

Mashpee Water Quality Monitoring Program Summary of Nutrient Related Health of Mashpee's Estuaries (summer 2018)

***Town of Mashpee
Mashpee Wampanoag Tribe
SMAST-UMASSD Collaboration
For Estuarine Restoration***

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Major Anthropogenic Problem Facing Estuaries Globally

Habitat Degradation:

- increased nitrogen loading is the major threat to estuaries, world-wide;
- Nitrogen enrichment is causing impairments to estuarine resources in portions of most Cape Cod Estuaries.

How do we restore and protect our estuaries?

Nitrogen management is the only way to restore degraded estuarine habitat, primarily through:

- Increased tidal exchange
- Control of watershed nitrogen sources
- Increased Nitrogen removal in transport

Mashpee Water Quality Monitoring Program

Goals:

- to assess the current nutrient related water quality of each estuary within the Town of Mashpee**
- to track short & long-term changes in embayment health**
- to yield site specific validation of the effectiveness of Nitrogen Management Alternatives and for TMDL compliance**

Estuarine Monitoring: Town of Mashpee



Waquoit Bay Water
Quality Stations

2010-2020

18 estuarine stations
monitored

4 sampling events



Estuarine Monitoring: Town of Mashpee



Popponesset Bay
Water Quality Stations

2010-2020

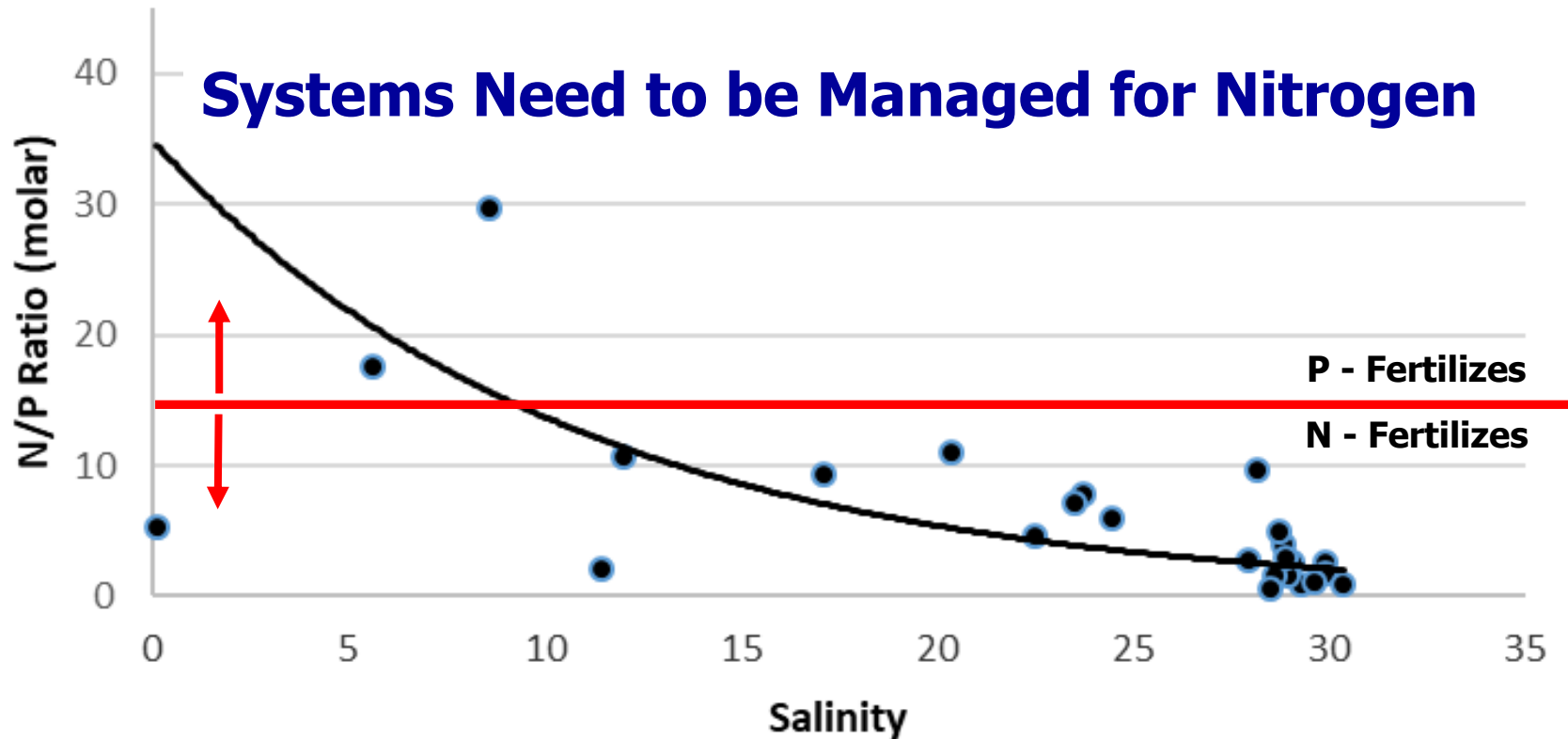
16 estuarine stations

4 sampling events



Estuarine Monitoring

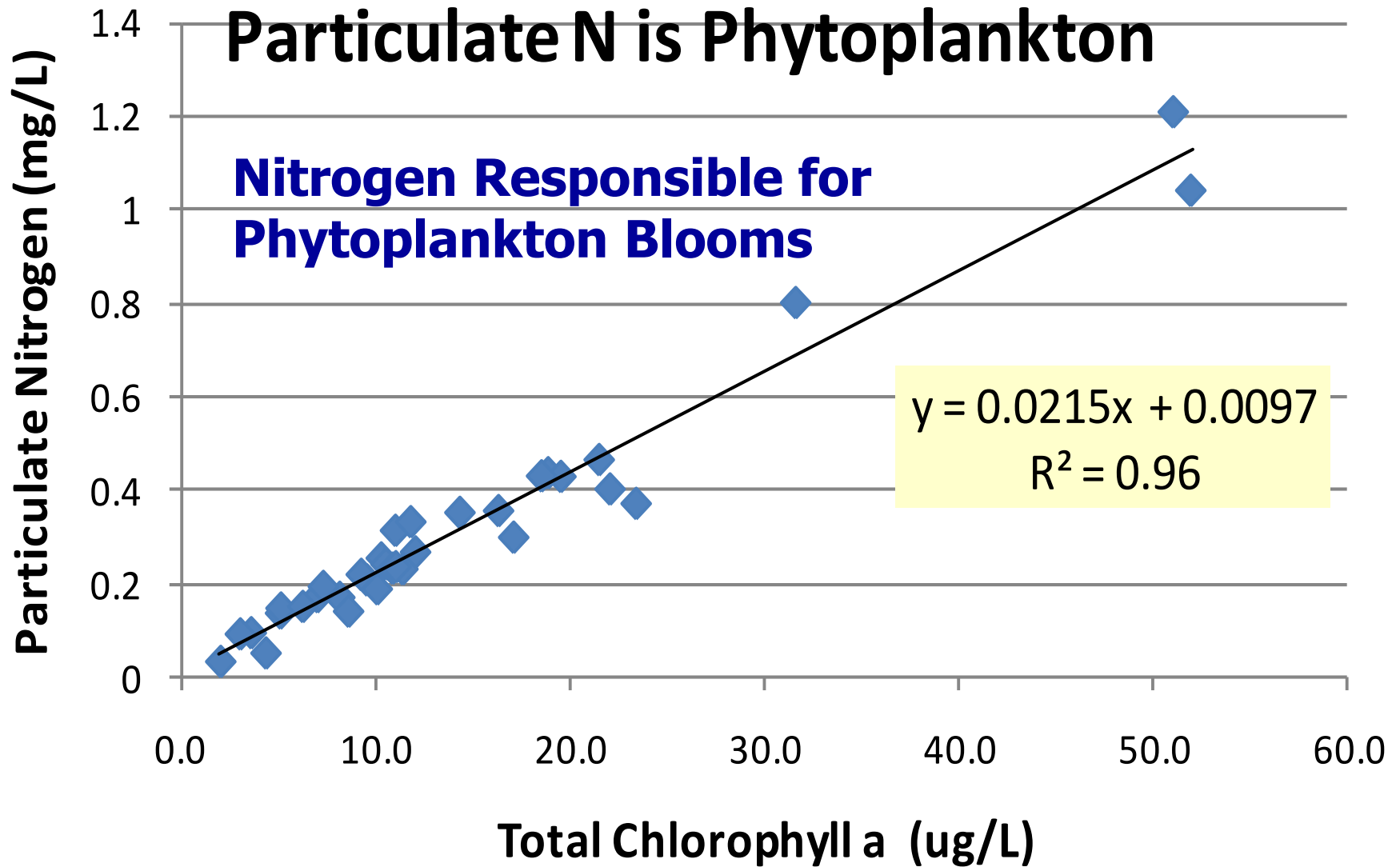
Waquoit and Popponesset Bays 2018

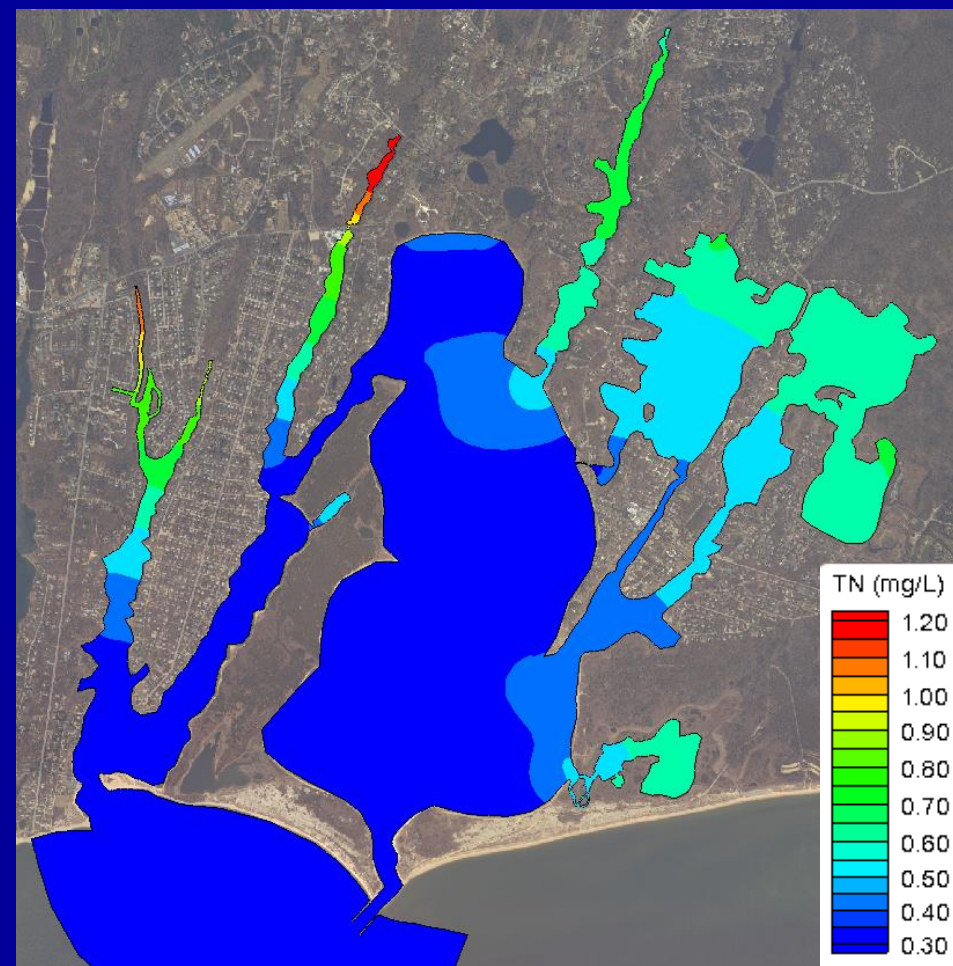


Salinity (ppt)

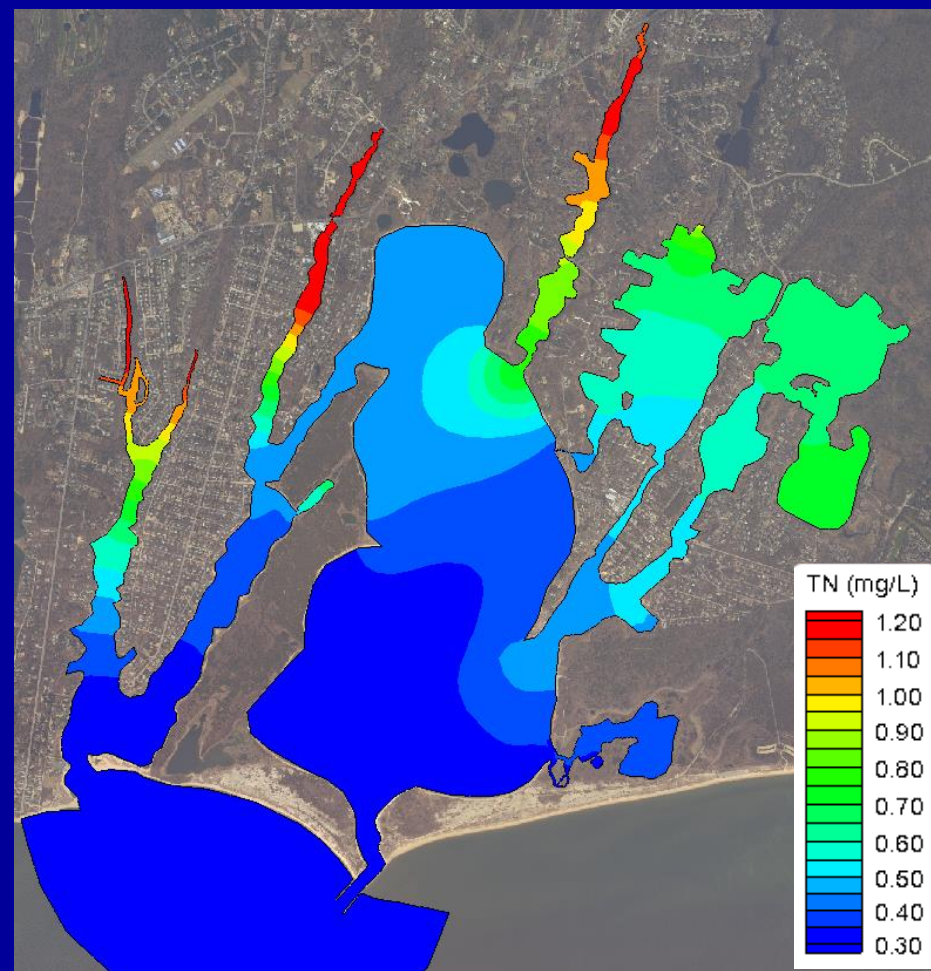
N/P Ratio (molar)

Estuarine Monitoring





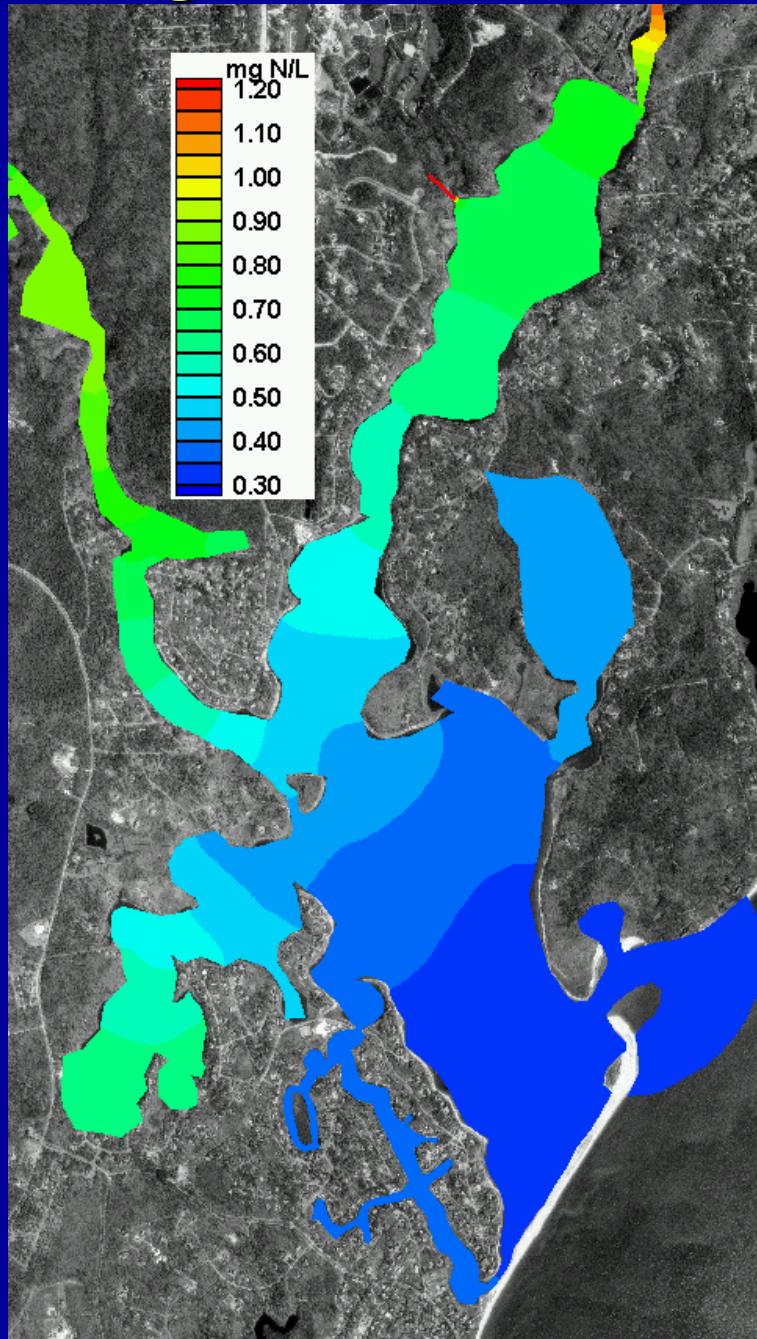
2010 N Loading



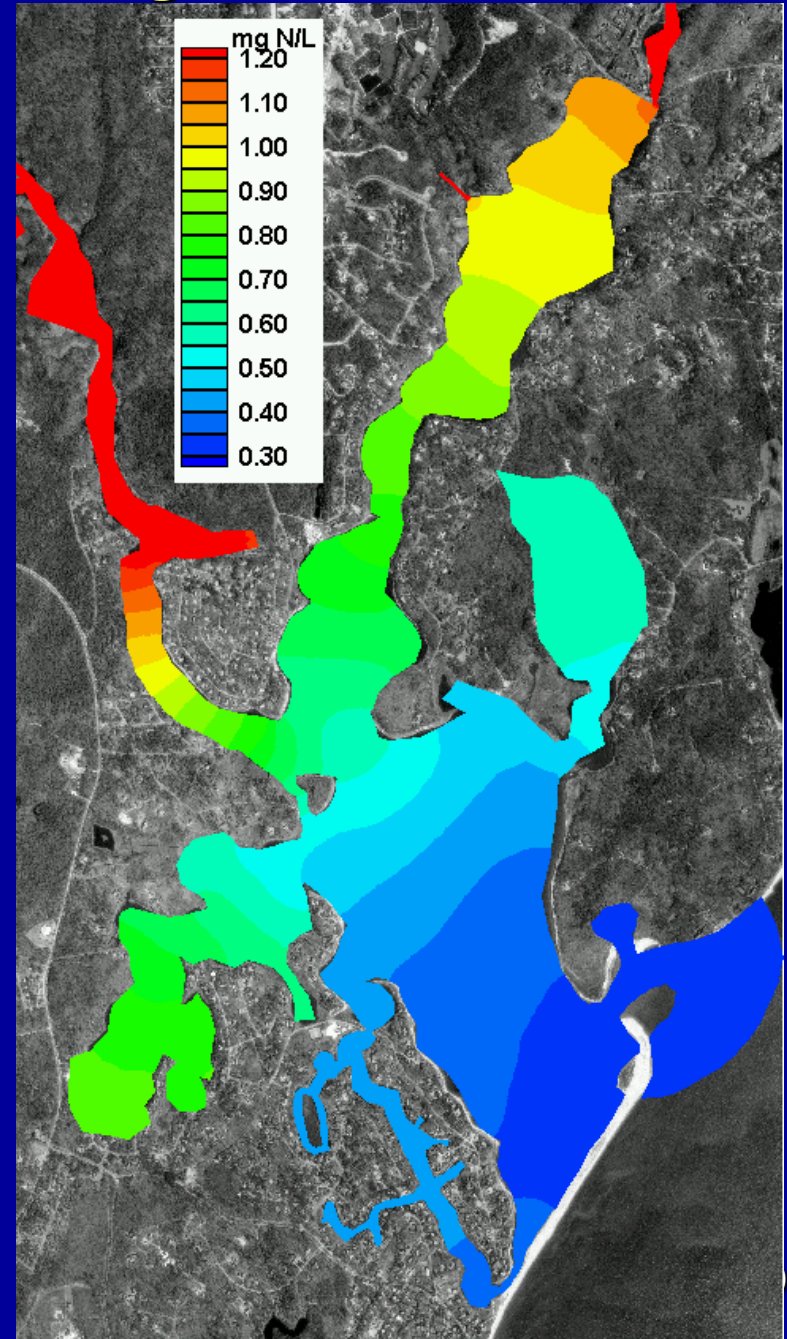
Build-out Loading

Tidally Averaged Total Nitrogen (mg/L) Gradient

Nitrogen Levels: 2008

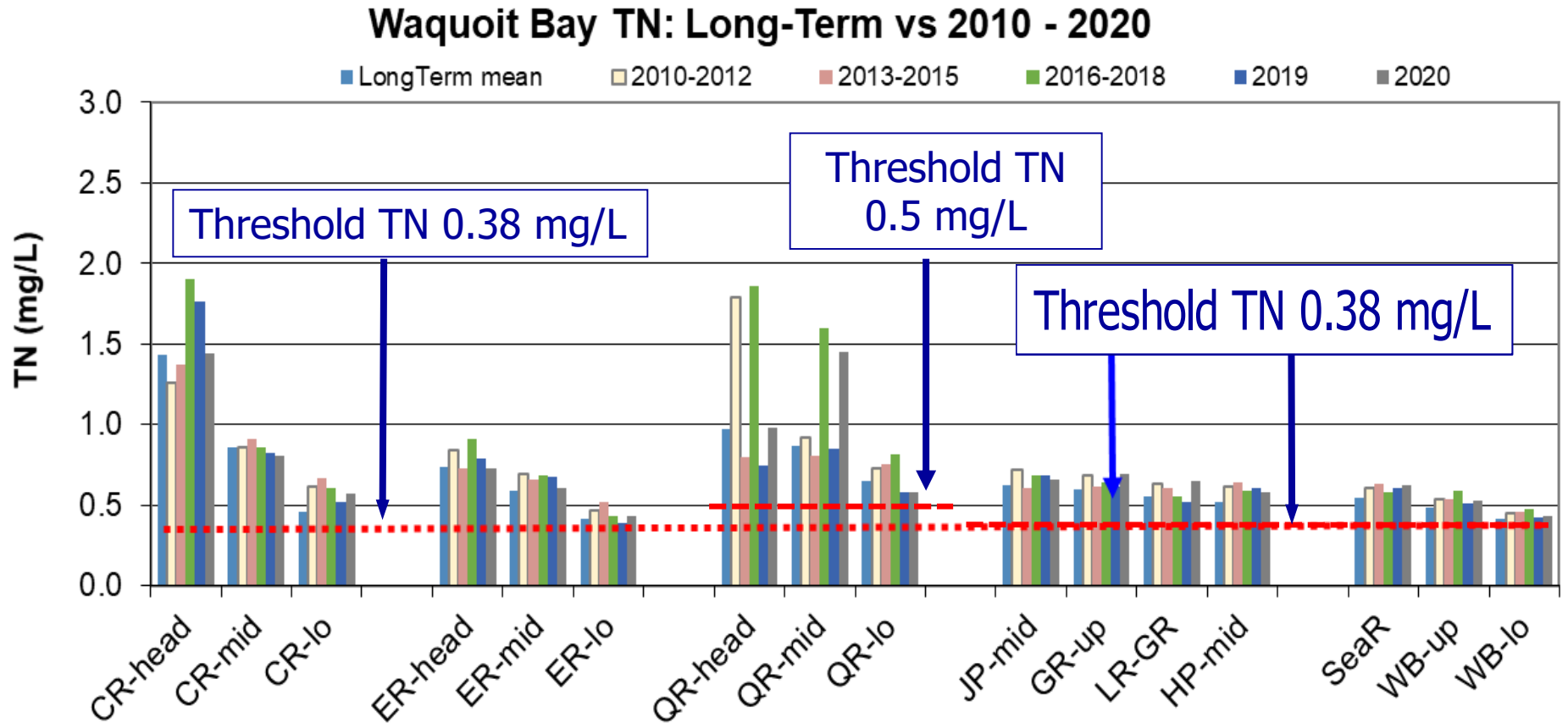


Nitrogen Levels: Build-Out



Waquoit Bay Monitoring Results: Total N

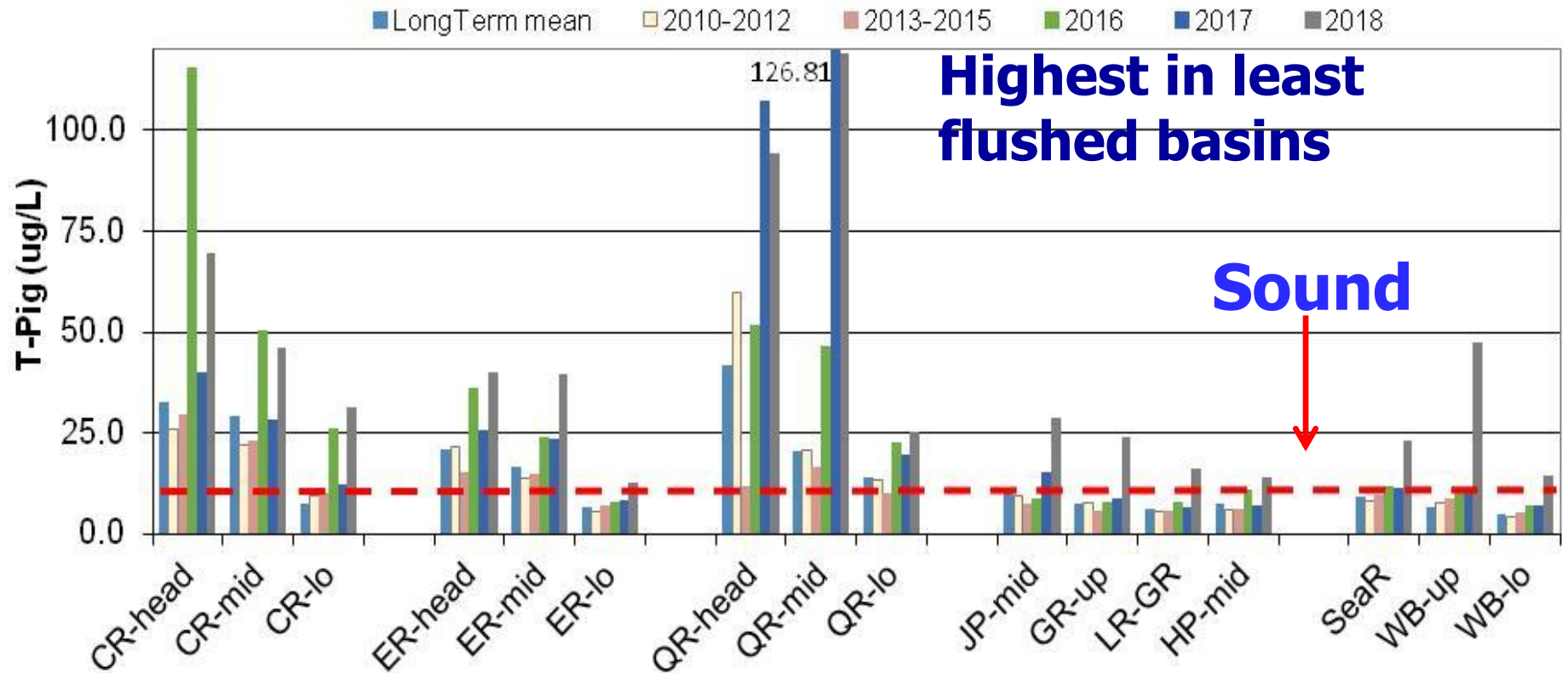
All Sites Over TMDL Nitrogen Threshold in All Years



CR: Childs River, ER: Eel River, QR: Quashnet River, JP: Jehu Pond, HP: Hamblin Pond, WB: Waquoit Bay main basin

Waquoit Bay *Monitoring Results: Phytoplankton Biomass (Chlorophyll-a)*

Waquoit Bay Total Chla Pigment: Long-Term vs 2010 - 2018



CR: Childs River, ER: Eel River, QR: Quashnet River, JP: Jehu Pond, HP: Hamblin Pond, WB: Waquoit Bay main basin

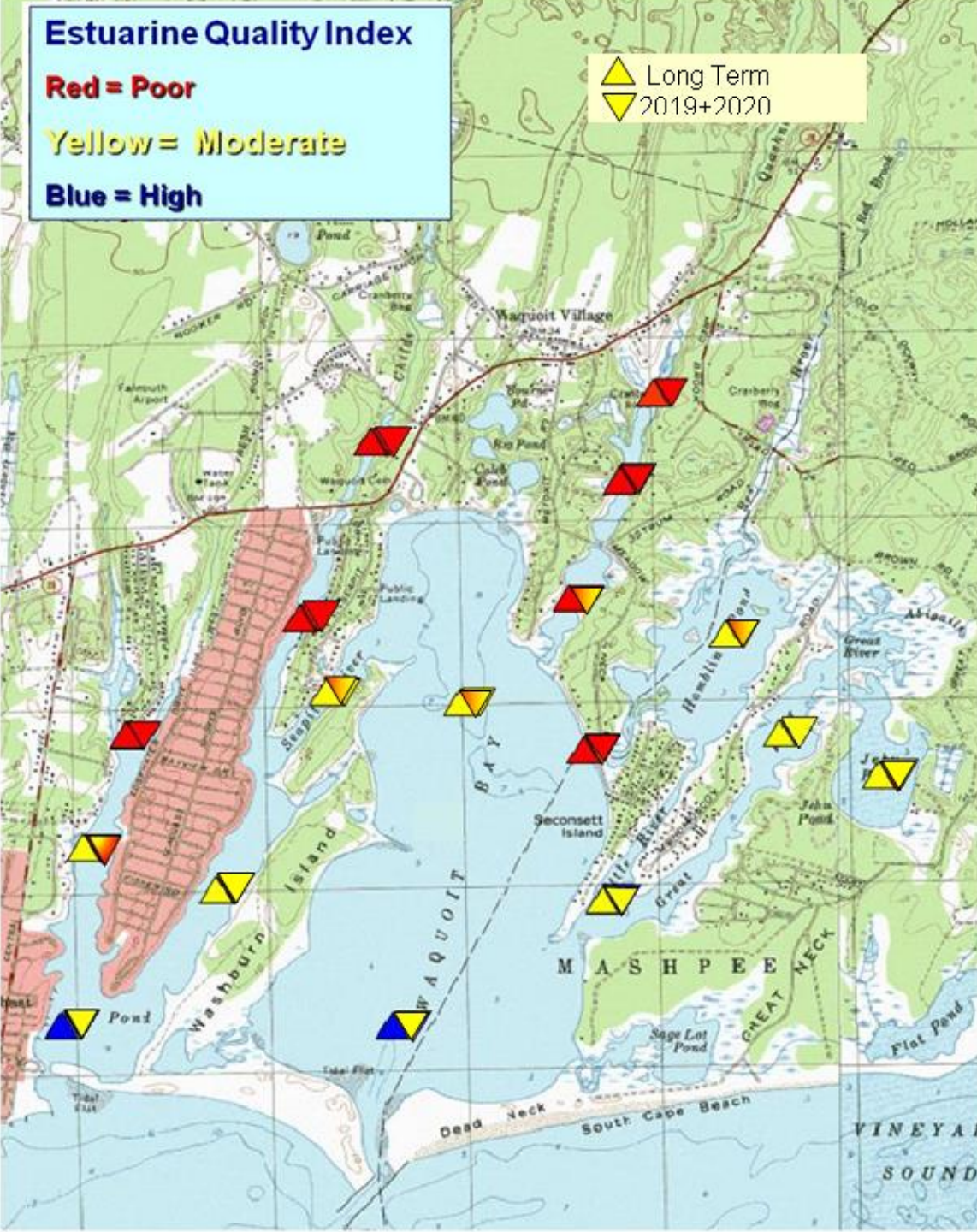
Estuarine Quality Index

Red = Poor

Yellow = Moderate

Blue = High

▲ Long Term
▼ 2019+2020



Waquoit Bay Water Quality

2019-2020

- No High water quality areas remain,
- TN levels gradually increasing
- Phytoplankton Blooms increasing
- Overall System showing gradual decline
- Eastern embayments moderately N enriched
- Quashnet continues to have poor water quality
- 2019-2020 terminal pond water quality, declined (Hamblin, Jehu).

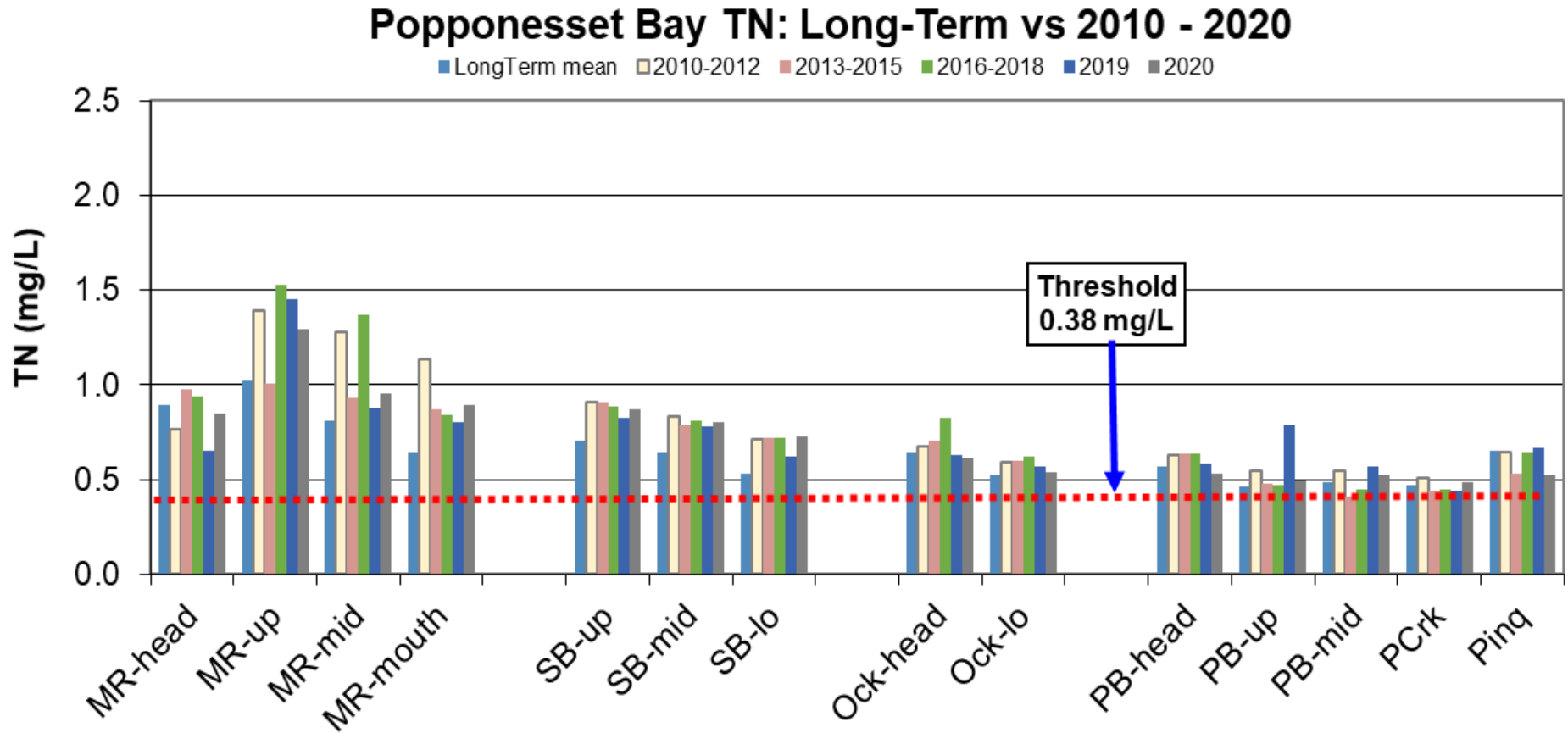
Status: Mashpee Waquoit Bay

Upper regions of each estuary showing the greatest level of nutrient related water quality decline. Eelgrass lost from both systems.

Summary of Present Status and Trends of Water Quality in Mashpee's Estuaries						
Estuary	Type	Habitat	TMDL	Status	Trend	Remedial Actions
Waquoit Bay						
Jehu Pond	Basin	Marine	In Place	TN Rebound	Declining	Shellfish Seeding
Hamblin Pond	Basin	Marine	In Place	TN Rebound	Declining	Shellfish Seeding
Great River	Tidal River	Marine	In Place	TN Rebound	Declining	Shellfish Seeding
Little River	Tidal River	Marine	In Place	TN Rebound	Declining	Shellfish Seeding
Upper Quashnet	Tidal River	Fresh/Brackish	In Place	Severely Degraded	UnChanging	None
Lower Quashnet	Tidal River	Brackish	In Place	Severely Degraded	UnChanging	None
Upper Childs River	Tidal River	Brackish	In Place	Severely Degraded	UnChanging	None
Lower Childs River	Channel	Marine	In Place	Moderately Impaired	UnChanging	None
Upper Eel River	Tidal River	Brackish	In Place	Significantly Impaired	UnChanging	None
Lower Eel River	Basin	Marine	In Place	Moderately Impaired	Declining	None
Upper Main Basin	Basin	Marine	In Place	Impaired	Declining	None
Lower Main Basin	Basin	Marine	In Place	Moderately Impaired	Declining	None

Estuarine Monitoring Results: TN

Stations Exceed TMDL TN Threshold in All Years



MR: Mashpee River, SB: Shoestring Bay, Ock: Ockway Bay, Pinq: Pinquickset Cove, PCrk: Popponeset Creek, PB: Popponeset Bay

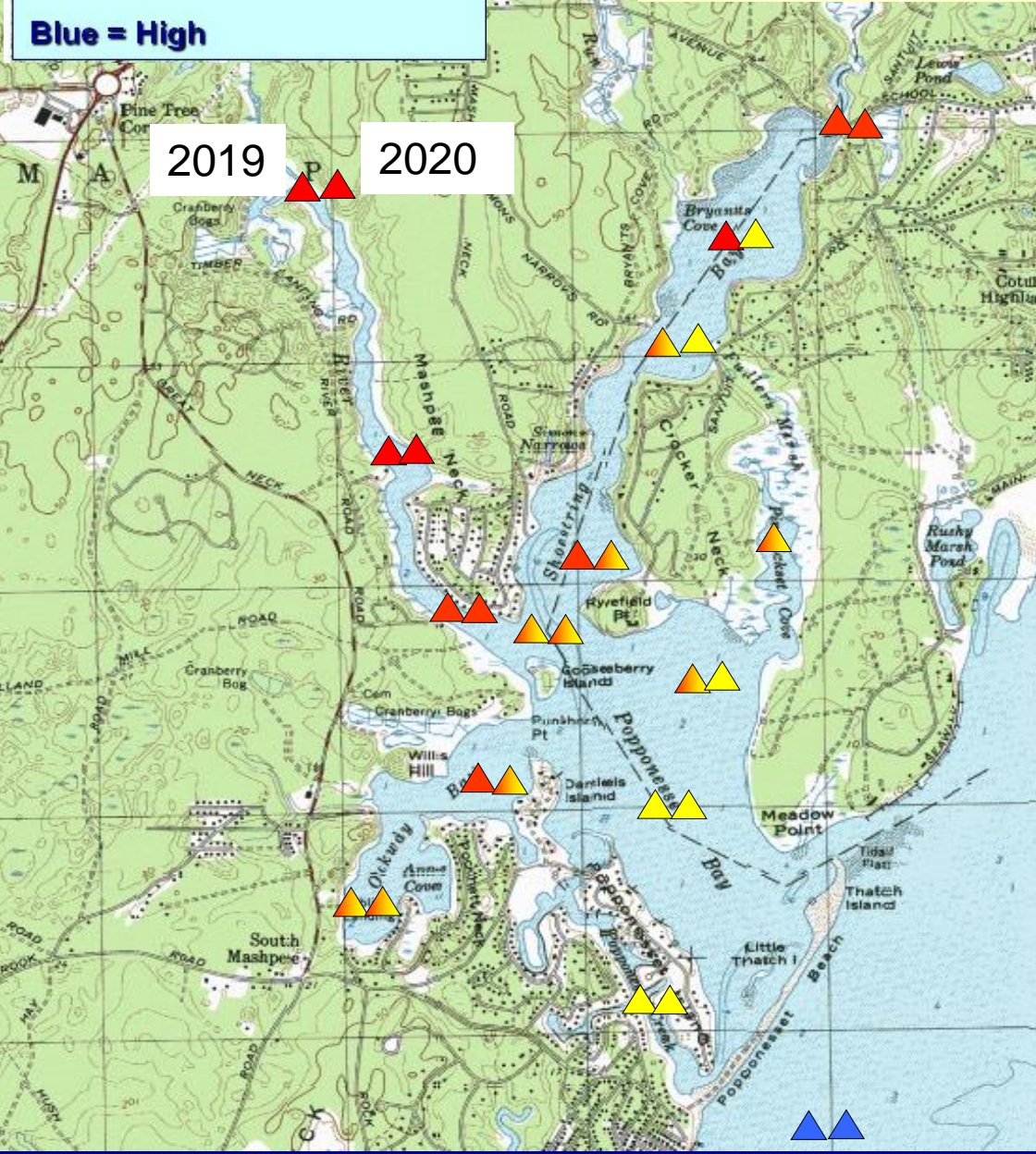
Estuarine Quality Index

Red = Poor

Yellow = Moderate

Blue = High

Popponesset Bay
Health Index:
2019 & 2020



Popponesset Bay Water Quality

- Large and Significant N enrichment in upper tributaries; nutrient impairments throughout
- Increasing Large phytoplankton blooms each summer
- No High water quality areas remaining
- 100% eelgrass loss
- Benthic Habitat impaired through most of system.

Status: Mashpee Popponesset Bay

Upper regions of each estuary showing the greatest level of nutrient related water quality decline. Eelgrass lost from both systems.

Summary of Present Status and Trends of Water Quality in Mashpee's Estuaries						
Estuary	Type	Habitat	TMDL	Status	Trend	Remedial Actions
Popponesset Bay						
Upper Mashpee River	Tidal River	Fresh/Brackish	In Place	Impaired	UnChanging	None
Lower Mashpee River	Tidal River	Brackish	In Place	Impaired	TN Decline	Shellfish Culture
Inner Shoestring Bay	Basin	Marine	In Place	Severely Degraded	UnChanging	None
Outer Shoestring Bay	Basin	Marine	In Place	Significantly Impaired	UnChanging	None
Upper Ockway Bay	Basin	Marine		Significantly Impaired	UnChanging	None
Lower Ockway Bay	Basin	Marine		Significantly Impaired	UnChanging	None
Pinquissett Cove	Basin	Marine	In Place	Moderately Impaired	UnChanging	None
The Creeks	Channel	Marine	In Place	High Quality Waters	UnChanging	None
Upper Main Basin	Basin	Marine	In Place	Moderately Impaired	UnChanging	None
Lower Main Basin	Basin	Marine	In Place	Moderately Impaired	UnChanging	None

Popponesset and Waquoit Bays

Findings:

- General impairment throughout both estuaries, no high water quality areas remain.
- Gradual decline in lower basins, while upper tributary regions remain significantly impaired.
- Frequency and magnitude of phytoplankton blooms increasing, although variable.
- Clear evidence that declines due to nitrogen enrichment within the bay waters

Estuarine Monitoring: Popponesset Bay and Waquoit Bay

Findings:

- Results indicate that Monitoring Program is able to detect changes in response to implementation of management alternatives.
- Town implementing CWMP Phase I will be tracked and water quality versus TMDL targets will be used to support management & regulatory compliance tracking.

*Estuarine Monitoring:
Popponesset Bay and Waquoit Bay*

***THANK YOU ! To all the Volunteers from
Mashpee and the Wampanoag Tribe***

***And the Mashpee Waterways Commission
(Don MacDonald) who oversee the project***

Phase I in reversing the decline: Coming Soon.

Questions & Discussion