

# Successful Water Quality Management Lonnie's Pond, Cedar Pond, Uncle Harvey's Pond

**Town of Orleans Select Board**  
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# Adaptive Management Plan



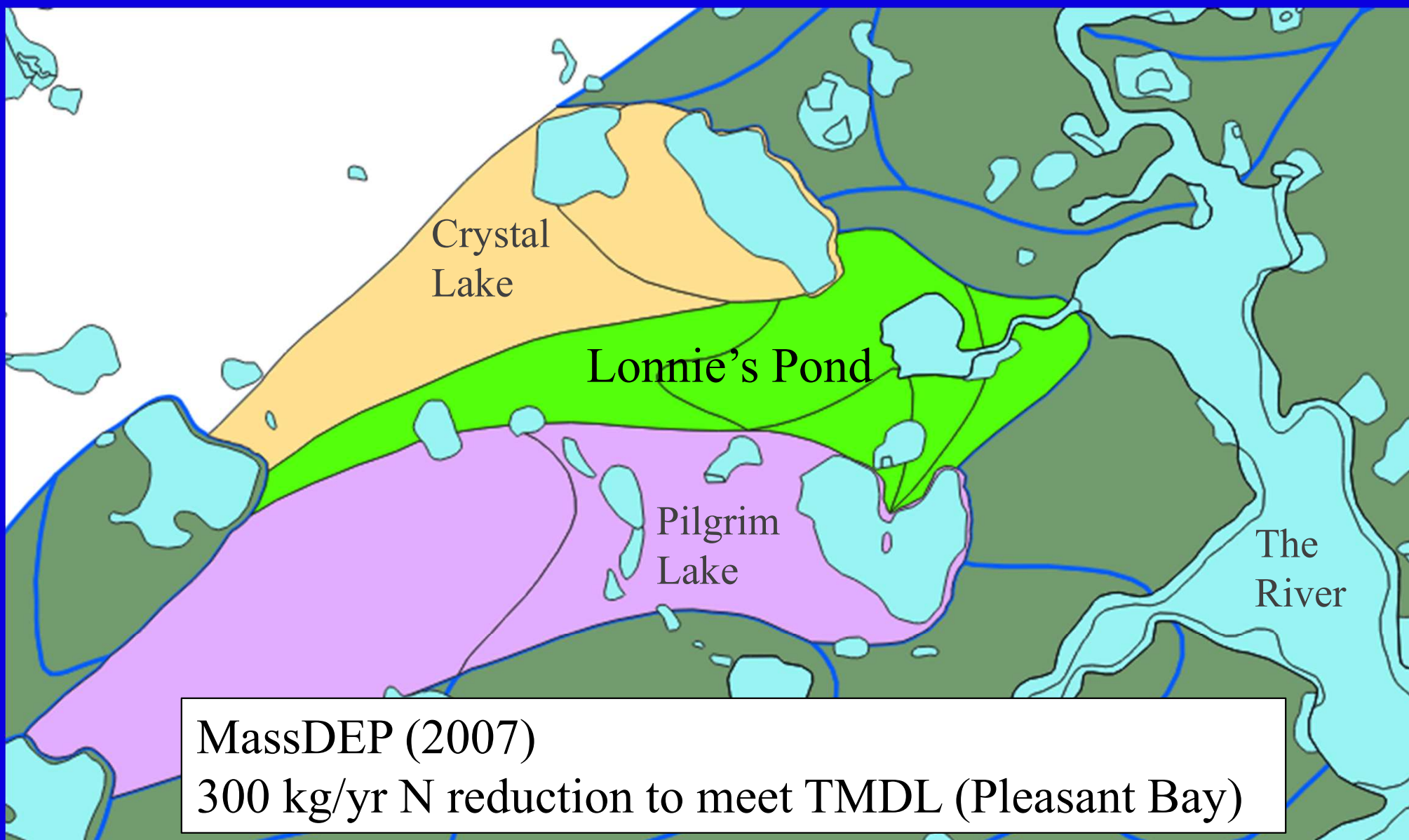
## 2015/2016: Implement the Amended CWMP

- Build on the WQ monitoring from the Marine & Fresh Water Quality Committee and Pleasant Bay Alliance
- Use Massachusetts Estuaries Project findings, data, and tools
- Develop ways to confirm compliance with the N TMDLs
- Build on PALS and 2007 Review to wrap in freshwater ponds and lakes





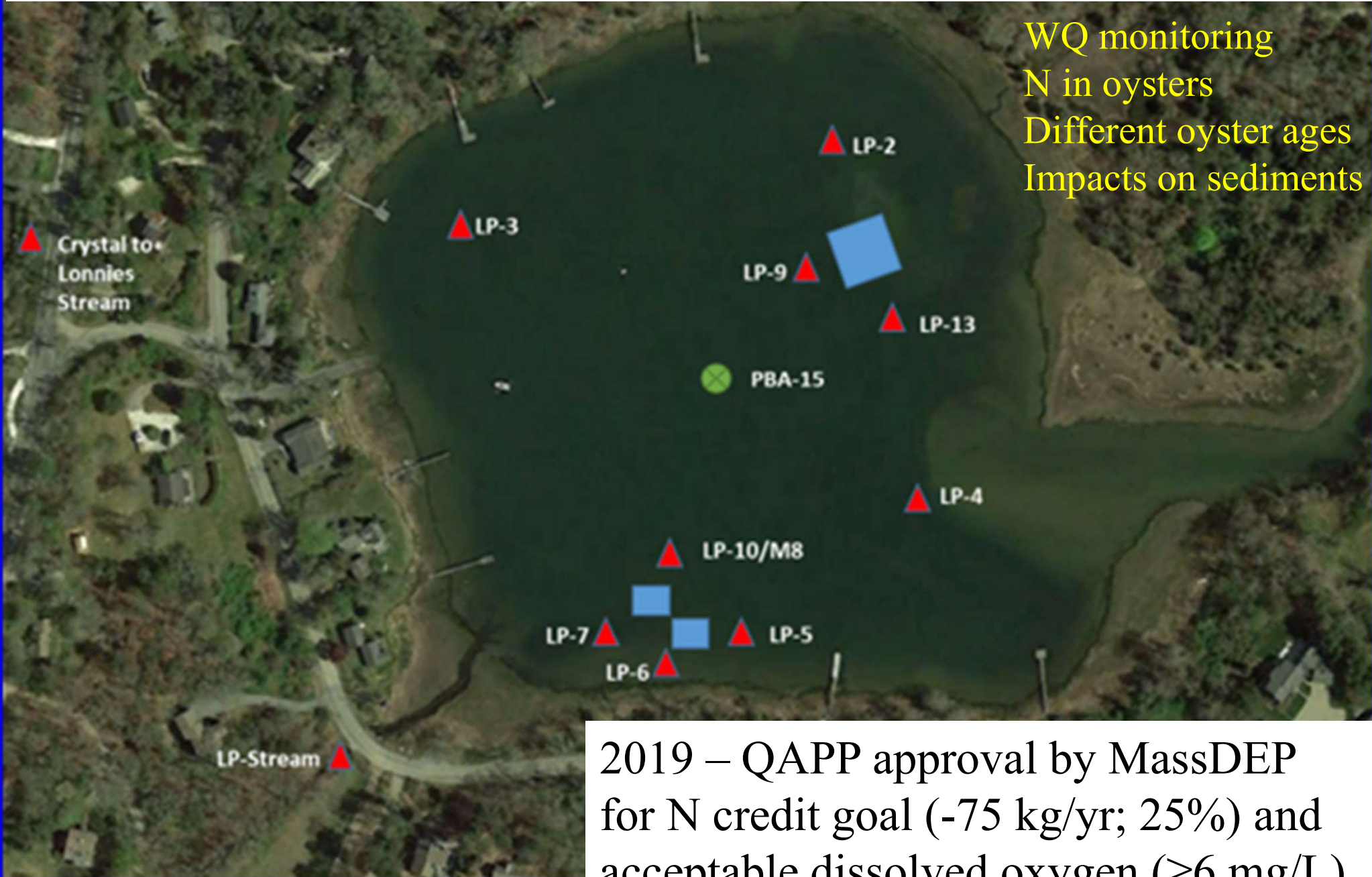
# Lonnie's Pond Non-traditional Nitrogen Reduction



2016-2018

## Demonstration Project to evaluate Oyster Aquaculture to remove N

WQ monitoring  
N in oysters  
Different oyster ages  
Impacts on sediments



2019 – QAPP approval by MassDEP for N credit goal (-75 kg/yr; 25%) and acceptable dissolved oxygen ( $\geq 6$  mg/L)



# Lonnie's Pond

## Successful Nitrogen Reduction



Meeting the N Reduction Goal (>75 kg)

2019: 62 kg net N removal (**oysters only**)

2020: 109 kg net N removal

2021: 108 kg net N removal

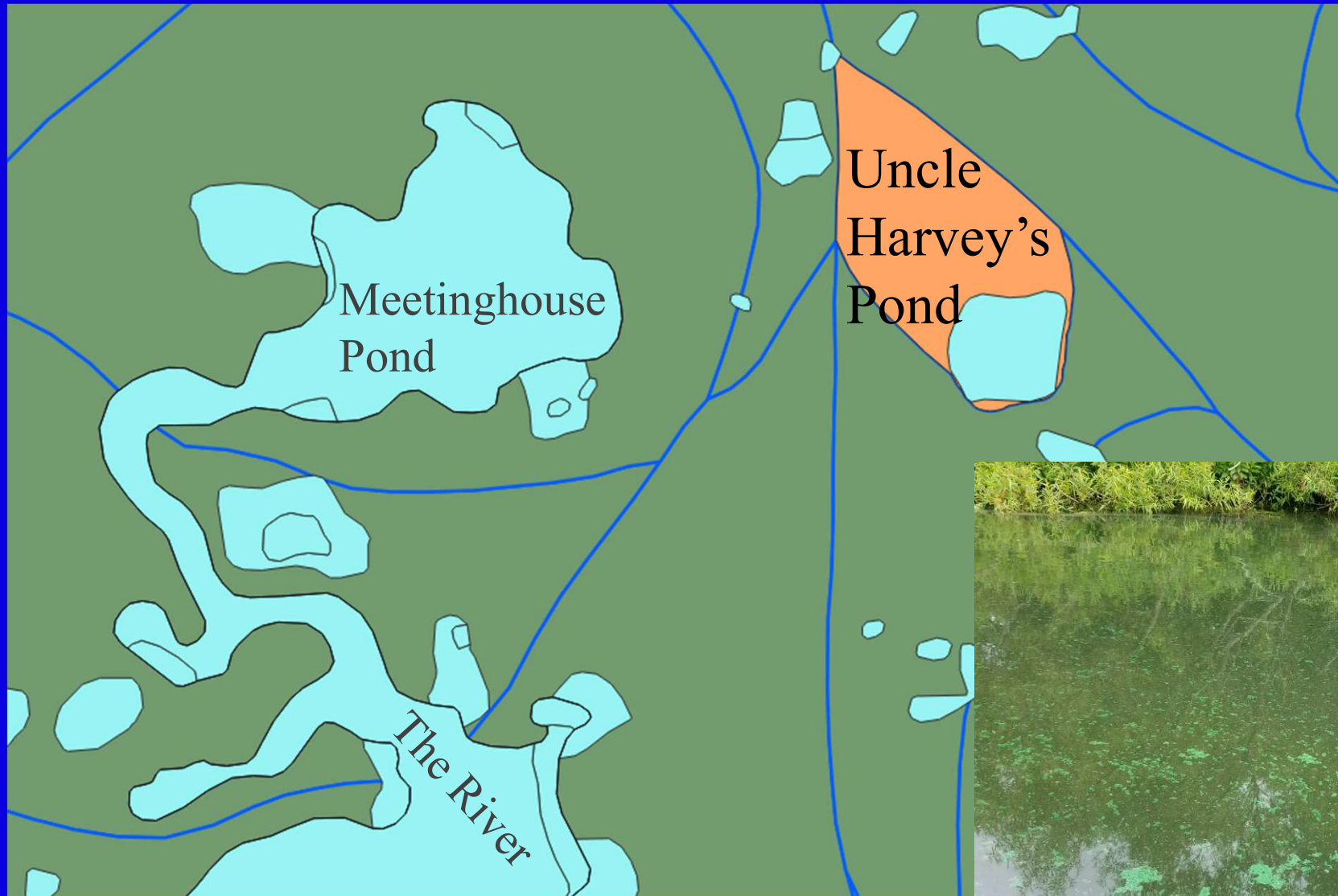
### Lessons:

- Sediment denitrification adds 10-15% additional N removal
- Age/size of oysters and length of season key in N removal
- Coordination between Aquaculture Contractor (Ward Aquafarms) and Monitoring Contractor (CSP/SMAST) key
- Improved sediments: switch from oligochaetes to dense amphipod mats (still impaired, but evidence of multi-year cumulative benefits)

Public/private partnership: Private grower, town monitoring  
low cost per N removed (\$300/lb N, ~50% of IA cost)



# Uncle Harvey's Pond Lake Management: Phosphorus





# 2018 Uncle Harvey's Pond Management Plan

## Diagnostic Summary

- Reduced clarity
- Anoxic/hypoxic dissolved oxygen
- Cyanobacteria (blue-green) dominance
- High nutrient concentrations

## Management Options

- Phosphorus determines water quality
- Sediments are main source of water column P
  - ~5 yrs worth of watershed load regenerated each summer on average, even more available in sediments
- Watershed is source of all phosphorus in pond including sediments; wastewater is ~80% of watershed load

## Recommended Plan:

Short Term: Alum Treatment (issues as <10 ac pond)

Long Term: Sewer Watershed

### Uncle Harvey's Pond Management Plan and Diagnostic Assessment

FINAL REPORT

March 2018

for the

Town of Orleans



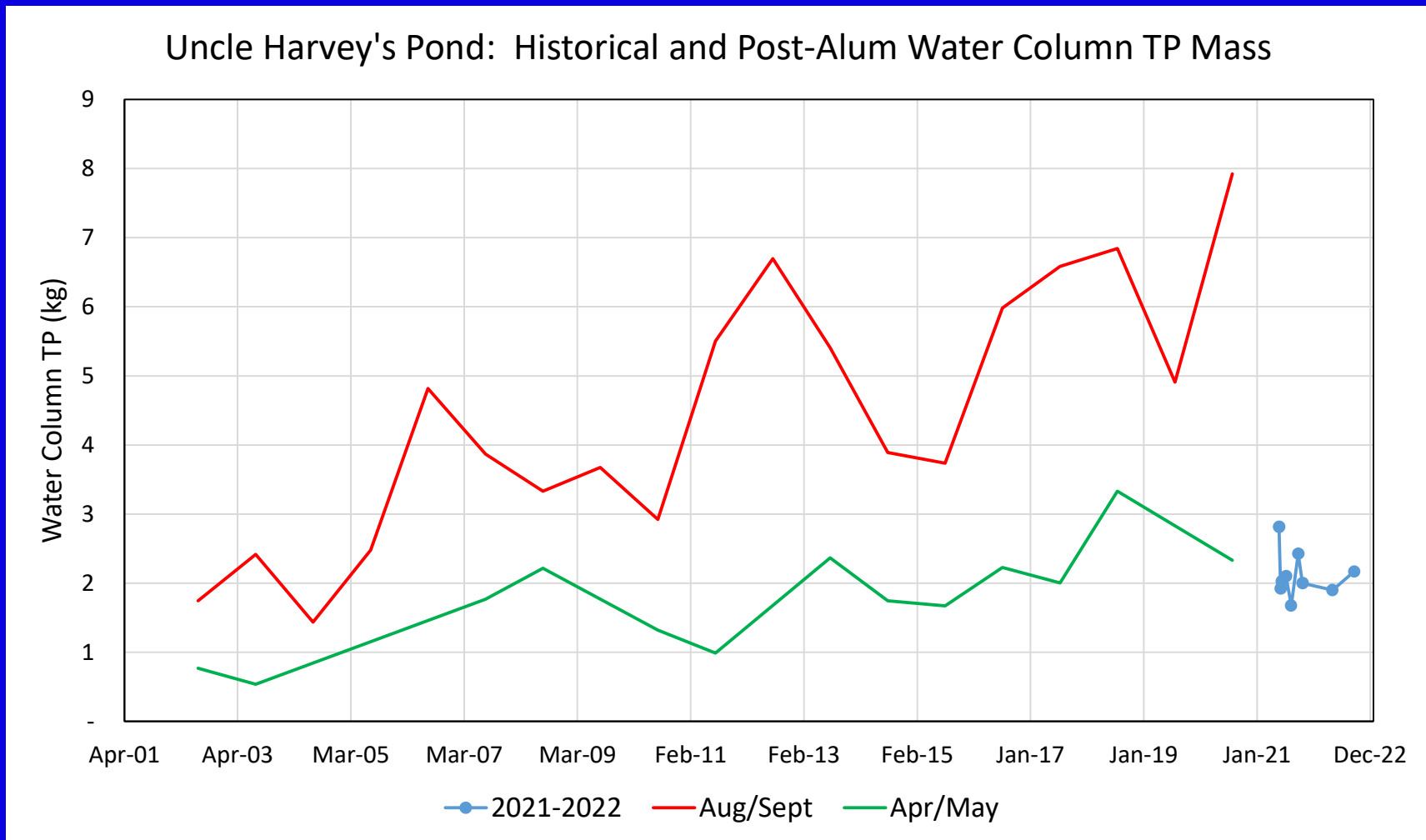
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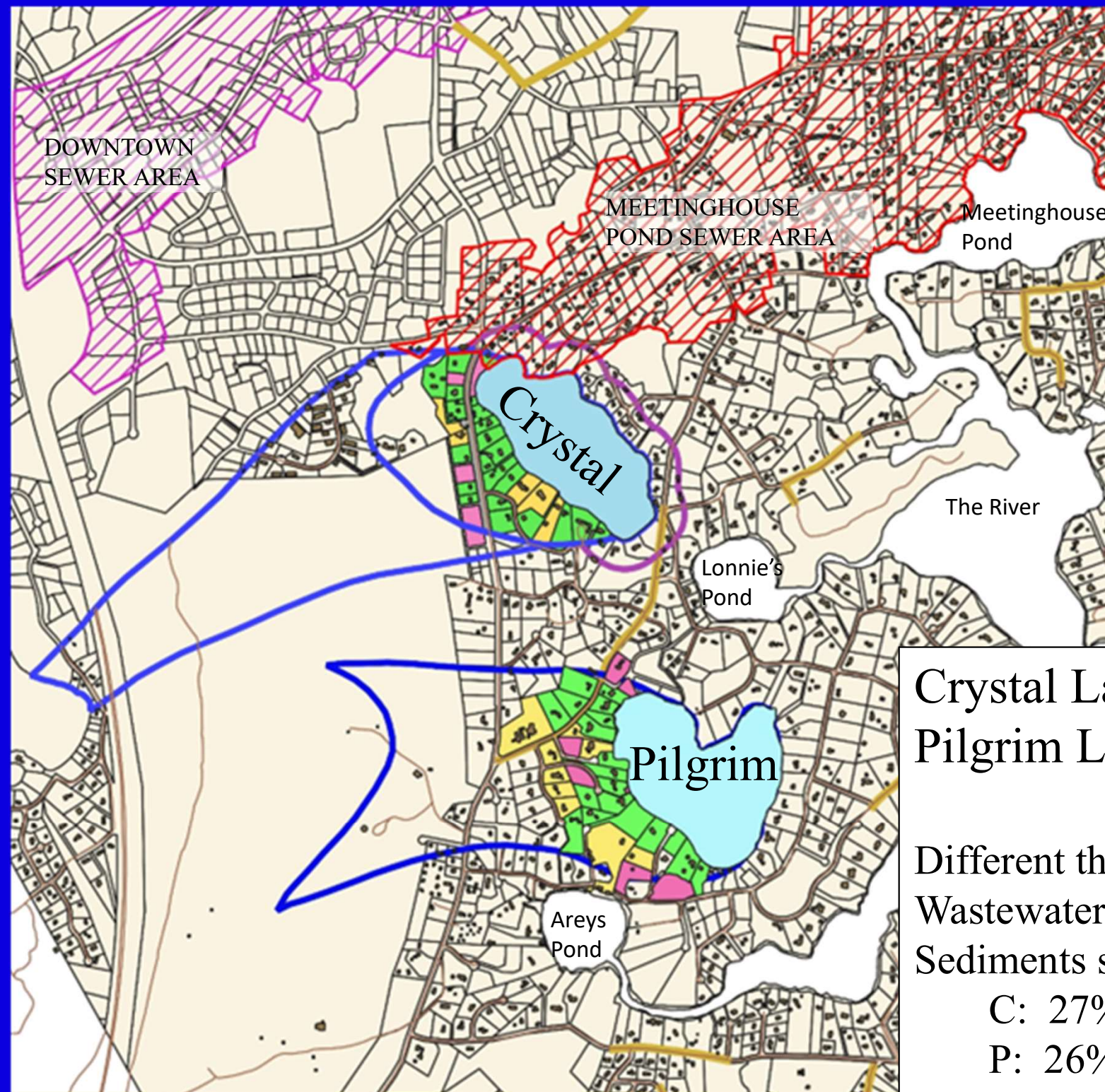


# Uncle Harvey's Pond Successful Phosphorus Reduction

## Water Column TP: Spring conditions in 2021/2022



May 25, 2021 Alum Application



DOWNTOWN  
SEWER AREA

MEETINGHOUSE  
POND SEWER AREA

Meetinghouse  
Pond

Crystal

The River

Lonnie's  
Pond

Pilgrim

Areys  
Pond

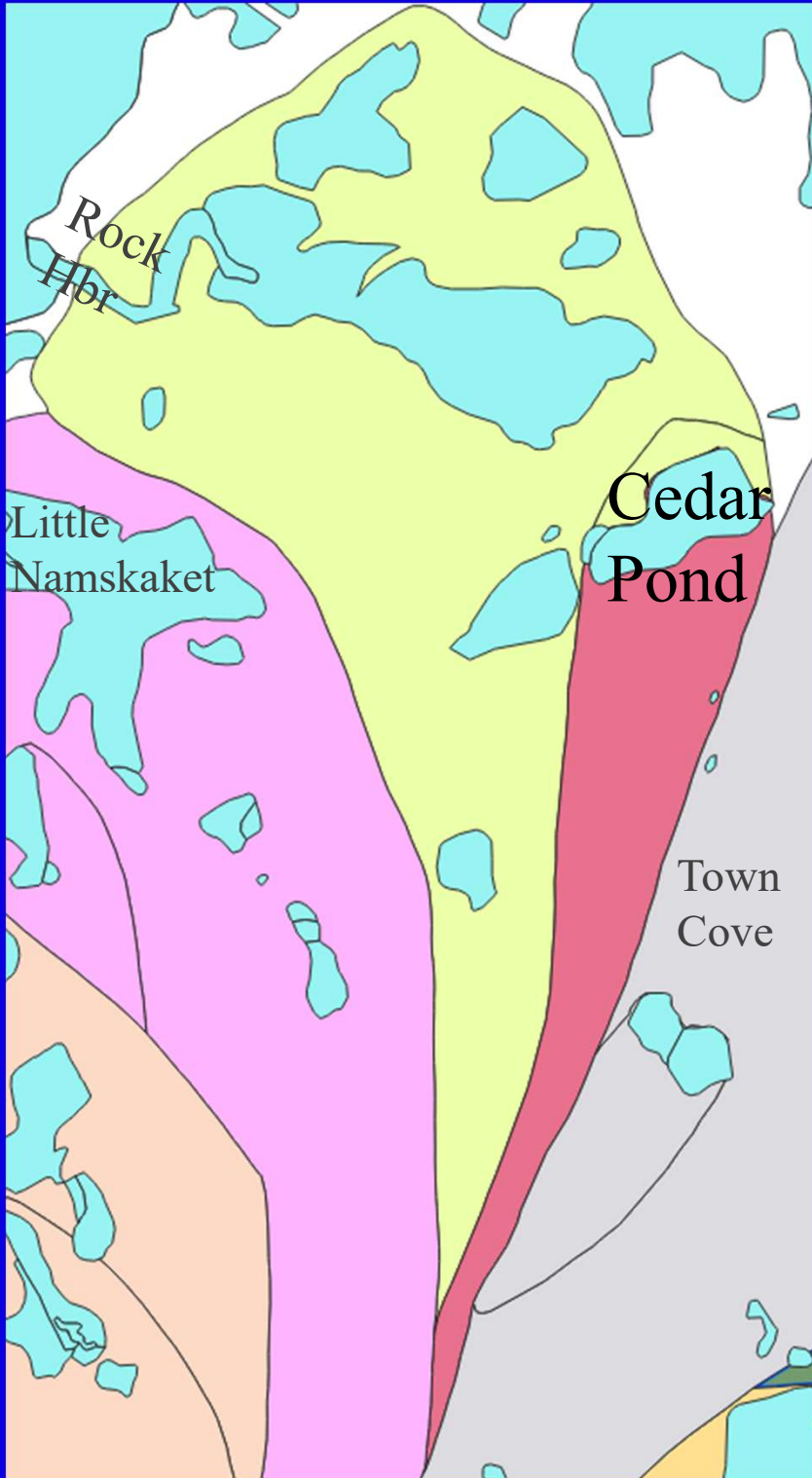
Crystal Lake (2021)  
Pilgrim Lake (2019)

Different than Uncle Harvey's  
Wastewater primary P source  
Sediments smaller % of P budget

C: 27% of summer P  
P: 26% of summer P



# Cedar Pond WQ Restoration



## 2013 Management Plan

- Reinstall outlet boards to gradually return to pre-2007 brackish conditions
- Move power lines to limit cormorants
- Address pond sediments later





# Cedar Pond Implementation



- 2016 – Management Plan approved by MassDEP and EOEA includes MassDMF Fishway Plan adjusting boards each summer for herring
- 2017 – Reinstalled boards; accompanying monitoring begins
- 2018 – Main power lines removed following SB negotiations
- 2018 – First Annual and Semi-Annual Reports

## Adaptive Management

- Adjust boards heights, configuration
- Additional monitoring (included continuous tidal levels at outlet)
- Annual review of data



# Cedar Pond: Successful Adaptive Restoration

## Future Management

### Reduced salinity key to improving water quality

Lower salinity in upper waters mostly isolates deep impairments

All 2021 DO readings in upper 1 m were > MassDEP minimum (1<sup>st</sup> time in four years of management; great improvement from 2018 when anoxia was within 0.75 m of surface)

### Herring are returning (2022)

Lower salinity, acceptable DO have partially restored habitat

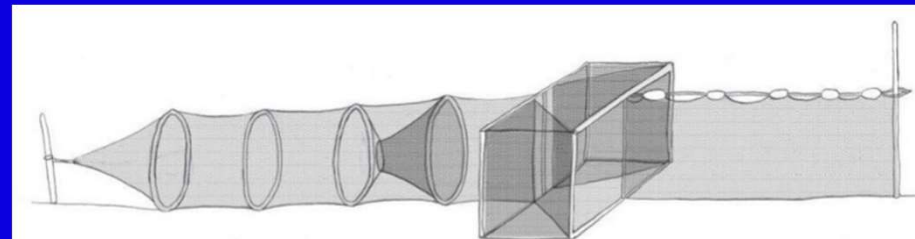
Town and MassDMF installed fyke net and had trapped and released 30 alewife between March 30 and April 25

### Still need to address sediments

Sediments still creating hypoxia, releasing nutrients

### State Regulators Approve (2022)

MassDEP issued Certificate of Compliance with ongoing condition that Town continues board management





# Water Quality Management Successes in Orleans



- ✓ Lonnie's Pond: Successful N Reductions
- ✓ Uncle Harvey's Pond: Successful P Reductions
- ✓ Cedar Pond: Successful Adaptive Restoration



# Coastal Systems Program University of Massachusetts Dartmouth



*Science for Management*

## *Questions & Discussion*

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