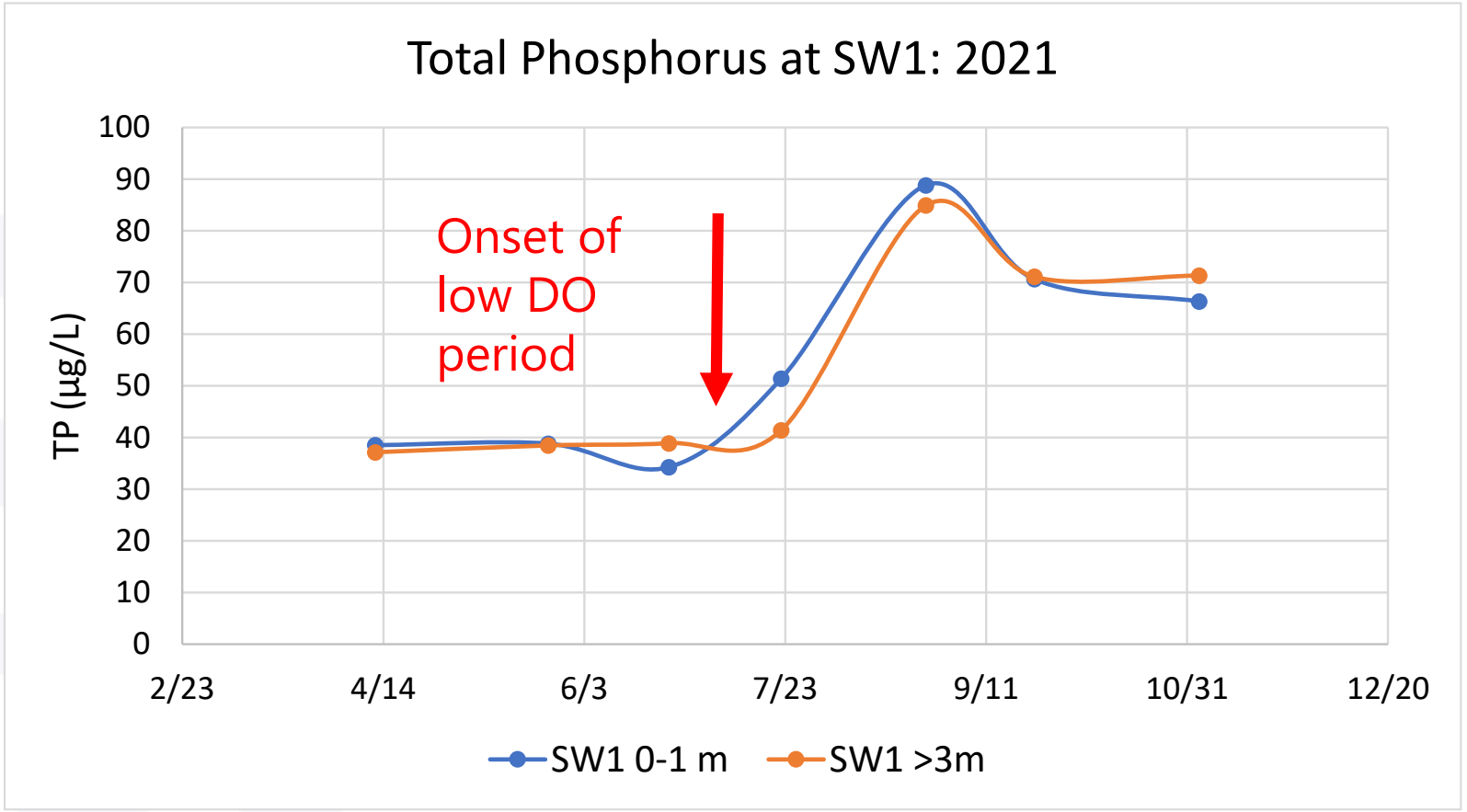
Internal Recycling

- DO losses due to sediment demand began in June and were significant in July
- July: deeper than 2 m was less than the MassDEP regulatory minimum (impaired)
- July: deeper than 4 m was anoxic (no effective DO); sediment P release
- Uncertain about duration of anoxia (need for continuous DO recording)
- August: low DO continues
- September: mixing of water column; acceptable DO throughout



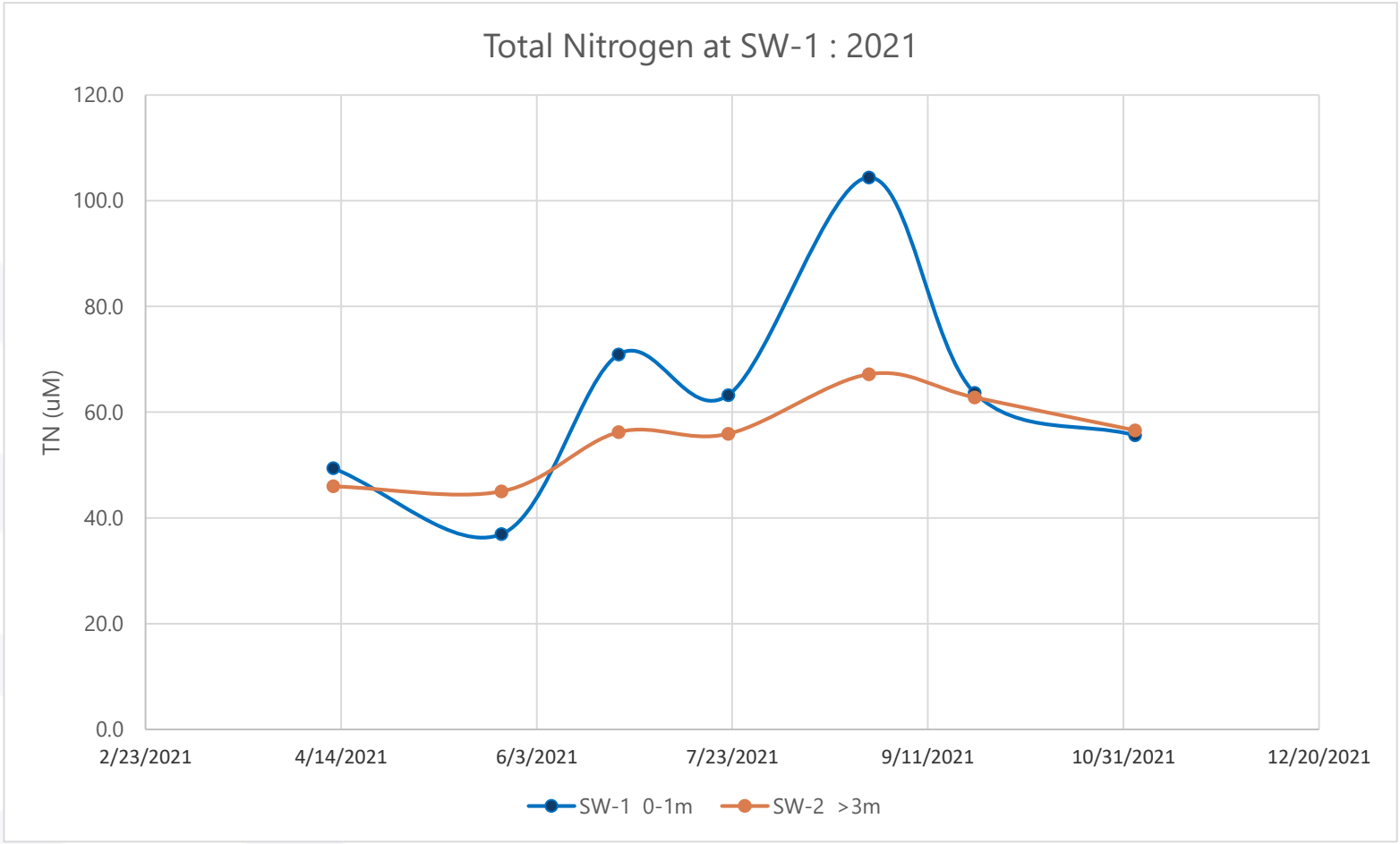
Internal Recycling

- Anoxia and warm temperatures in July seem to prompt phosphorus release
- Similarity between shallow and deep concentrations suggest regular mixing of water column
- Background TP is high
- 2021 max = 87 µg/L (impaired)
- regional target = 10-30 µg/L



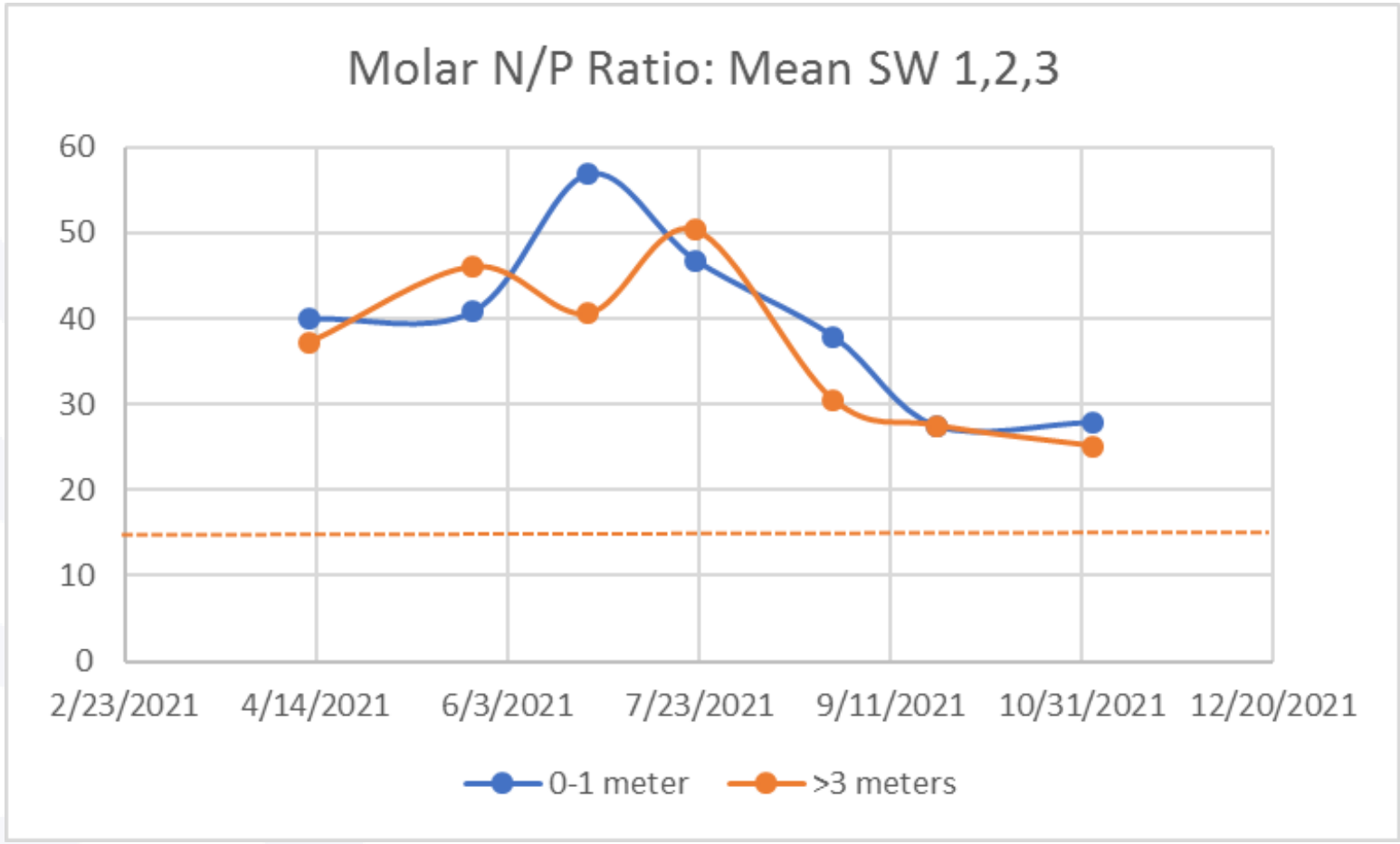
Internal Recycling

- Nitrogen follows a similar pattern to phosphorus, which could be due to nitrogen transformation (nitrification/ denitrification) shutting down under low DO conditions
- Varies between shallow and deep waters



Internal Recycling

- Molar N:P ratio
  - High N:P ratio indicates that phosphorus is the limiting nutrient in this ecosystem
  - Molar ratios ranged from 23 to 64, with an average of 38 throughout the summer



Internal Recycling

- Bloom starts when P spikes with anoxia in July 2021 max = 47 ug/L regional target = <2 µg/L

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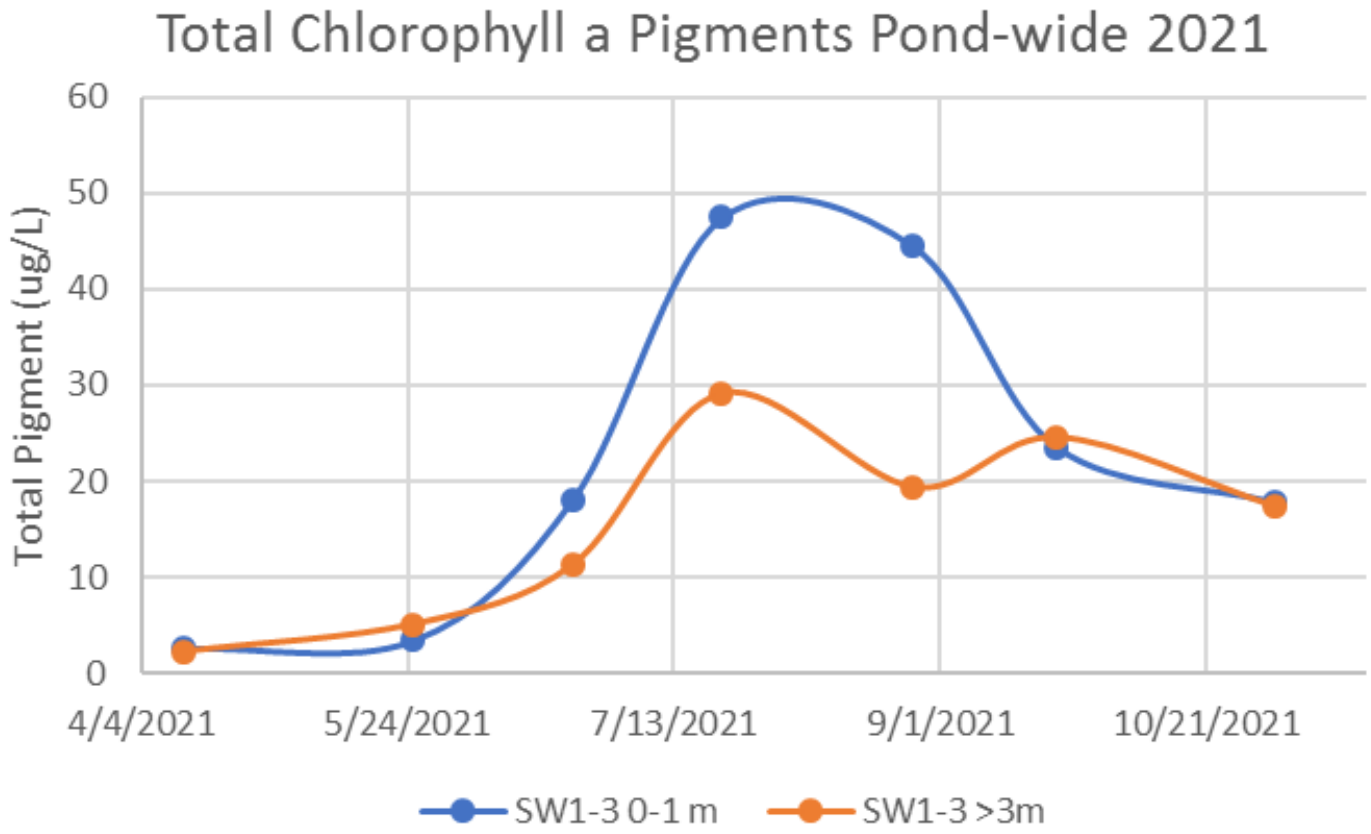

Next Steps

Internal

- Sediment Sampling and Analysis:
  - Where and at what level is phosphorus released from pond sediments to support phytoplankton blooms?
- Continued Water Sampling:
  - Continue nutrient monitoring
  - Add continuous Dissolved Oxygen monitoring to Pond sampling
  - Determine extent and depth of low dissolved oxygen
  - What is level of blue-green algae in the phytoplankton community
- Influent Flow Monitoring:
  - Measure influent stream flow and nutrient concentration to assist with watershed nutrient input analysis

Internal

- Common Restoration Actions
  - If Sediment phosphorus recycling primary issue: Treat with phosphorus binding agents, aeration, or dredging
  - If Watershed phosphorus primary issue: Conduct Source reductions
  - If Watershed Stormwater major issue: Manage discharges by infiltration, diversion or phosphorus treatment

Closing Remarks

- → Develop implementation strategy for internal pond management
- → Understand budget and funding for internal management
- → Design and construct watershed management projects

Questions & Comments

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https://thecaptainscask.com/fishing-spots/fishing-spot-south-watuppa-pond-fall-river-massachusetts/