

Wastewater in Truro

A brief history and a look forward



Town of Truro

Water Resources Oversight Committee

August 13, 2015

Presenters

Robert Almy, Geologist
Senior Project Manager

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Water Resources Oversight Committee

Purpose of Presentation

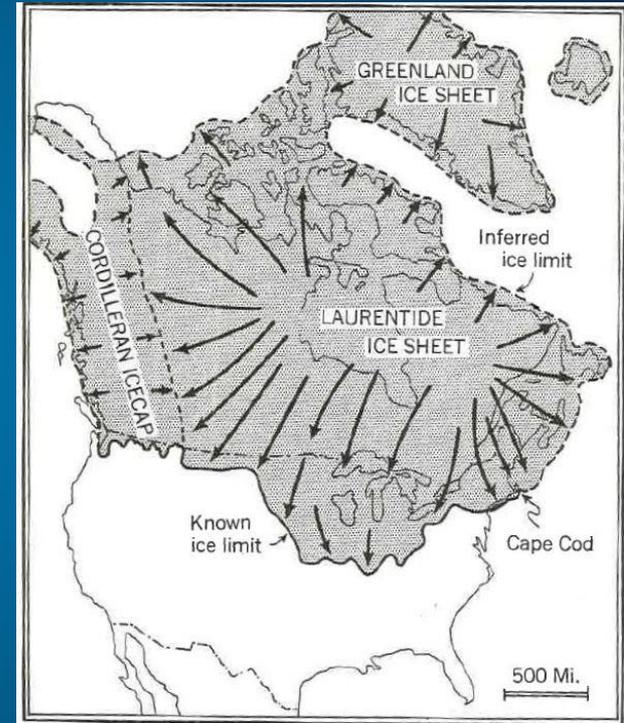
1. **Provide an understanding of Truro Water Resources**
2. **Give an overview of potential threats to our groundwater**
3. **Describe what is being done to protect water quality**
4. **Present options for the future**

Topics

- **Geologic History: Materials of the “Outer Cape”**
- **Ongoing Change: Natural processes and human interaction with the land**
- **Truro Water Supplies: A most precious asset**
- **Threats to water quality**
- **Approaches to protect water quality**

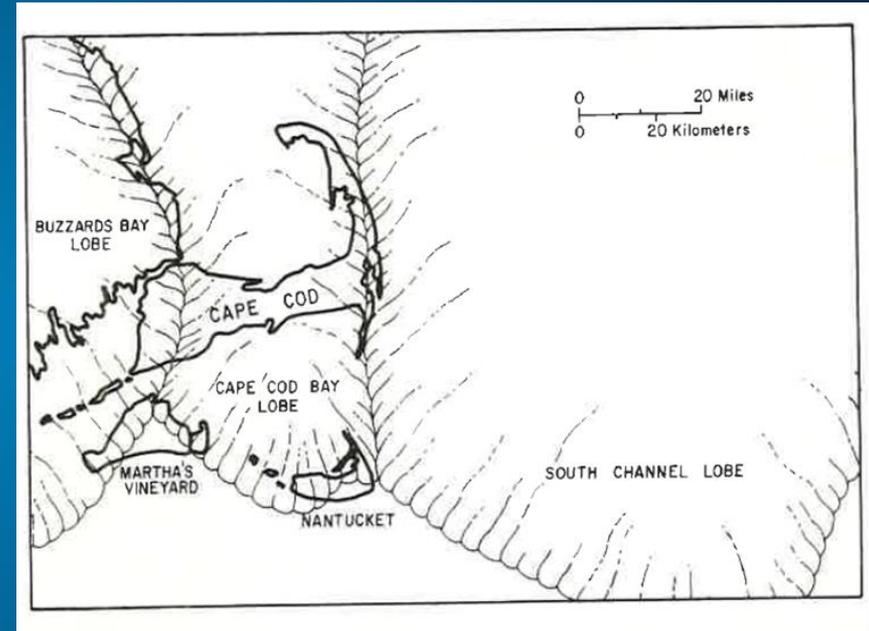
Geologic History: Materials of the “Outer Cape”

- Continental glaciation
- Thickness of 10,000 feet +
- Lower sea level (300+ feet)
- Large amount of material captured/carried by ice
- Outer Cape between ice lobes



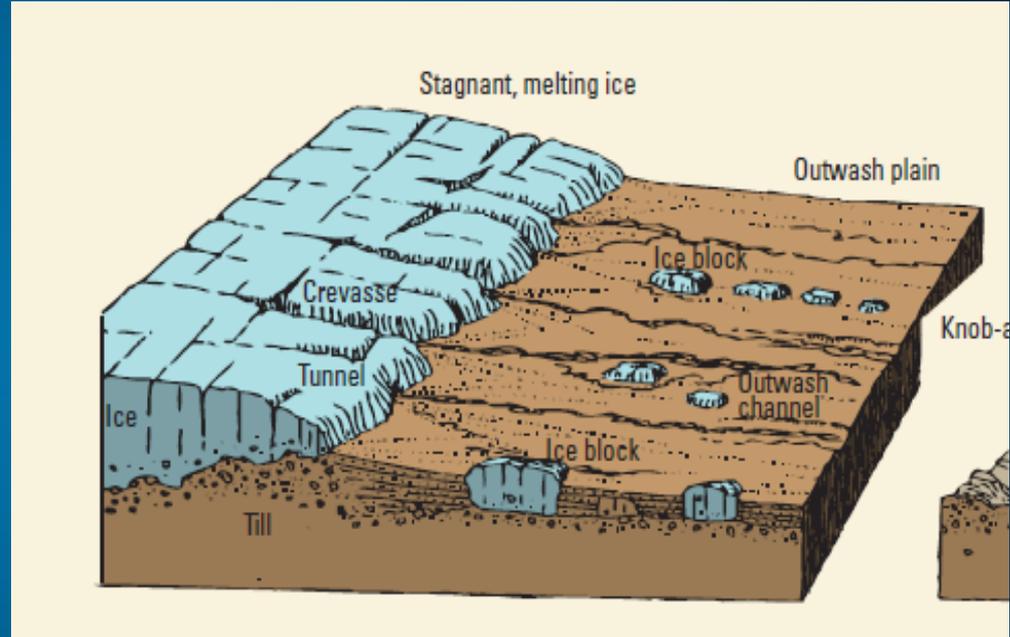
Geologic History: Materials of the “Outer Cape”

- Local “lobes” of ice
- South Channel Lobe retreated more slowly
- Material shed from the east
- Bedrock at great depth
- Initial deposits then shaped by wind and sea



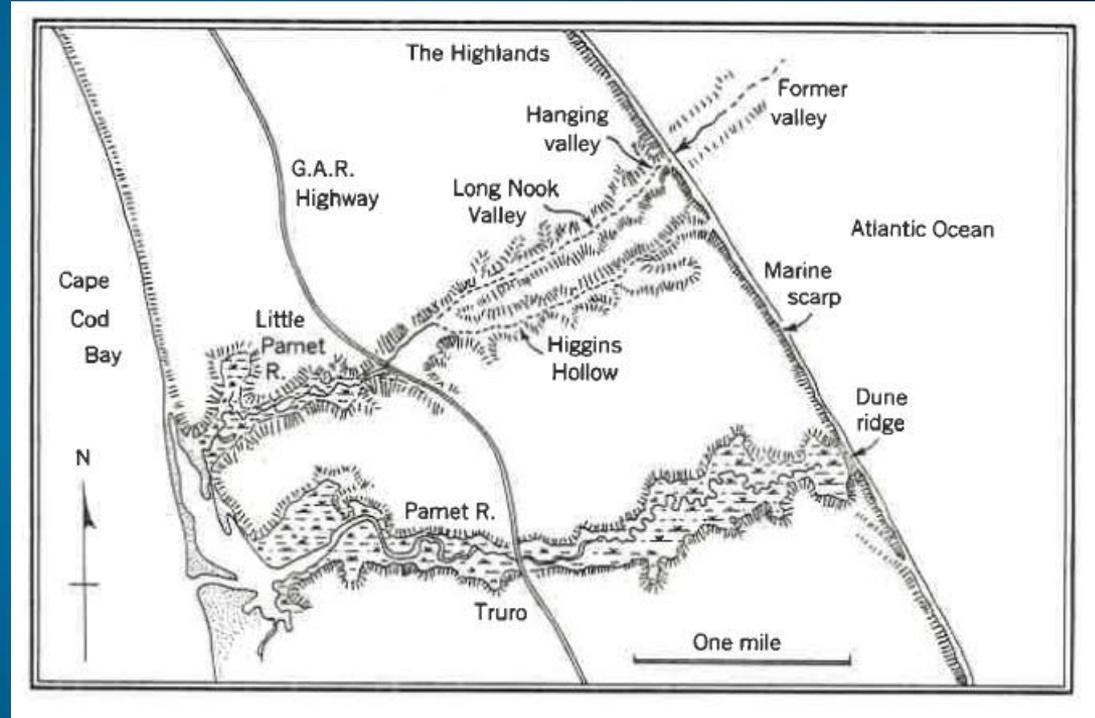
Deposits from the Channel Lobe

- East to west deposition
- Thicker deposits on east
- Outwash materials common



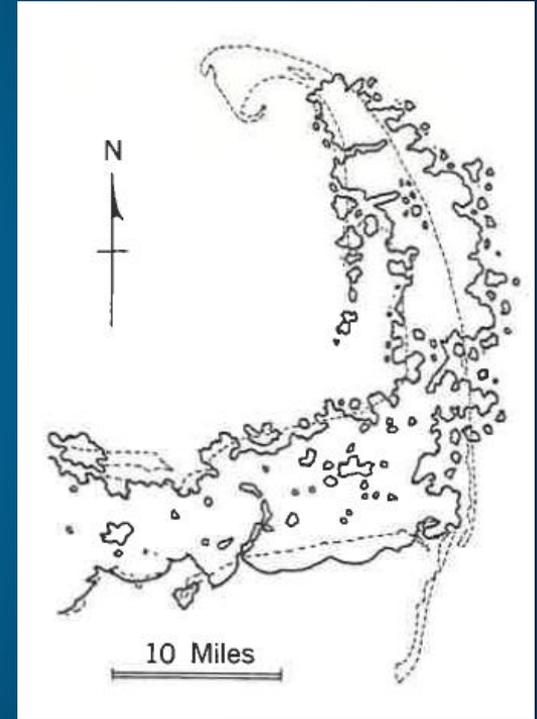
After Deposition; Ocean Process

- Erosion along eastern side
- Distinctive Features
- “Hanging valleys”
- Pamet River



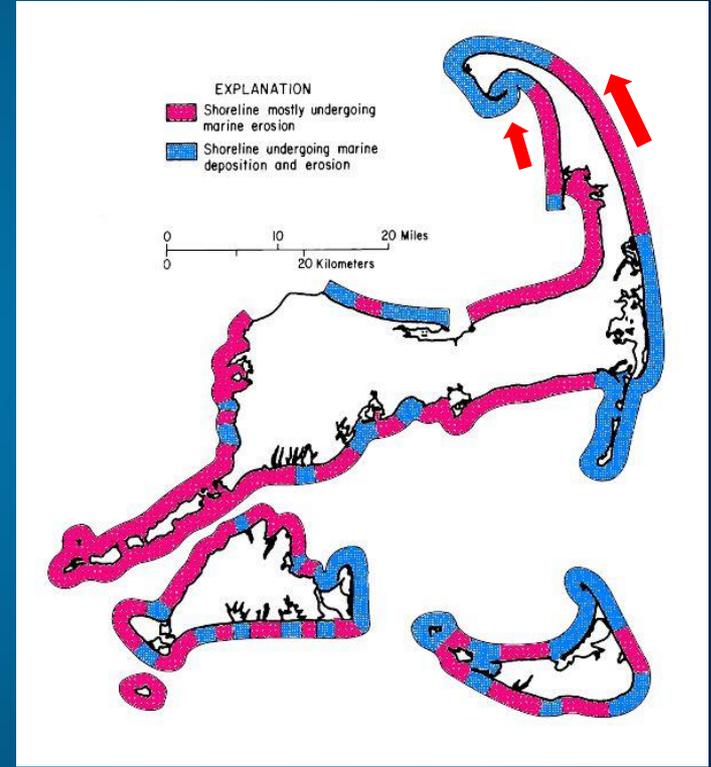
After Deposition: Ocean Process

- Erosion and transport shape the outer Cape
- Formation of the Provincetown area
- Westward retreat of initial shoreline



Coastal Erosion and Deposition

- Shapes the coastline
- Response to dominant wind/wave direction
- Typically to the North
- Shapes Truro and Provincetown



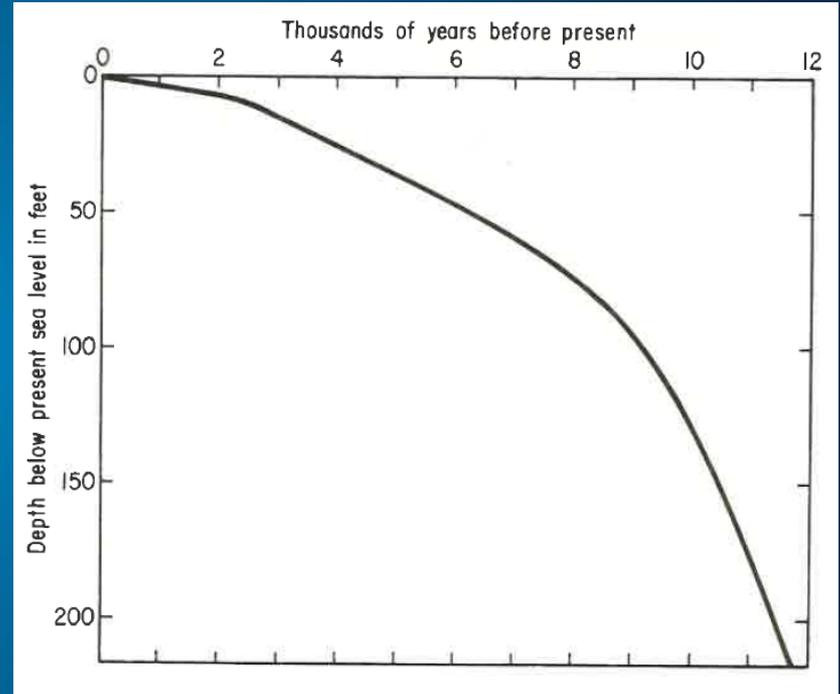
Deposits from the Channel Lobe

- **Outwash materials common**
- **Sand and gravel common**
- **Excellent aquifers**



Geologic History: Sea Level Rise

- **Sea level rise since glacial advance**
 - 300+ feet
- **Sea level rise continues**



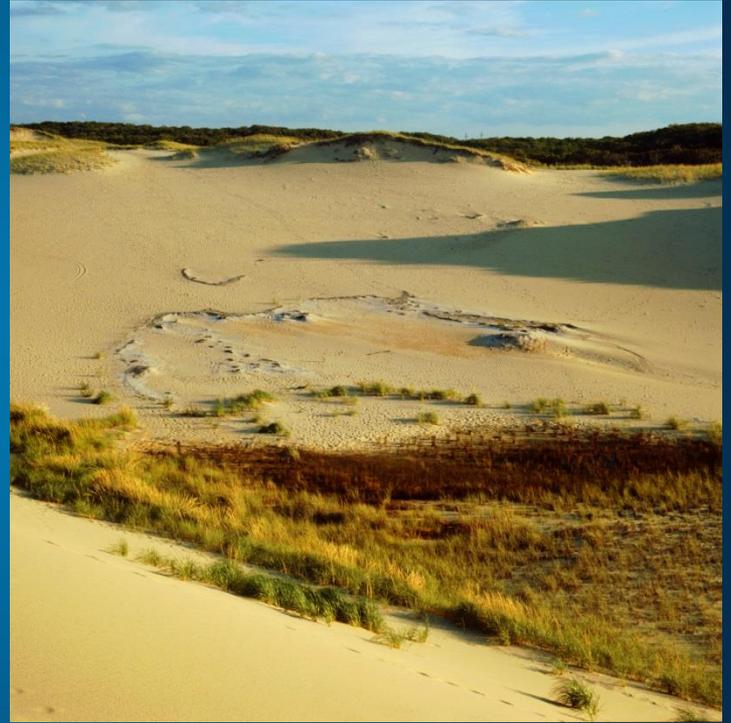
Natural Processes and Human Interaction with the Land

- Soil development and deforestation
- East Harbor
- Groundwater development
- Waste disposal

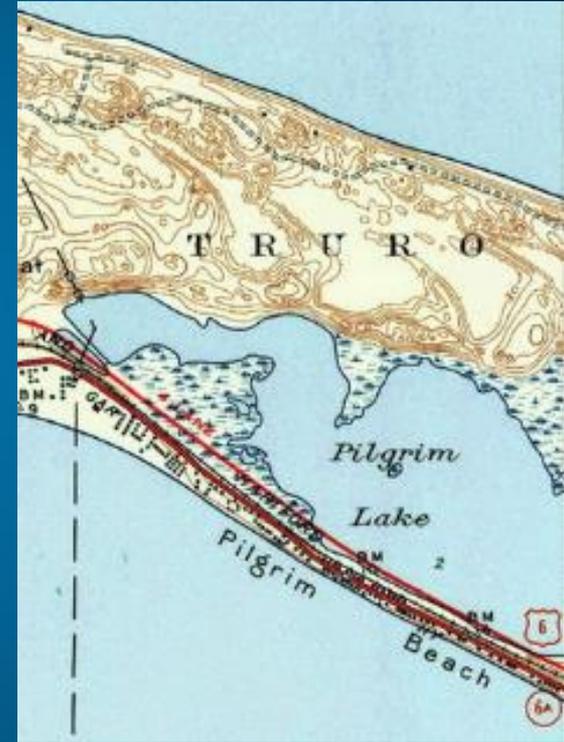
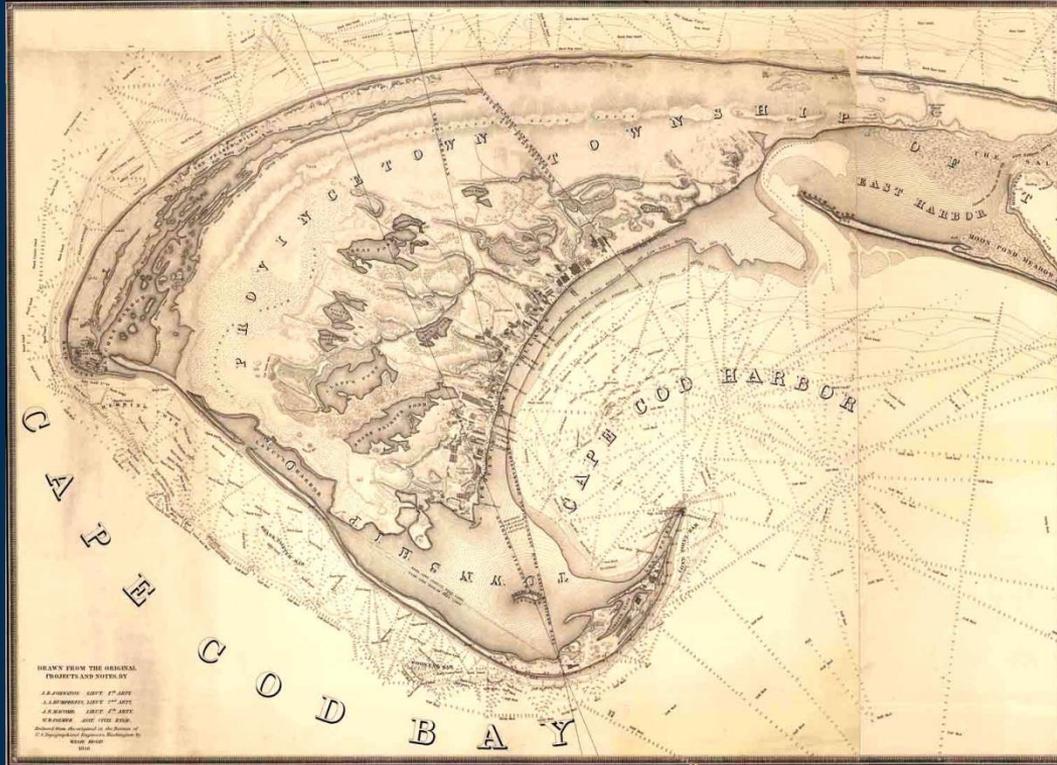
Sand Migration: Deposition and Erosion



Deforestation and Soils

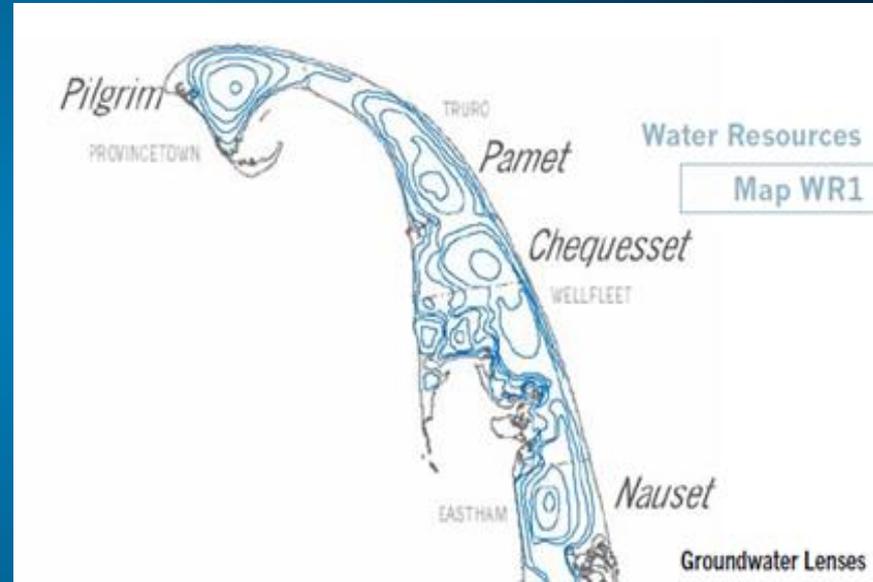


East Harbor 1836-2010: Human Influence



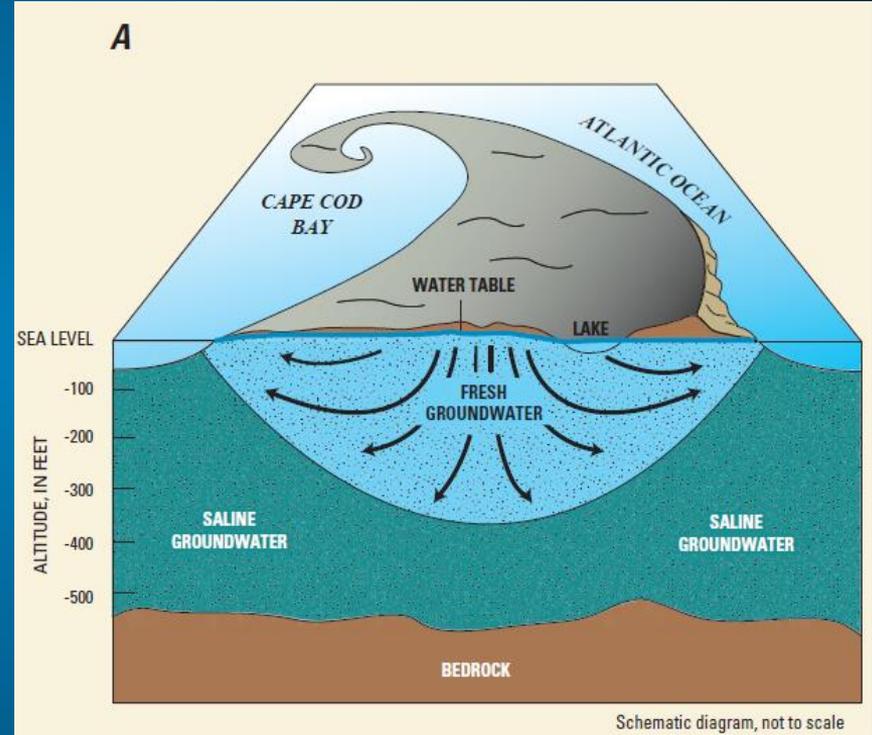
Groundwater of the Outer Cape

- Groundwater is virtually the only source of water on the Cape
- Developed by individual and municipal wells
- “Sole source “ aquifer; resource relied on by all
- Local “lenses” literally surrounded by salt water



Fresh Water “Floats” as a Lens

- Replenished by precipitation
- System in balance
- Sufficient supply
- A resource shared by all
- No fences underground



Hydrologic “Balance” of Cape Cod Aquifers

Cape Cod Flow Lenses	Flow in MGD	Discharge (percent)		
		To Coast	To Streams	To Wells
Pamet	12.4	71	22	7
Chequesset	24.2	49	51	0
Pilgrim	12.5	91	9	0
Nauset	19	74	26	0
Monomoy	110.6	77	16	7
Sagamore	269.2	66	28	6
Cape Cod Total	447.9	69	24	7

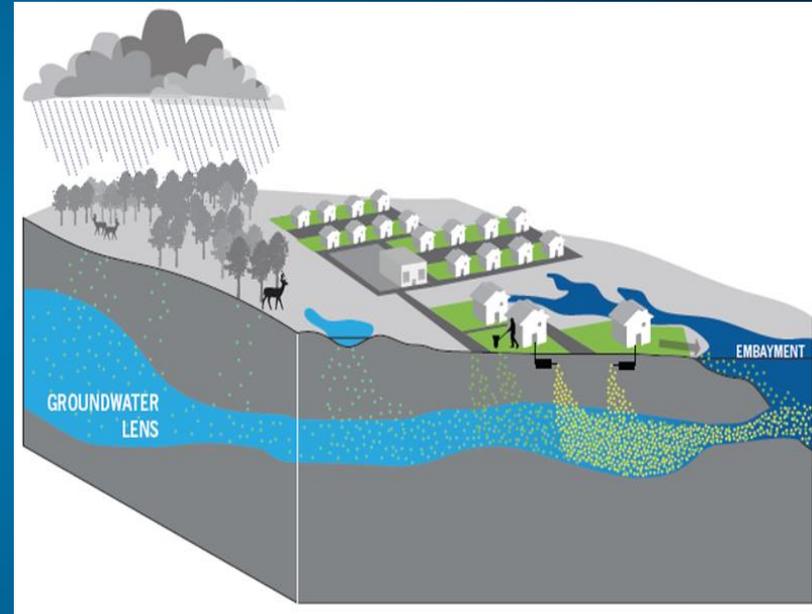
From 2002 data, increases to discharge to wells may have occurred

Truro Water Supplies: A Most Precious Shared Asset

- **Pamet lens; floats on top of sea water**
- **Sole source aquifer: the only source available**
- **Most water consumers depend on the Pamet and Chequesset lenses**
- **Recharge from precipitation and septic system return flows**
- **Septic systems contribute chemicals, including Nitrogen**
- **No fences underground: flow lines not property lines**

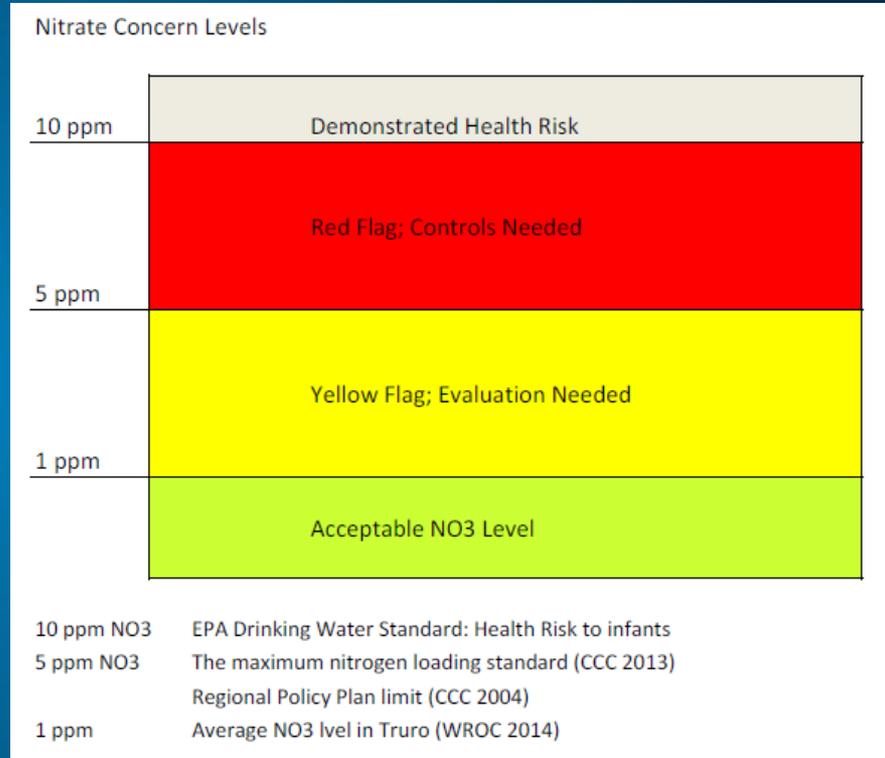
Nitrogen in the Environment

- **Nitrates (NO₃) and nitrites (NO₂)**
 - Nitrogen-oxygen chemical compounds
- **Threat to water quality**
 - Can be harmful to human health
 - Algal blooms in surface water bodies
- **Contained in:**
 - **Septic system effluent (dominant source)**
 - **Fertilizers**

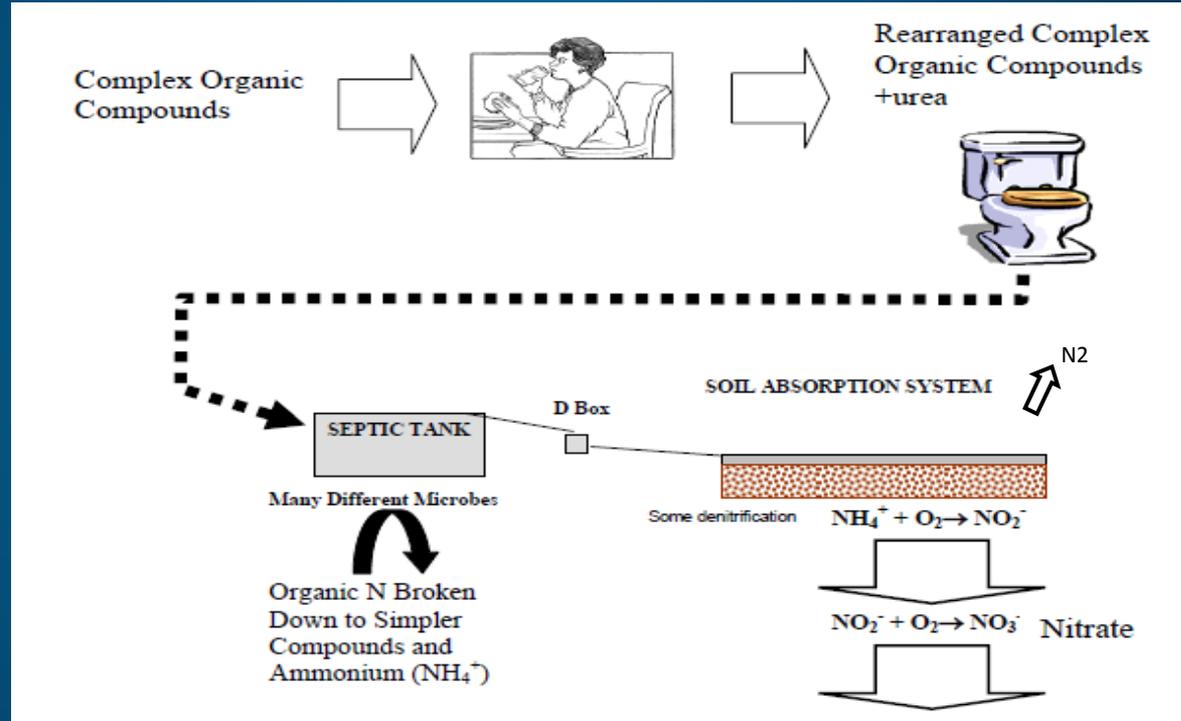


Nitrate Concern Levels

- **Voluntary Groundwater sampling**
 - 2008-2011
- **Average in Truro 1 ppm**
- **A few samples > 5ppm**



Nitrogen Travel Residential Systems



Existing Conditions

- Nitrogen enters Truro groundwater and surface water
- Main sources include cesspools, and septic systems
 - New systems take out 25% of N
- Some Nitrogen also results from
 - Over fertilized lawns
 - Stormwater runoff roads and other impervious surfaces

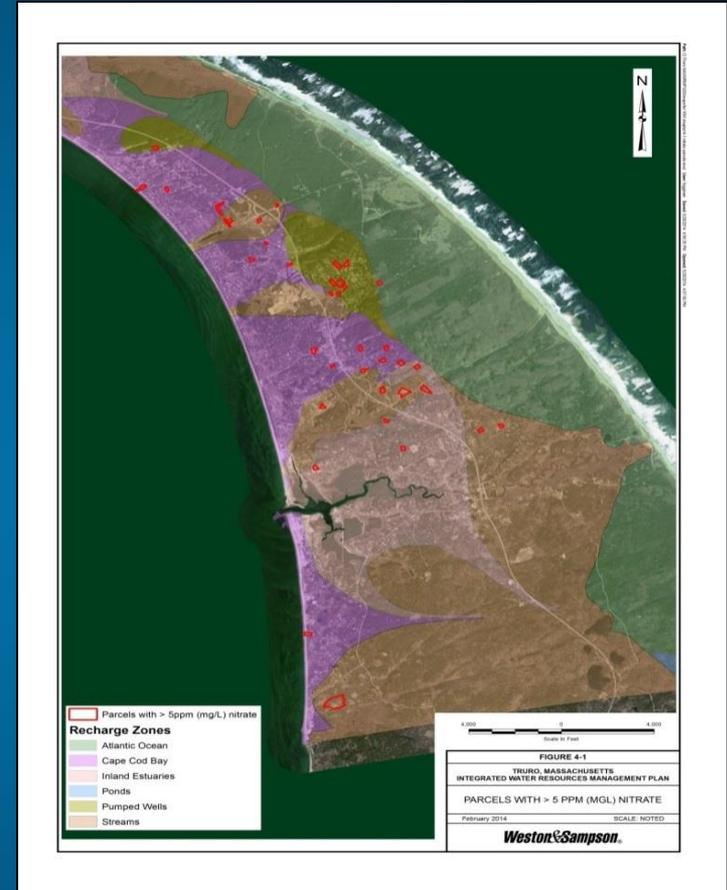


What is Being Done?

- **Board of Health oversight of Title 5 (septic systems)**
- **Integrated Water Resources Plan**
 - **Water Resources Oversight Committee**
 - **Phase I and II studies**
 - **Periodic sampling of Pamet estuary, East Harbor and Cape Cod bay (2007,-08,-09,-15)**
- **Stepwise analysis and development of approaches for the Town to consider**

Current Progress

- WROC and Weston & Sampson have evaluated water use and quality in Truro.
- High nitrogen areas have been identified.
- Monitoring wells are being installed to provide long-term water quality analysis and quantification of septic system impacts.

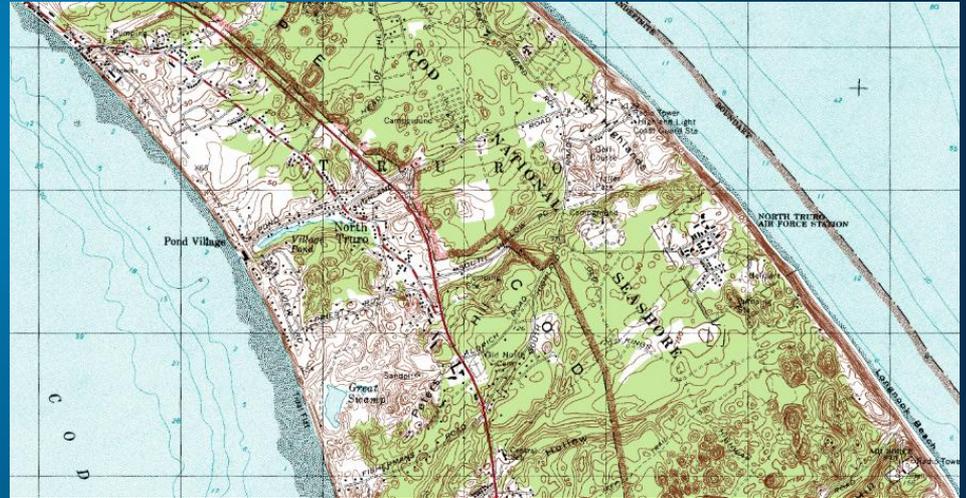


What can you do to help?

- **Have your septic system pumped**
 - Septic tanks should be pumped every 3 years
 - Reduces the amount of nitrogen reaching groundwater
- **Replace cesspools and non-conforming systems**
 - Cesspools are no longer compliant with regulations
- **If fertilizer is necessary, avoid overuse**
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 - Only use fertilizer when ground is above 50° F
 - Avoid applying fertilizer before rainfall

Potential Town-wide Options

- Overlay district to phase out cesspools



Example: Town of Dennis (Swan Pond)

Questions?

THANK YOU !

Unused slides follow

Another Coastal Community on Septic Systems

Sand Point/Sandyland Cove
Santa Barbara, CA



Eventual Conversion to Sanitary Sewer

Sand Point/Sandyland Cove

Closely spaced homes
On septic systems
Water quality an issue



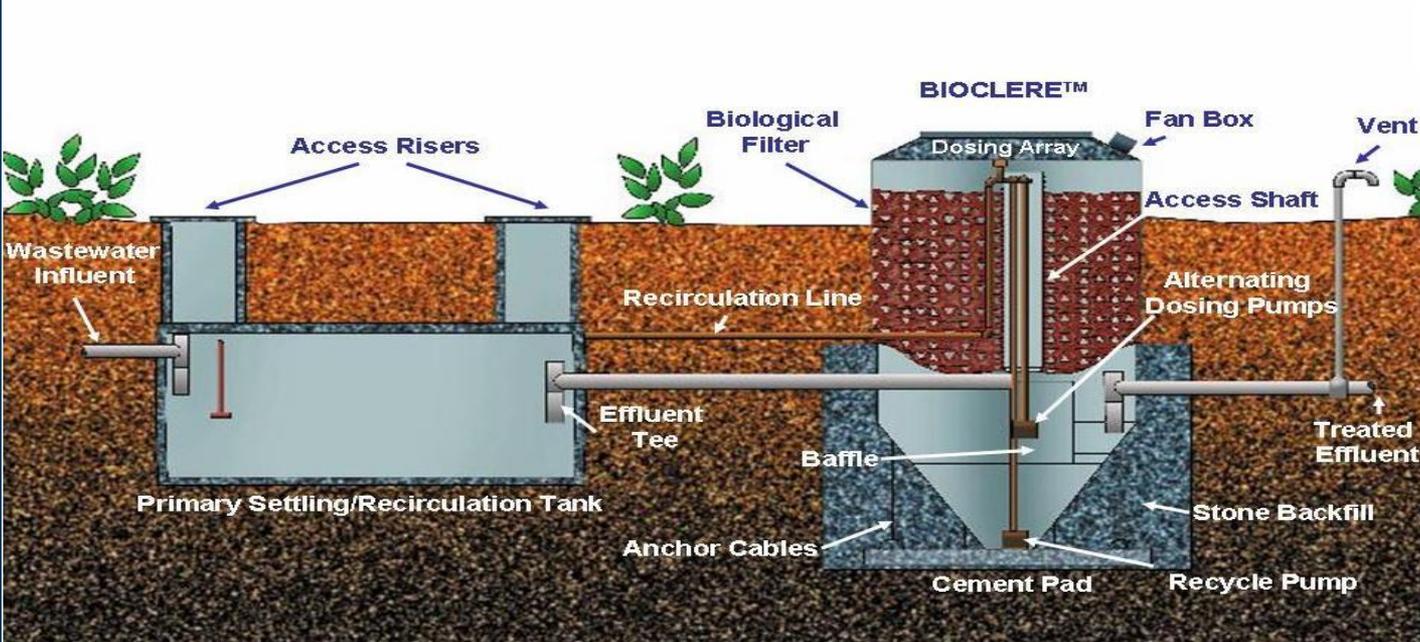
Available Alternative Septic System Options

- **Examples of existing alternative systems**
 - Fixed Activated Sludge Treatment (FAST)
 - Bioclere
 - Recirculating Sand Filters
- **Systems in use**
 - Barnstable County, MA
 - Buzzards Bay, MA
 - Concord, MA
- **Cost of installation and maintenance an issue**
 - Consider when replacement/repair of existing system is needed

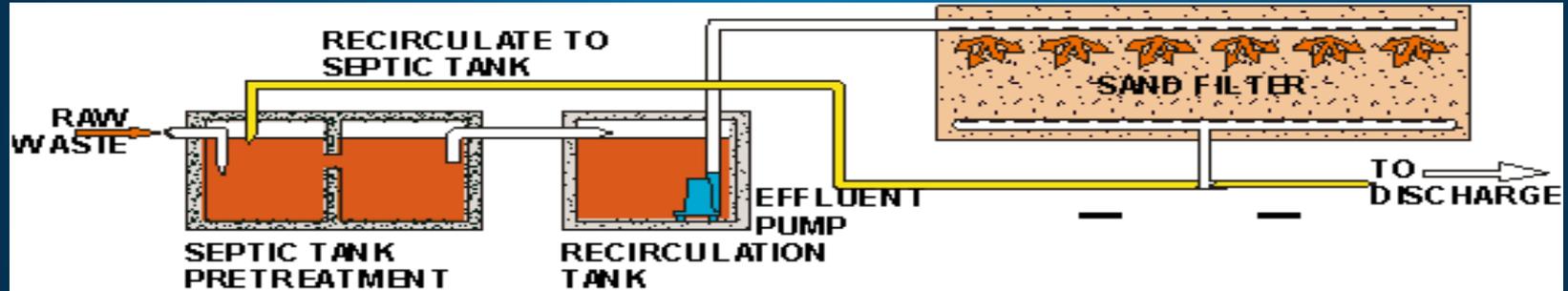
Fixed Activated Sludge Treatment



Bioclere

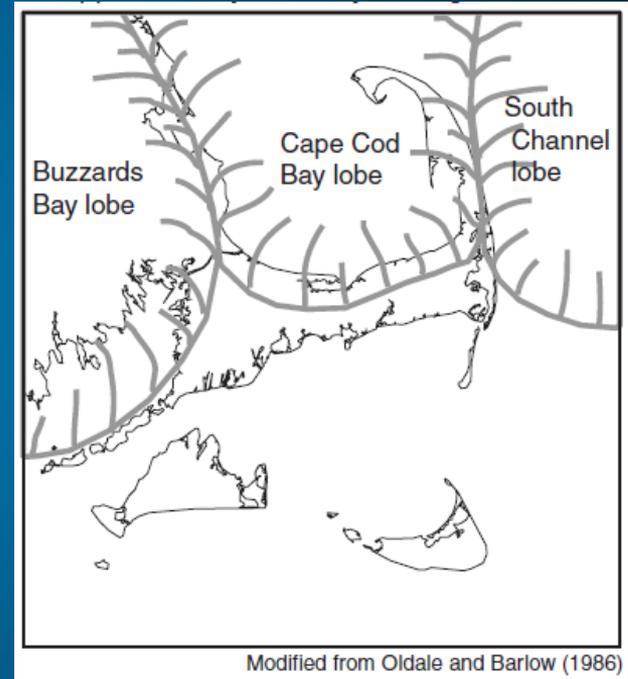


Recirculating Sand Filter

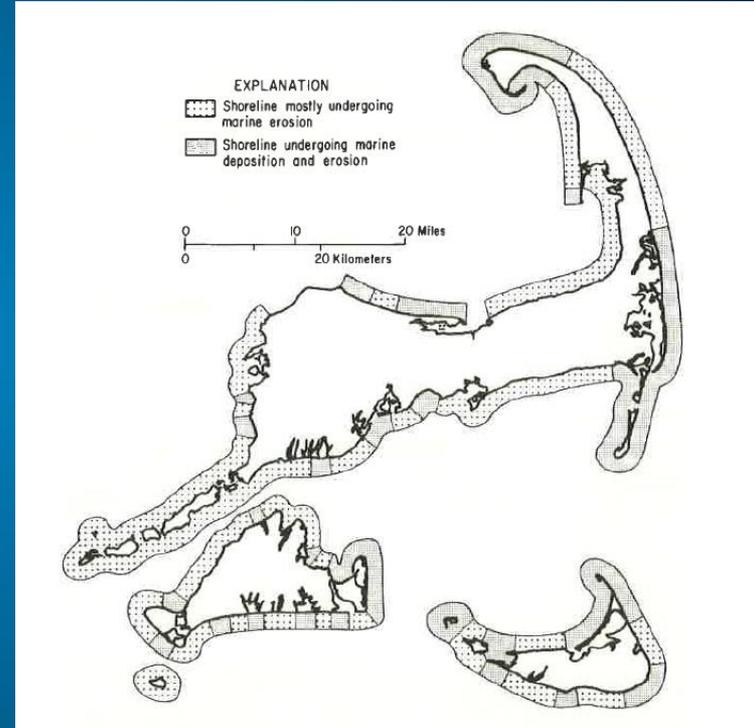
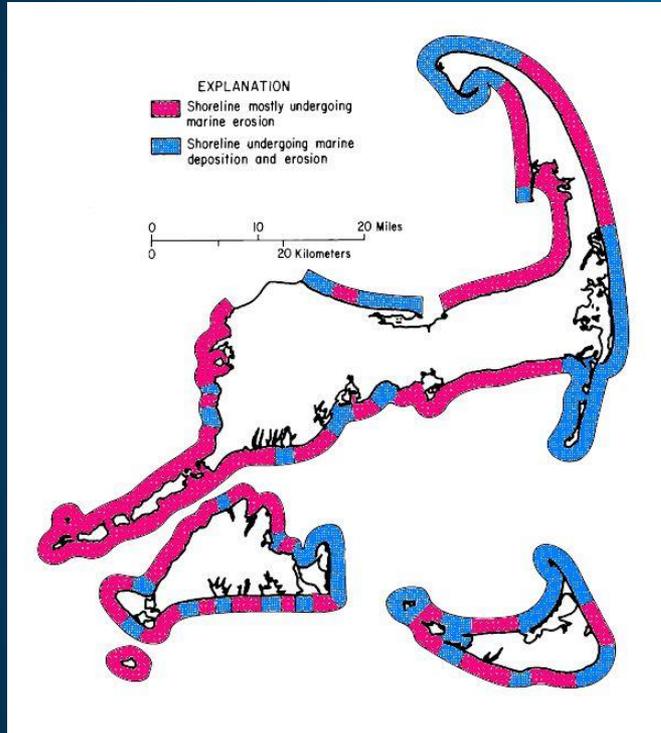


Geologic History: Materials of the “Outer Cape”

- Pleistocene ice lobes
- South Channel Lobe retreated more slowly
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Coastal Erosion and Deposition



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