Trends in water quality in response to urbanization across Waquoit Bay

Nitrogen loading, seasonality differences, and primary productivity

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Urbanization



Nitrogen load



Waquoit Bay Watersheds





Waquoit Bay Nitrogen







Questions

How does urbanization of land alter water quality in estuaries?

- Using a space-for-time landscape experiment
 - Sage Lot Pond = Pristine
 - Quashnet River = Intermediate
 - Childs River = Fully urbanized
- Seasonal responses in water quality
 - Nitrogen concentrations in its different forms
 - $\circ~$ Primary productivity of plankton

What implications does this have for management?











Field Methods







Laboratory Methods









Nutrient Concentrations

Nitrate (NO₃)

- Winter = HIGH
- Summer = LOW
- Higher concentrations as urbanization increases

Ammonium (NH₄)

- Relatively low concentrations
- Similar concentrations across seasons
 and sites

Dissolved Organic Nitrogen (DON)

- High concentrations
- Seasonality opposite of nitrate
- Similar concentrations across sites

Total Dissolved Nitrogen (TDN)

- Sum of previous nitrogen forms
- Seasonality unclear
- Difficult to see differences across sites

Chlorophyll-a Concentrations



What is chlorophyll-a?

- Photosynthetic pigment
- Estimates biomass of planktonic algae

chlorophyll-*a* indicates eutrophication (green water)

Summer = High values Spring + Fall = Low values

High urbanization results in higher concentrations of chlorophyll-a

High urbanization results in an earlier peak

Highly variable but show clear pattern

The peak lines up with the dip in nitrate due to consumption





Look at all forms of nitrogen, not just total nitrogen

Seasonality matters |Spring+fall = \uparrow NO₃ |

Summer =
$$\mathbf{VO}_3$$

Huge variability within the systems – cover the entire salinity gradient

Helps design monitoring programs

Management Strategies



Main goal = reduce nitrogen coming into these systems

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