NUTRIENT POLLUTION IN CASCO BAY, MAINE

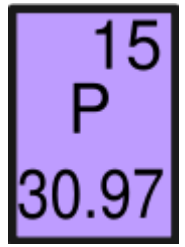
Curtis C. Bohlen, Director, Casco Bay Estuary Partnership

Nutrients (Maybe not what you think)

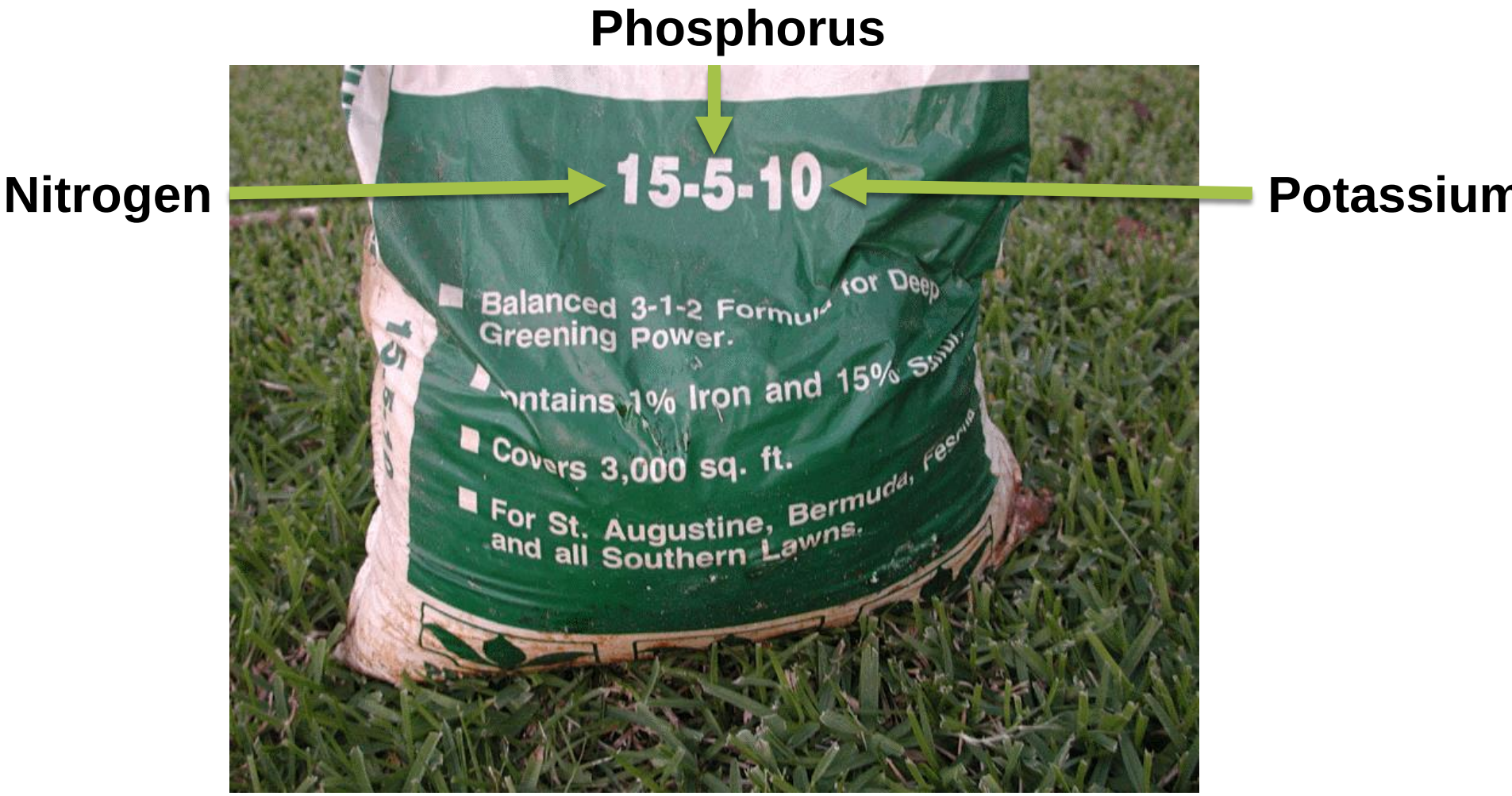
- Ecologists use the term in a specific, technical way
- NOT vitamins or healthy foods

- Elements like carbon, nitrogen, phosphorus required to build living organisms

- Nutrients of concern for coastal water quality generally include Nitrogen and Phosphorus



Nutrients Fuel Plant Growth



Plants Produce and Consume O_2, CO_2

- Daytime / In Light / Plants and Phytoplankton
  - "Photosynthesis"
    - Generates oxygen
    - Consumes carbon dioxide
- Nightime / In the Dark / Plants, animals, bacteria…
  - "Respiration"
    - Consumes oxygen
    - Generates carbon dioxide

Too Much of a Good Thing?

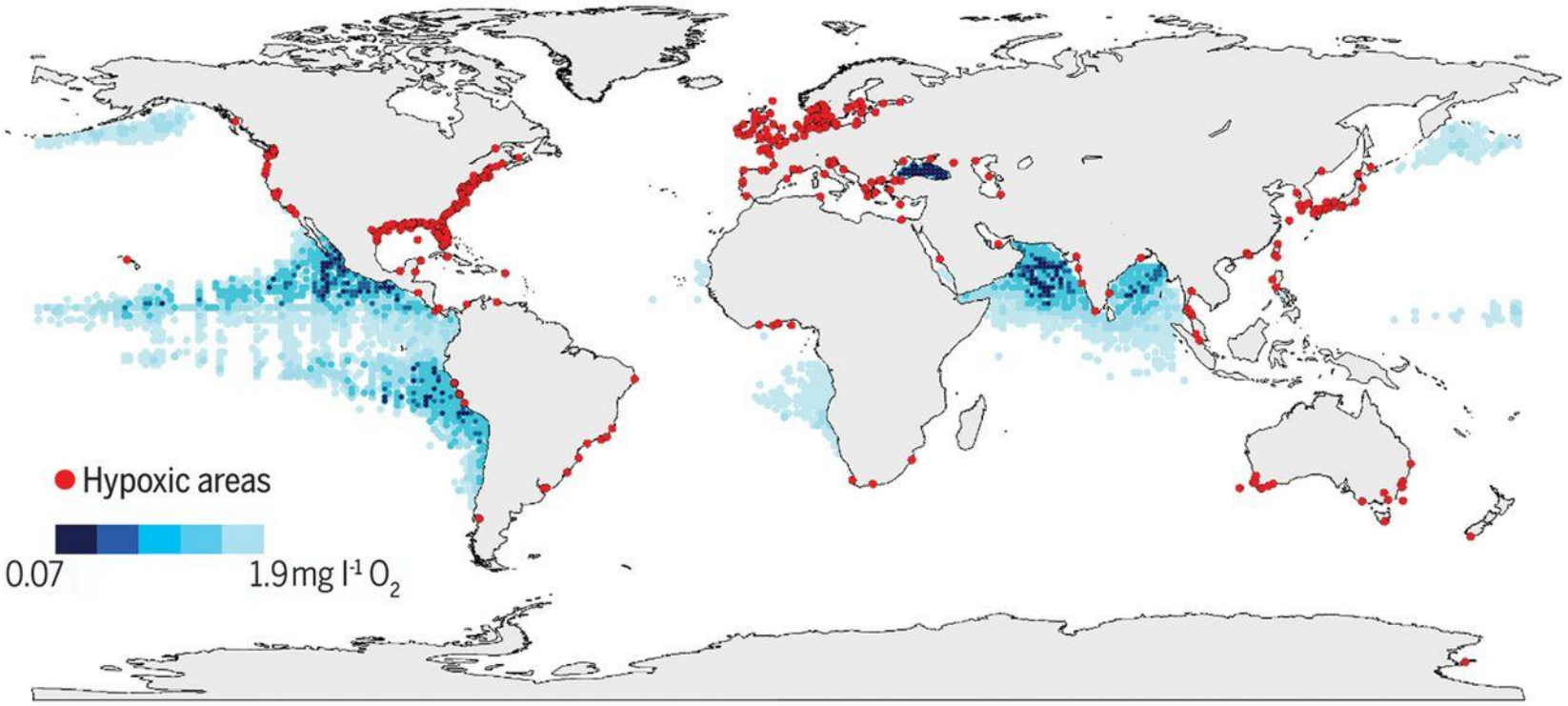
- Increased algae growth
  - Algal blooms / HABs
  - Reduced light on Bay bottoms
    - Loss of eelgrass habitat
  - Respiration and decomposition
    - Reduced oxygen
      - Fish kills, odors
    - Release CO_2
      - Acidification
  - Habitat loss or damage
  - Reduced marine harvests
  - Aesthetic impacts

Human Activity → Increases

- Population growth
  - More human waste
- (Sub)urbanization
  - More stormwater
  - More atmospheric deposition (driving)
- Agricultural production
- Use of lawn chemicals
- Loss of forests and wetlands
  - Reduce ability of the watershed to remove pollutants

Tree box filter maintenance

Low and declining oxygen levels in the open ocean and coastal waters affect processes ranging from biogeochemistry to food security.



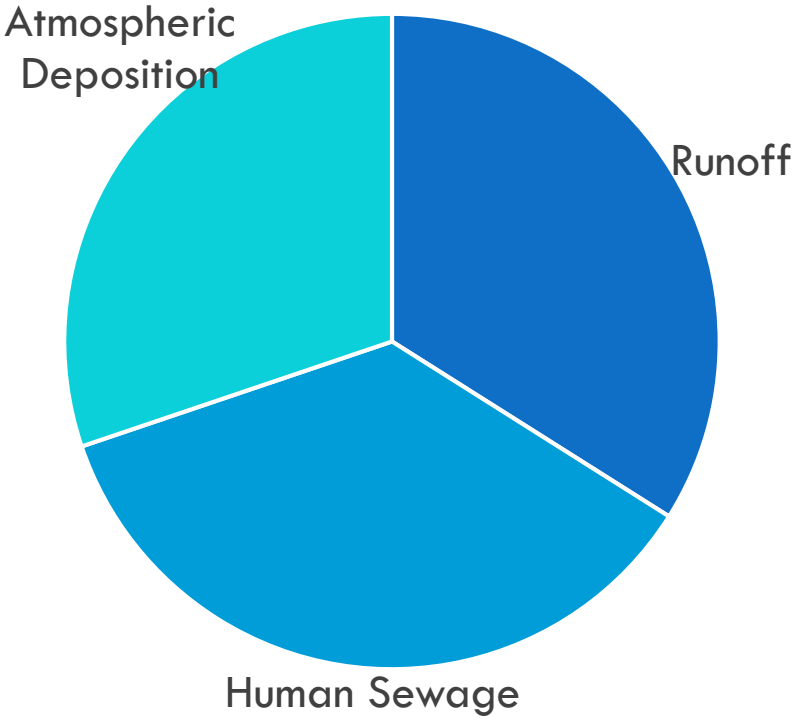
Denise Breitburg et al. Science 2018;359:eaam7240

In Casco Bay

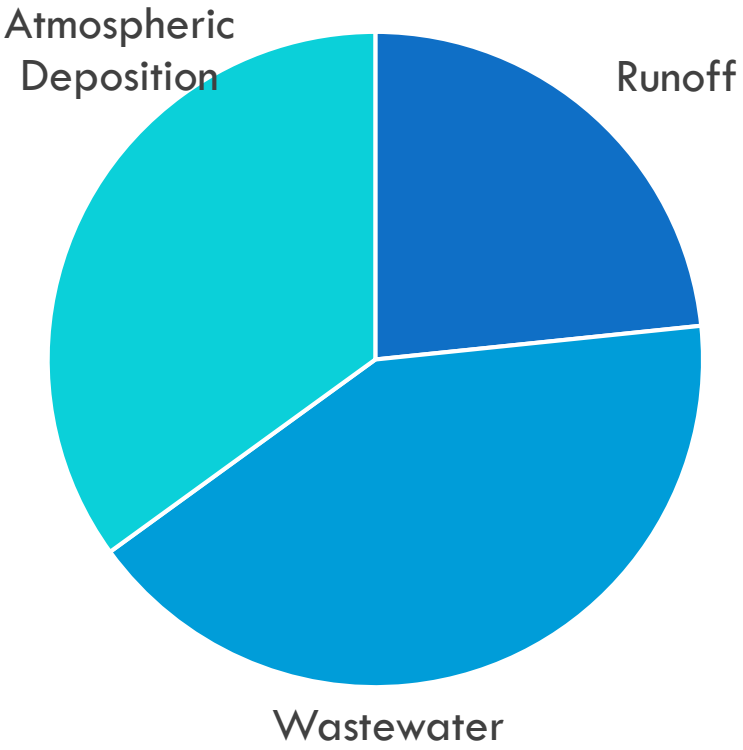
- Nitrogen is the primary nutrient of concern
- Few “dramatic” events like fish kills that raise public visibility
- Subtle effects (coastal acidification)
- Episodic or local events (algal blooms)
- Hypothesized effects (eelgrass)

Where's it all coming from?

Castro et al. 2003



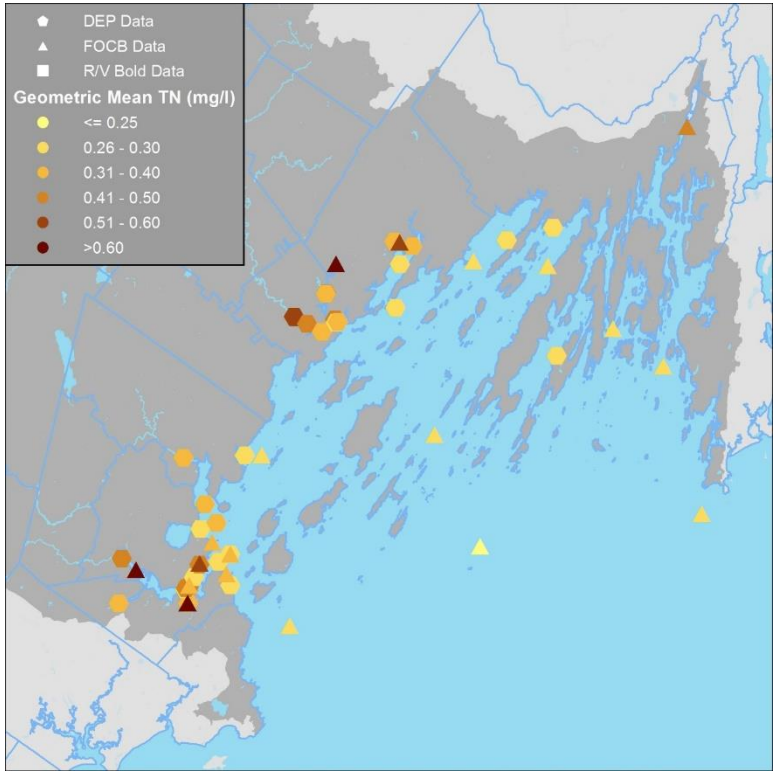
Bricker et al. 2006



Two Models -- Different assumptions, Methods

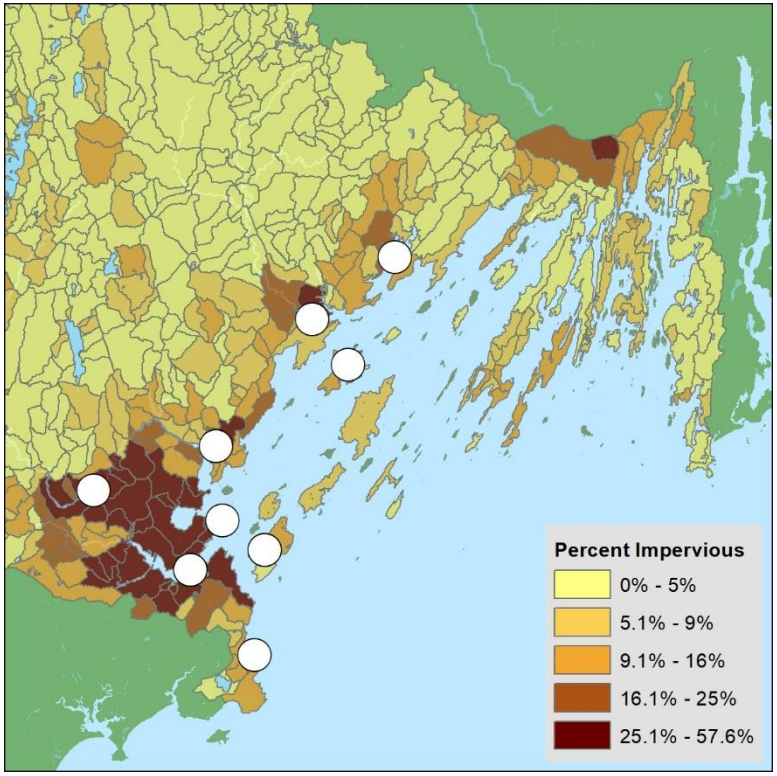
Source: Castro et al. 2003

Issues are Local, not Baywide



Data Provided by:
Friends of Casco Bay
Maine Department of Environmental Protection
US Environmental Protection Agency

Impervious Cover 2007

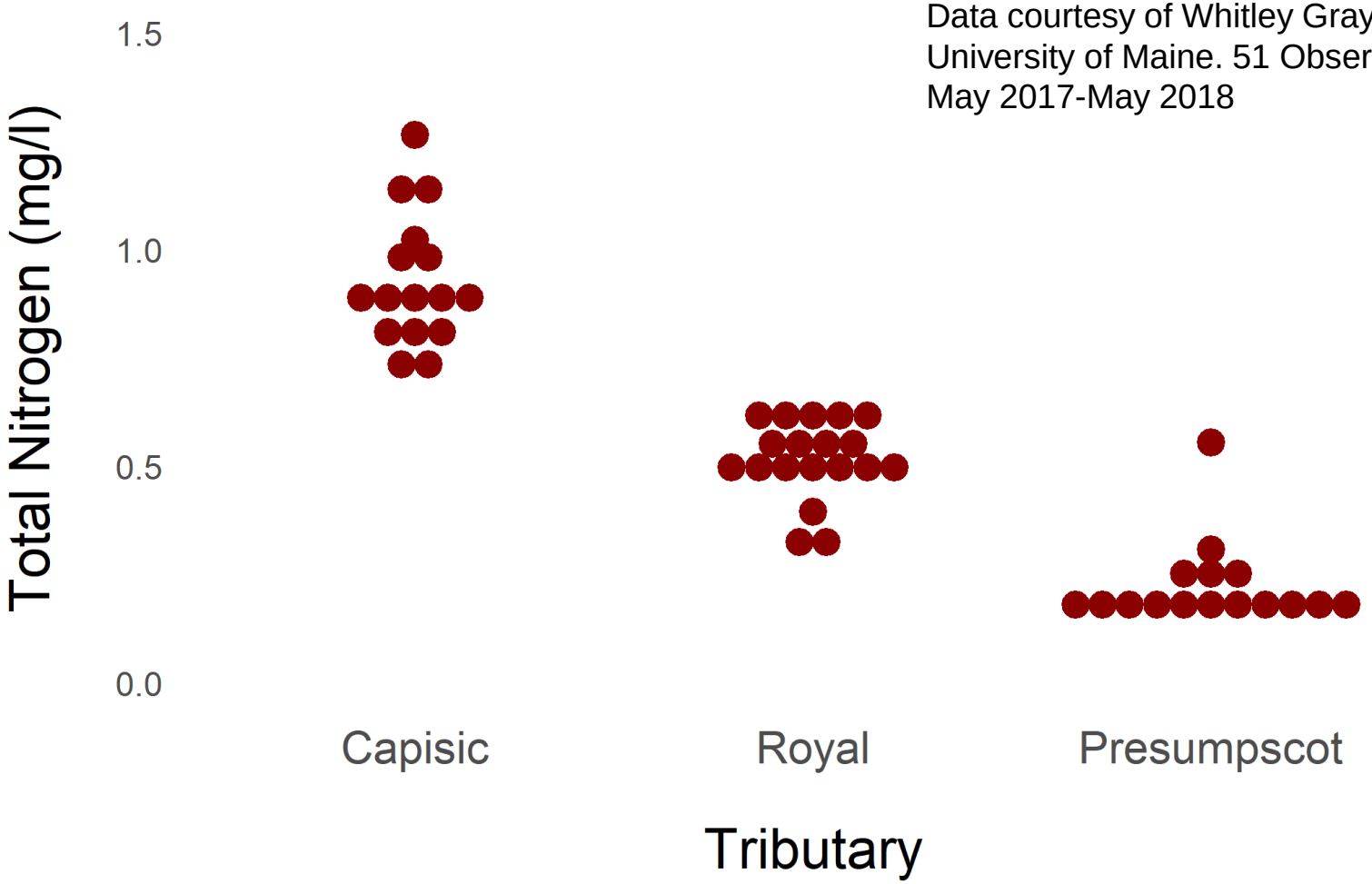


And Wastewater Treatment Facilities

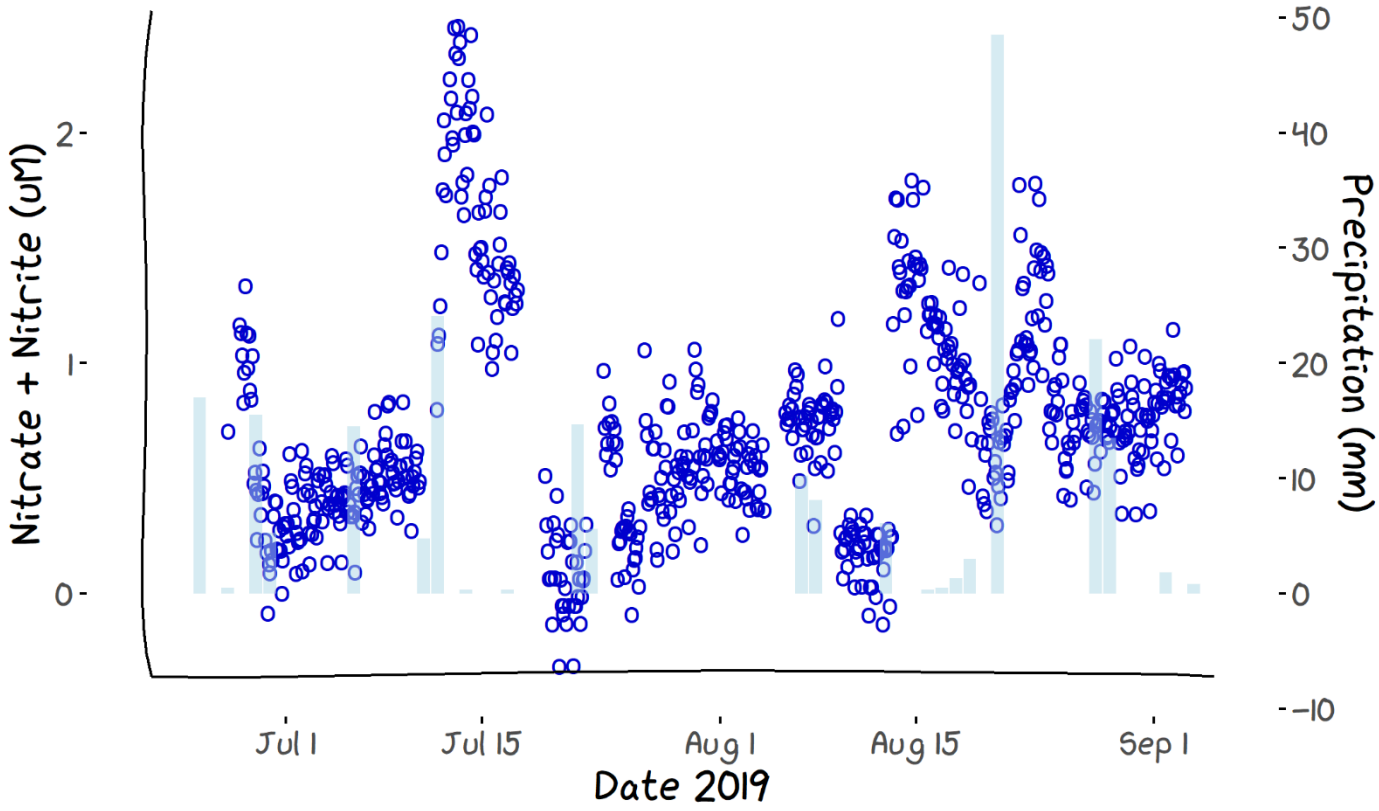
- A measure of urbanization
- Directly linked to runoff and water quality problems

Three Casco Bay Tributaries Total Nitrogen Concentrations

Data courtesy of Whitley Gray, University of Maine. 51 Observations May 2017-May 2018

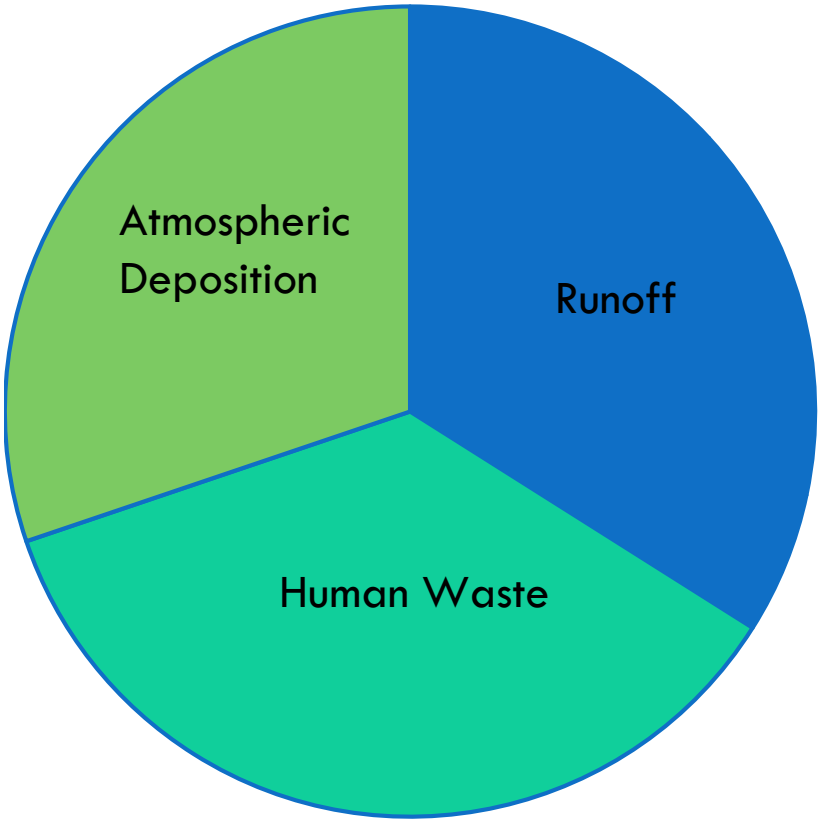


Nitrogen and Rainfall



Nitrogen Concentrations In Portland Harbor

Alternative Investments….?



- Atmospheric Deposition
  - Reduce reliance on fossil fuels
  - Reduce vehicle emissions
    - Fuel efficiency, electric vehicles, transit, compact development….
- Reduce runoff
  - Protect forests, wetlands and floodplains
  - Encourage “Low Impact Development” and “Green Infrastructure”
  - Implement stormwater technologies that treat nutrient pollution
  - Install stormwater treatment in developed areas
  - Reduce agricultural runoff
  - Reduce fertilizer use
- Wastewater
  - Repair/replace septic systems
  - Invest in waste disposal
    - On-site wastewater treatment
    - Extend sewer systems
    - Invest in wastewater plants
  - Reduce CSOs

Source: Castro et al. 2003

Thank you

- Curtis Bohlen
- Director, Casco Bay Estuary Partnership
- cascobayestuary.org
- cbohlen@usm.maine.edu