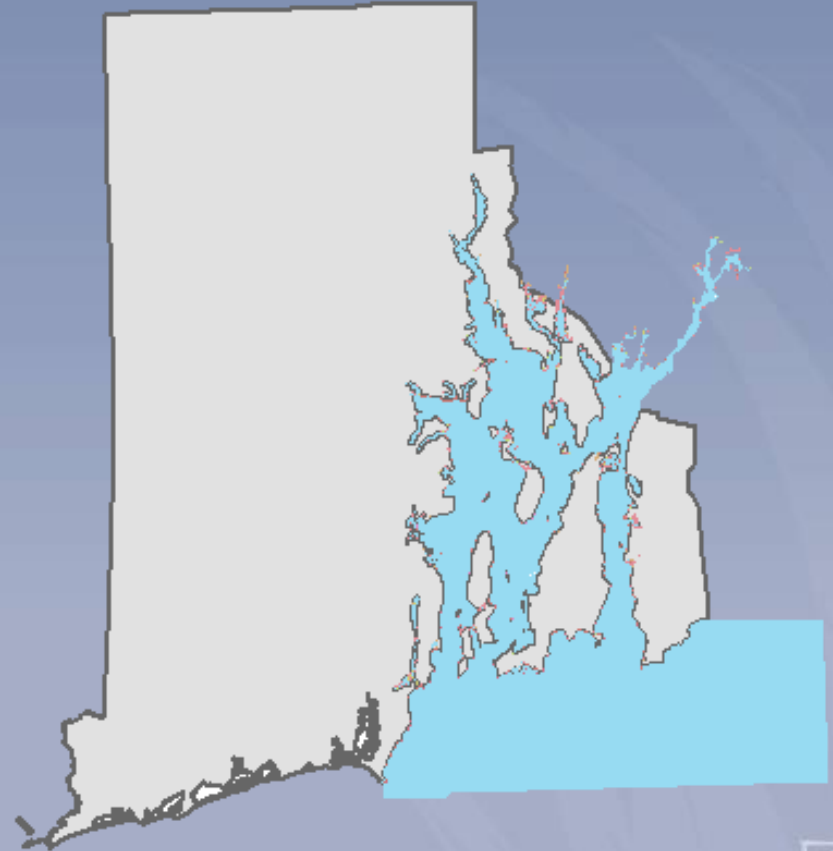


A satellite image of a large estuary system, likely the Chesapeake Bay. The image shows a complex network of waterways and marshlands. The land is a mix of green and brown, indicating different vegetation and possibly some urban or developed areas. The water is a deep blue, contrasting with the lighter green of the marshes. The text "An Introduction to Estuaries: Where Rivers Meet the Sea" is overlaid on the right side of the image.

An Introduction to Estuaries: Where Rivers Meet the Sea



Estuary: a semi-enclosed coastal body of water which has a free connection with the open sea and within which sea water is measurably diluted with fresh water derived from land drainage. (Pritchard, 1963)



Narragansett Bay is New England's largest estuary



national estuarine research reserve system

Importance of Estuaries

Habitat/food source

3,500 acres of marshes and wetlands in Narragansett Bay
More than 60 species of fish & shellfish spawn or feed in the Bay

Economics – fisheries, recreation, tourism

Value of Bay's commercial catch of fish & shellfish is \$25 million/year
Tourism on Narragansett Bay generates \$400 million/year and support 15,000 jobs
More than 100,000 people fish on Narragansett Bay each year

Filter

An adult oyster can filter 50 gallons of water/day
About 90% of river runoff nutrients in the Chesapeake are absorbed by plankton

Water/Sediment Trap = Sponge

Natural silt traps reduce amount of sediments and contaminants reaching coastal waters

Storm protection – buffer of wind/water, erosion control



Estuary Essentials: Importance of Tides & Mixing

- Plant and animal wastes are washed away
- Tides bring in plankton and nutrients
- Sediments move in, around and out of estuary
- Fresh and salt water are mixed



Estuary Productivity: Biomass & Biodiversity

- Rank with **tropical rainforests** and **coral reefs** as most productive ecosystems
- They are **more** productive than both the **rivers** and **ocean**



The salt and fresh water mix supports phytoplankton and plants like eelgrass.



Estuary Habitats

Rocky Shoreline



Open Water



Sandy Beach



Salt Marsh



Eelgrass Beds



Salt Marsh



- Dominant salt marsh plants include grasses, rushes and reeds.
- Specially adapted to tolerate varying levels of salinity and water
- *Spartina alterniflora* is the dominant low marsh plant in Narragansett Bay



Threats to Estuaries



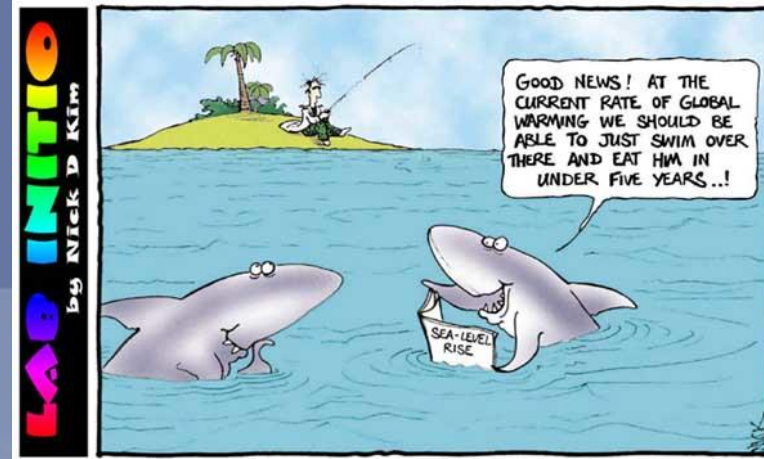
Population Density

- Approx. 1,500 single family housing units are constructed every day in coastal counties
- Coastal counties average 300 persons per square mile – the national average is ~100 per mile²
- Coastal counties have 53% of nation's population

Population Trends Along the Coastal United States: 1980 - 2008



Climate Change & Sea Level Rise



A. Warmer water temperatures:

1. Juvenile winter flounder face increase in predators
2. Lobsters will move north to reach cooler water

B. Sea Level Rise (SLR):

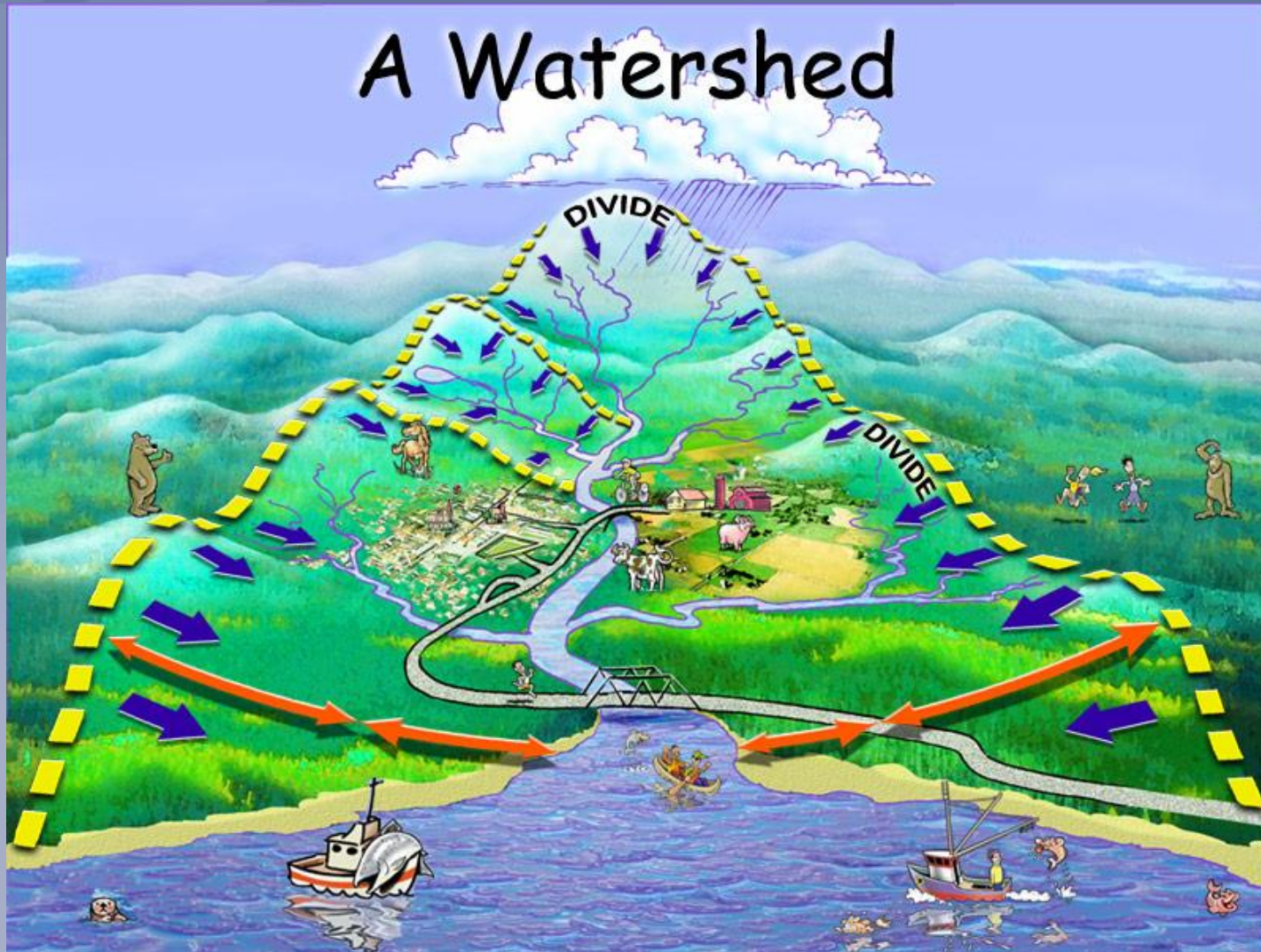
1. Impact on marshes – higher waters leads to die-off patches where less salt tolerant species once thrived
2. High marsh habitat is disappearing – no where to go because of coastal development
3. Can marshes keep up with SLR?

C. Stronger storms

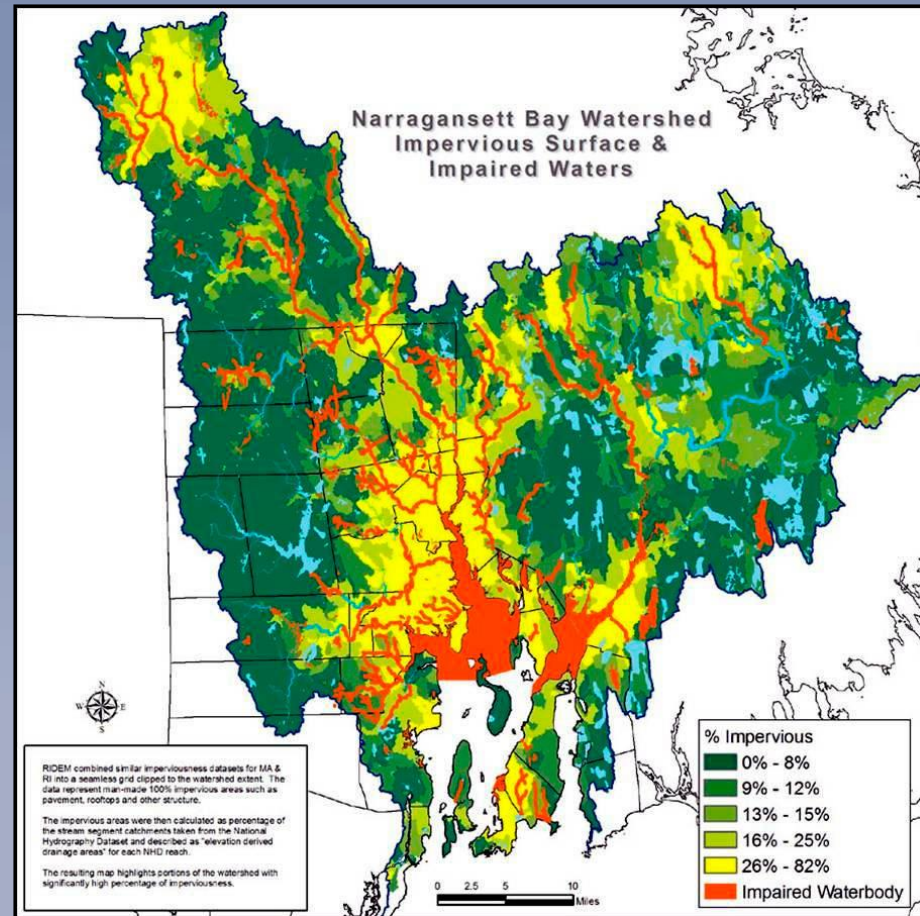
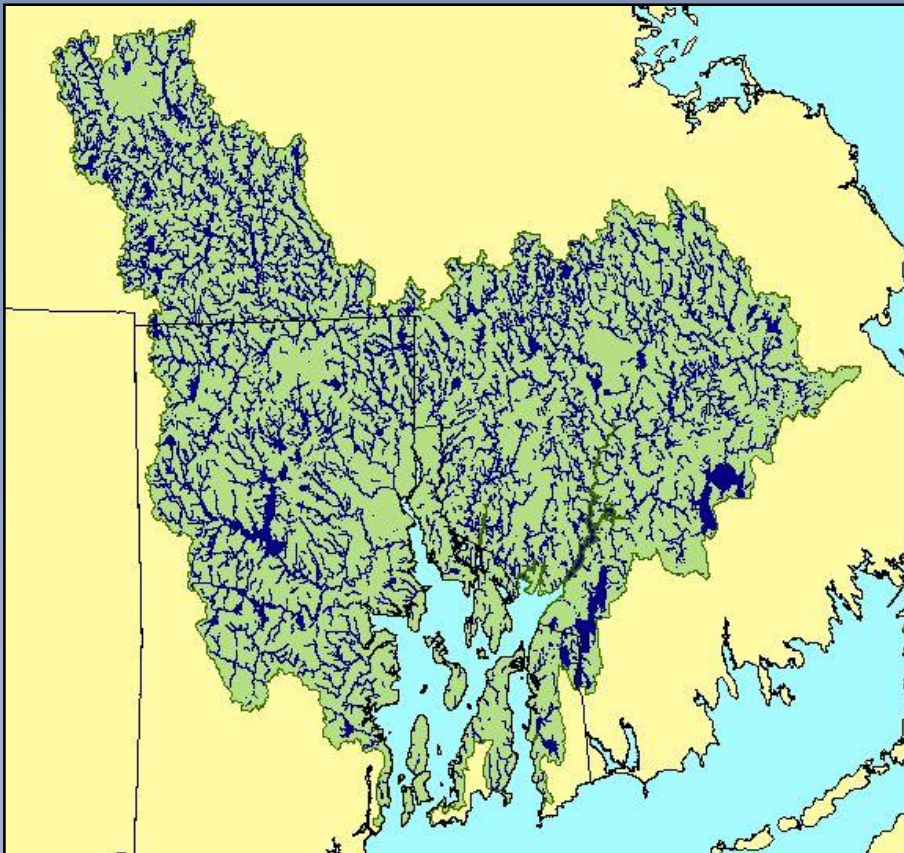
1. As marshes are impacted, their ability to absorb excess storm water and act as a buffer to the shoreline will be reduced.



What is a Watershed?



Narragansett Bay Watershed



Estuary Principles and Concepts

- Principle 1: Estuaries are interconnected with the world ocean and with major systems and cycles on Earth.
- Principle 2: Estuaries are dynamic ecosystems with tremendous variability within and between them in physical, chemical, and biological components.
- Principle 3: Estuaries support an abundance of life and a diversity of habitats
- Principle 4: Ongoing research and monitoring is needed to increase our understanding of estuaries and to improve our ability to protect and sustain them.
- Principle 5: Humans, even those living far from the coast, rely on goods and services supplied by estuaries.
- Principle 6: Human activities can impact estuaries by degrading water quality or altering habitats; therefore, we are responsible for making decisions to protect and maintain the health of estuaries.



Questions?

