Water quality monitoring to motivate and track management in Buzzards Bay, Massachusetts

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Signs of Bay Health Decline

- Loss of eelgrass
- Reduced water clarity
- More frequent algal blooms
- Less diverse/abundant benthic fauna
• Program initiated in 1992
  • Evaluate WQ & ecological health
  • Educate citizens
• >200 stations by ~140 volunteers
• DO, temp, salinity & Secchi depth every ~5 days (late May to Sep)
• Nutrient and Chl 4 times (2x in Jul, 2x in Aug), analyzed by MBL
• Methods approved by EPA & DEP
How do we use our data?

- To ground advocacy efforts in sound science
- Provide regulators with critical info on WQ:
  - Listing waters on State 303d impaired waters list
  - MA Estuaries Project reports
  - Wastewater treatment plant discharge permits
  - Track TMDL progress
- Give students and researchers WQ data
- Educate the community on Bay health
Wareham Wastewater Treatment

- Degraded water quality in the Wareham River downstream of wastewater treatment plant
**Degraded water quality in the Agawam River downstream of wastewater treatment plant**

- EPA used Coalition data to lower permit limit to 4 mg/L
- Plant upgraded to N reducing technology in fall 2005
• Degraded water quality in the Agawam River downstream of wastewater treatment plant

• EPA used Coalition data to lower permit limit to 4 mg/L

• Plant upgraded to N reducing technology in 2005
• Discharges to GW, travel time ~7-10 yrs to West Falmouth Harbor

• Treatment plant built in 1986, degradation 1st noticed in mid-1990s

• Plant upgraded in 2006

• Coalition data used repeatedly in discussions on permit limits over the last 20 years
Downstream Impacts Continue
• Red dots are where TN or Chla significantly increased over 22 yrs (1992 – 2013)
• Dot size represents magnitude of the slope
Trends of TN, Chl, and T over time

Average July Temperature:
1992 – 2002: 22.6 °C or 72.6 °F
2003 – 2013: 23.1 °C or 73.6 °F
• Each dot represents the average concentrations of an estuary
• Slope has shifted up over time indicating higher Chl for the same unit nitrogen
• At the same, water temperatures have risen by 0.082°C/yr, or 1°C every 12 yrs
Summary

• Baywatchers valuable for motivating nitrogen management and documenting improvements
• Data can summarize Bay health in simple, accurate way
• Baywatchers will document responses to climate change

Thank you to the >1,000 Baywatcher volunteers who have made this work possible!
Questions?
Communicating to the public

- Key monitoring parameters are combined to produce a Bay Health Index score on a scale of 0 to 100, 5-year running average used
  - DO saturation (lowest 20%)
  - Secchi disk depth
  - Chlorophylla + phaeophytin
  - Total Organic Nitrogen
  - Dissolved Inorganic Nitrogen

Good to Excellent (65-100)
Fair (35-65)
Poor/Eutrophic Conditions (<35)
How do we use our data?

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- Provide regulators with critical info on WQ:
  - Listing waters on State 303d impaired waters list
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  - Wastewater treatment plant discharge permits
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[Graph showing summertime TN in West Falmouth Harbor and Bay Health Index Score for West Falmouth Snug Harbor]