APC & Nemasket Watershed Management and Climate Action Plan

Existing Conditions and Anticipated Climate Change Impacts Overview

WATER QUALITY

Surface and Ground, Drinking Supply and Ecological Conditions

CURRENT CONDITIONS IN WATERSHED

Nutrients that are important for water suppliers: Nitrogen, Phosphorous…and new in 2021 are standards for PFAS that are capped in the parts per trillion and would be very expensive to treat if they are present. For now, water suppliers have not collected data on how treatment costs fluctuate with water quality because cost has been fairly consistent, but as water levels decrease, concentrations will change, and this could change.

Presence of milfoil tends to be indicative of excessive phosphorous, per convo with Naomi.

Important for fish: dissolved oxygen

Troubling inputs: runoff from law fertilizers, septic systems…

Inter-regional cooperation: Water suppliers receive a copy of all NOI's that go before pondside conservation commissions, but don't have any regulatory authority despite impacts to water quality.

Nitrogen

- Sources: fertlizer, septic systems, WWTP, non-point source pollution; See figures 1 and 2.
- Ecological impacts, primarily calculated based on the TMDL for Mt Hope Bay (N is clear limiting nutrient in coastal settings).
    - Some evidence that N important in eutrophication in ponds, but I don't have hard numbers on this. If we want them, I (Sara) could do some digging with EPA ORD.
- Limits regulated based on drinking water only (without TMDLs)
- Elevated levels can help invasive species advantages, can have adverse impacts on native plant health (could follow up on specifics re: species and N vs P vs other).

Phosphorus

- Sources: sediment (need to check how much orthophosphate binds to the sand that seems to be shifting around in the system; Sara).
- Impacts: P tends to be limiting nutrient in freshwater. This likely to be primary driver of eutrophication, risk of low DO, acidification, toxic algal blooms, fish kills - more likely in reservoirs, rivers also not immune to these impacts (see Gold book standards).
- Elevated levels can help invasive species advantages, can have adverse impacts on native plant health (could follow up on specifics re: species and N vs P vs other).
- Cranberry bogs can be a source, some farms in the watershed have adopted P smart fertlizer management

PFAS

- DEP recently lowered PFAS standards for drinking water (https://www.mass.gov/doc/pfas-mcl-revisions-to-310-cmr-2200-clean-version-9-16-2020/download).
- Easton, Mansfield tackling this, not sure how. Hyannis did dilution, I don't know a lot about removal tech (Sara)
- Are Taunton and New Bedford sampling for PFAS yet?

Fecal Coliform

- Impacts drinking water and meeting assessed recreation and contact uses. Would need to think about source to think about solution. This would be relatively new territory for me, but could think about. First thoughts = failed septics/cess pools, pet/livestock waste (some horse farms in the watershed; Sara)

Impervious Surfaces

- Impacts of impervious cover vary based on target of concern (all the way down to instream species tolerance). Whether its connected or disconnected also matters. However, in recent consultation with DCR and EPA, TNC set a threshold of 10% impervious cover as a threshold for impacting infiltration, generating stormwater flooding.
    - Some areas around the watershed do have greater than 10% IC. See Figure 3. If we want to dig in on this, I can explain the methods and make a better map (Sara).
    - Could also think about overlapping IC and outfall catchment areas.

Contaminant	MCLG[1] mg/l	MCL[2] mg/l	Standard health effects language for public notification
National Primary Drinking Water Regulations (NPDWR) and Massachusetts Drinking Water Regulations:			
...			
J. Per- and Polyfluoroalkyl Substances (PFAS)			
91. PFAS6	None	20 ng/l[24]	Some people who drink water containing these PFAS in excess of the MCL may experience certain adverse effects. These could include effects on the liver, blood, immune system, thyroid, and fetal development. These PFAS may also elevate the risk of certain cancers.

[24] Nanograms per liter.

Ongoing Efforts

- TRWA sampling
- Any restoration efforts ongoing.

Measured concentrations:

TRA monitors the Nemasket monthly, I think not 2020; Nemasket at Murdock St (https://savethetaunton.org/water-quality-monitoring/water-quality-results/)

- Nitrate under **0.4 mg/L** all of 2019
- TP under **0.100 mg/L** all of 2019
- Fecal Coliform (FC) ENterococci (EN), threshold for concern **>61 colonies/100 mL**
    - Nemasket exceeded: May, June, Sept, Oct 2019
- DO target for concern **<5.0 mg/L** (12 is great) (we could check with Steve Silva - but I'm pretty sure these are surface samples, expect lower concentrations at depth)
    - Nemasket low: July 2019
- Met all TSS in 2019
- Met all pH in 2019
- Met all Temp 2019

Need some help with this for the ponds, more comprehensive on the river?, previous 208 work all based on modeled loading (Sara can do follow-up if someone has leads. Maybe water suppliers would know?)

Table 1. DEP Assessments (as of 2001
https://vc.bridgew.edu/cgi/viewcontent.cgi?article=1006&context=taunton_riv_ref

Long Pond	108	Impaired	non-native aquatic plants, source unknown		supports	support
Assawompsett Pond	003	not assessed			not assessed	not assessed
Pocksha	045	not assessed			not assessed	not assessed
Great Quittacas	083	not assessed			not assessed	not assessed
Little Quittacas	107	not assessed			not assessed	not assessed
Upper Nemasket	MA62-25	supports			not assessed	support
Lower Nemasket	MA62-26	not assessed			not assessed	support
Fall Brook	195	Unassessed			unassessed	unasses
Tispaquin Pond	195	not assessed			supports	support
Wood Pond	220	Impaired	non-native aquatic plants, source unknown		not assessed	not assessed

Management Targets

Drinking water limits for nitrate currently 10mg/L - based on methemoglobinemia, which can be fatal to babies and seniors. However, there is evidence that lower concentrations in drinking water are linked to various cancers, and fetal development impacts (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6068531/).

Ecological standards for pond and rivers to avoid N eutrophication impacts based on EPA's gold standards (to use in lieu of water quality assessment or TMDLs; ecoregional standards: https://www.epa.gov/nutrient-policy-data/ecoregional-criteria):

- Lakes and Reservoirs Gold Book (https://www.epa.gov/sites/production/files/documents/lakes14.pdf):
    - BASED ON 25th PERCENTILE ONLY Nutrient Parameters Aggregate Nutrient Ecoregion XIV Reference Conditions Total phosphorus (µg/L) 8; Total nitrogen (mg/L) (reported) 0.32; Chlorophyll a (µg/L) (fluorometric method) 2.9; Secchi (m) 4.5
- Rivers Gold Book (https://www.epa.gov/sites/production/files/documents/rivers12.pdf):
    - **Recommend we use the same standards as TRWA**
    - BASED ON 25th PERCENTILES ONLY Nutrient Parameters Aggregate Nutrient Ecoregion XII Reference Conditions (same as EcoR 75) Total phosphorus (µg/L) 40.0; Total nitrogen (mg/L) 0.9; Chlorophyll a (µg/L) (Spectrophotometric method) 0.40; Turbidity (NTU) 1.9
- Middleboro WWTP EPA permit 2015 - nitrogen reduction goals (focusing on stormwater)
    - "Based on the overall flow of the estuary (average of summers 2004 and 2005), the allowable TN load to the Taunton River Estuary, including both ocean and watershed loads, is 3,879 lbs/day. The load from the ocean is 1,798 lbs/day, leaving an allowable load of 2,081 lbs/day from watershed sources. As noted Above actual loads in 2004-05 averaged 4,228 lbs/day. This means a reduction in watershed loads of 2,147, or approximately 51%, is required in order to meet water quality standards in the Taunton River Estuary."

Figure 1. Sources of nitrogen loads for the Taunton River Estuary. EPA Draft Permit Middleboro, 2015. More details on loading assumptions for N can be found here: https://tnc.box.com/s/qbdxxbajz6m2mt3vomg1mf47c3fmcolz

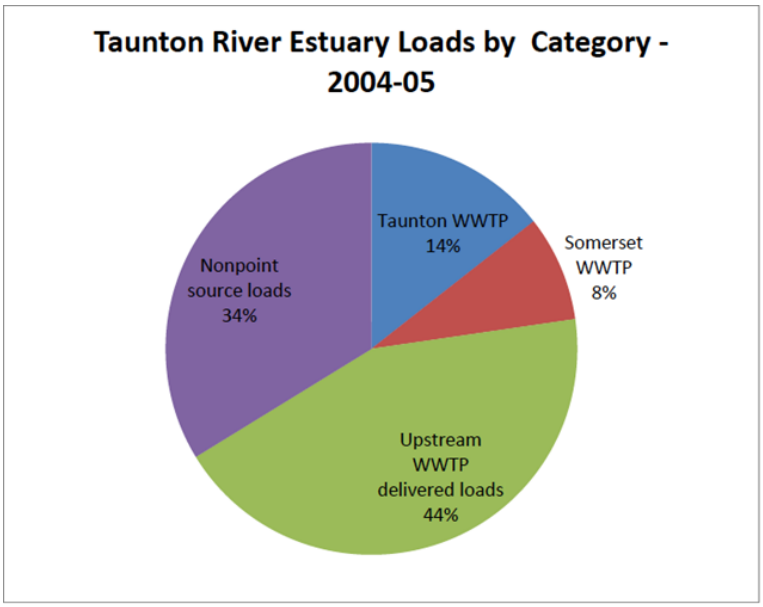


Figure 2. Sources of nitrogen loads for the combined Assawompsett Pond and Nemasket River HUC 12 watersheds (2017 assessment based on 2009 LULC GIS data by HW and CCC for 208 grant) - methods for apportioning N load available; could use P coefficient to get at P loading as well., ask Sara; slides here (https://tnc.box.com/s/p6a2wf63j69l76ltla6tjapwqkenu9os)

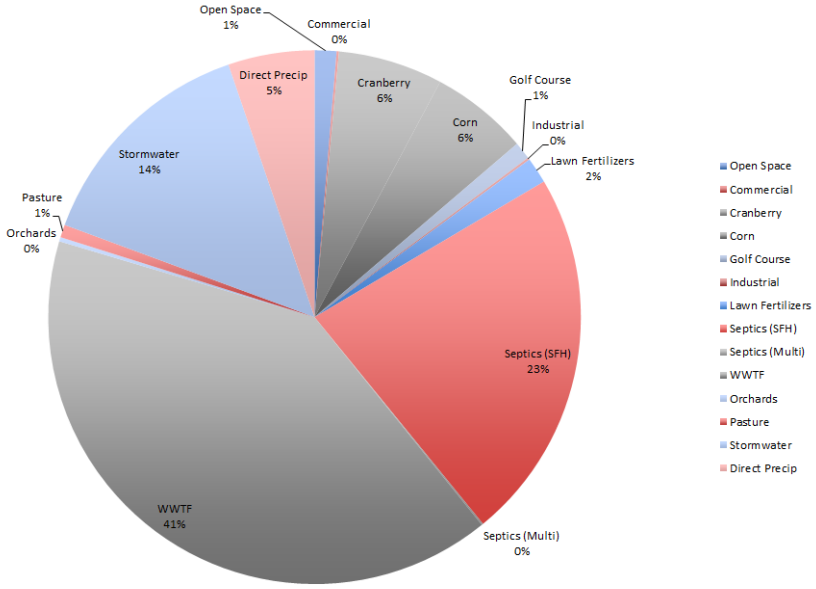
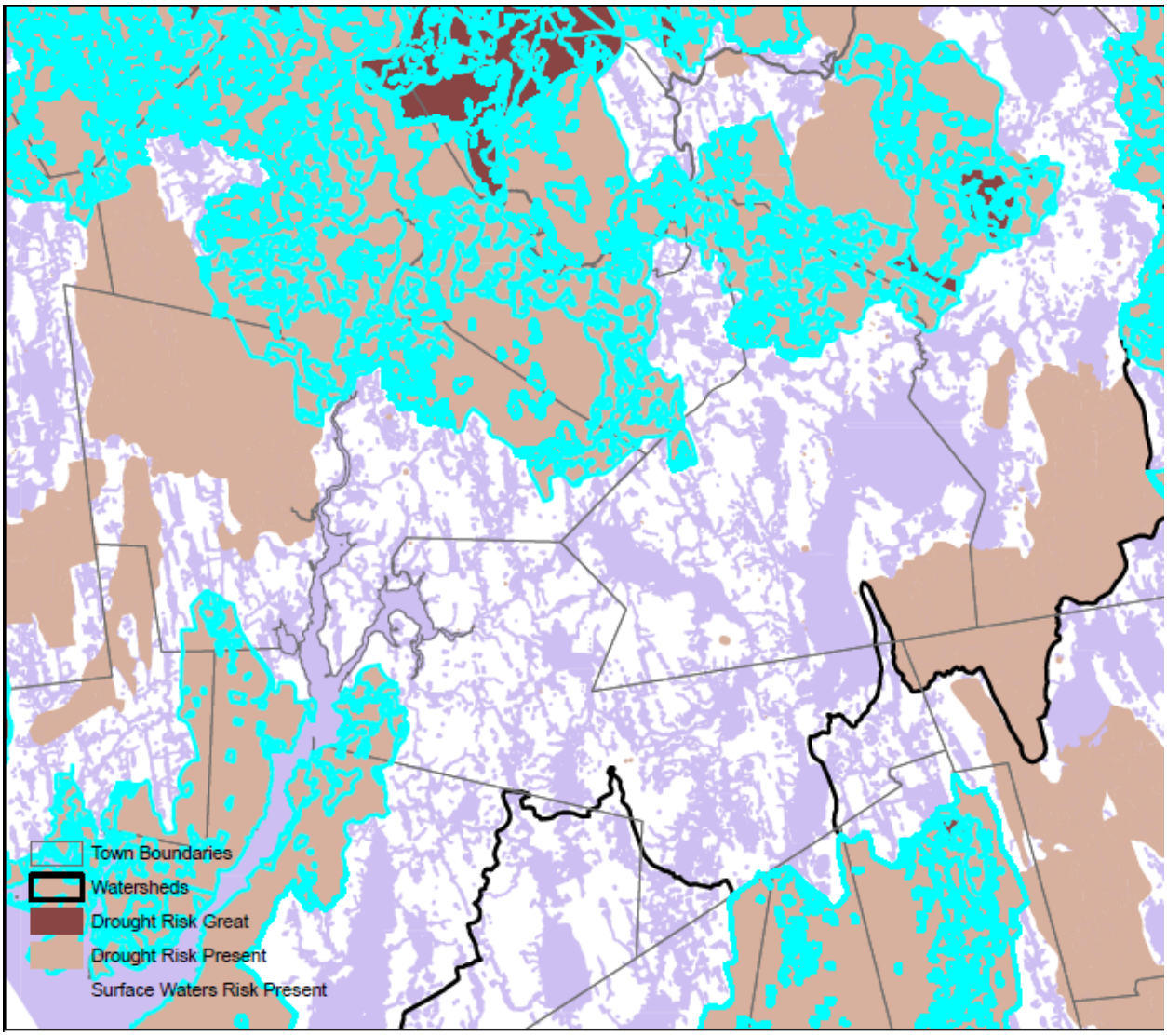


Figure 3. SWMI Hyrdologic units with greater than 10% impervious cover are shown in bright blue. This is a TNC product, and if we want to really dig in on this, I can make a more polished version (Sara).



Additional Data Points to Explore (sources included, if known)

TRADE-OFFS AND CO-BENEFITS WITH OTHER INTERESTS

Improved Water Quality and...

1. **Drinking Water Supply Levels: Neutral.**
2. **Floodwater Management: Neutral to Co-Benefit.** Flooding over built areas has the potential to move and migrate pollutants and debris into the water system. Minimizing these floodwater extents will minimize this effect.

3. **Stormwater Management: Co-Benefit.** Increased stormwater infiltration decreases runoff that carries pollutant loads into the water system.
    a. Stormwater flooding, potentially as frequently as the 2 year flood event can cause bed moving events, destablizing sediments, banks, and re-circulating pollutants, esp. P, exacerbating decreased water quality, and contributing up to 25% NFIP claims nationally. Also raising temperatures.
4. **Ecology, Unique Habitats and Natural Resources: Co-Benefit.** Wetlands enhancement achieves both. Milfoil control. Riparian restoration shown to be most cost-effective P control in the WMOST assessment led by Manoment and EPA in the Wading, removing invasives and restoring trees might improve P, sediment, and temperature.
5. **Increased Land Development: Trade-Off.** Increased development doesn't have to have adverse impacts to water quality, but to both increase development and protect and enhance water quality, the munis might consider LID or other bylaw review, development standards.
6. **Increased Inter-Agency Cooperation: Co-Benefit.** More cooperation between local and state operators on roadway drainage systems benefits water quality.
7. **Recreational Access: Tends Toward Trade-Off.** Increased recreation can encourage users to become stewards of the sites they love to frequent, potentially building support for water quality improvement measures. Water crafts that move between watersheds and systems can bring invasives with them that would harm water quality. Recreation is not permitted on Assawompset Pond due to adverse water quality concerns.
8. **Increased public stewardship: Co-Benefit.**

IMPLICATIONS OF ANTICIPATED CLIMATE CHANGE IMPACTS

Increased surface water temperatures:

- Less dissolved oxygen, diminished water quality habitat for aquatic species, and eutrophic conditions potentially triggered by lower nutrient concentrations than currently planned for.
- Increased storm magnitude and intensity increases flooding, stormwater flooding, decreases infiltration.
- Increased frequency and intensity of drought also reduces infiltration, base flows which in turn exacerbates impacts of Temp and nutrients.