



Eastern Shore

WELLS *and* SEPTIC *Forum*

Bundick
WELL & PUMP
Water and Sewage Systems
757-442-5555

The logo for Eastern Shore Community College (ESCC) features a stylized white bird in flight above the letters "ESCC" in a bold, white font. Below this, the text "Eastern Shore Community College" is written in a smaller white font. The background is dark blue with a light blue wave graphic at the bottom.

ESCC
Eastern Shore Community College



Presentations by:

- ▶ Shannon Alexander, Accomack-Northampton Planning District Commission
 - ▶ Groundwater 101
- ▶ Jimmy Bundick, Bundick Well & Pump
 - ▶ Wells and Septic Systems: Options, Installation, & Maintenance
- ▶ Jon Richardson, Eastern Shore Health District
 - ▶ On-Site Sewage & Water Services: Permitting & Design Services

A-NPDC Overview and Purpose

- ▶ Commonwealth created 21 PDCs in 1970 to address regional issues by fostering cooperation amongst localities and cooperation between state & localities
- ▶ Accomack-Northampton District:
 - ▶ Members: 2 Counties and Town of Chincoteague
 - ▶ Also provides services to 18 other towns
- ▶ Affiliate Organizations:
 - ▶ A-N Regional Housing Authority → provides privately or authority-owned rental housing
 - ▶ ESV Housing Alliance → improving housing for homeowners
 - ▶ A-NPDC →
 - ▶ Community Development
 - ▶ Economic Development
 - ▶ Transportation Planning
 - ▶ Environmental Planning → Ground Water Committee; Climate Adaptation Working Group; GreenWorks



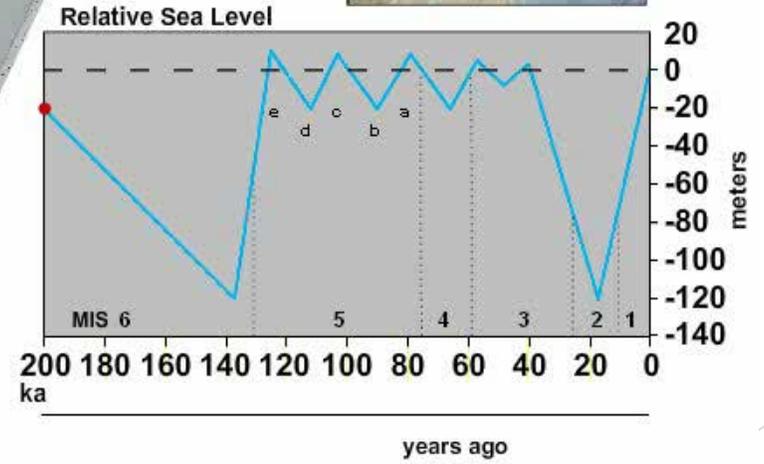
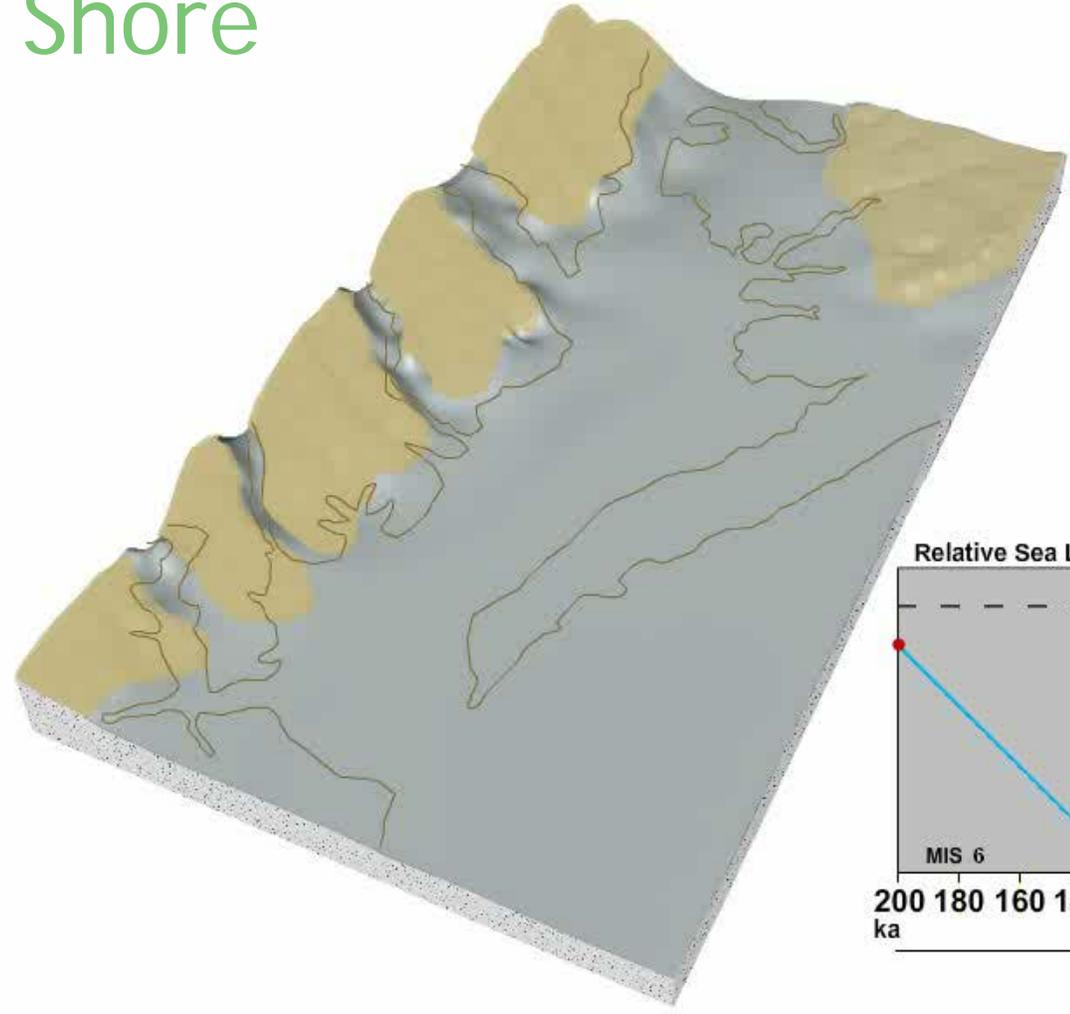
Groundwater 101: Presentation Overview

1. Eastern Shore Formation
2. What is Groundwater?
3. Local Groundwater Conditions
4. Trends in Groundwater Use
5. Threats to Our Groundwater Quality
6. Groundwater Planning and Management





Evolution of the Chesapeake Bay & Eastern Shore



Video courtesy of John F. Bratton, USGS



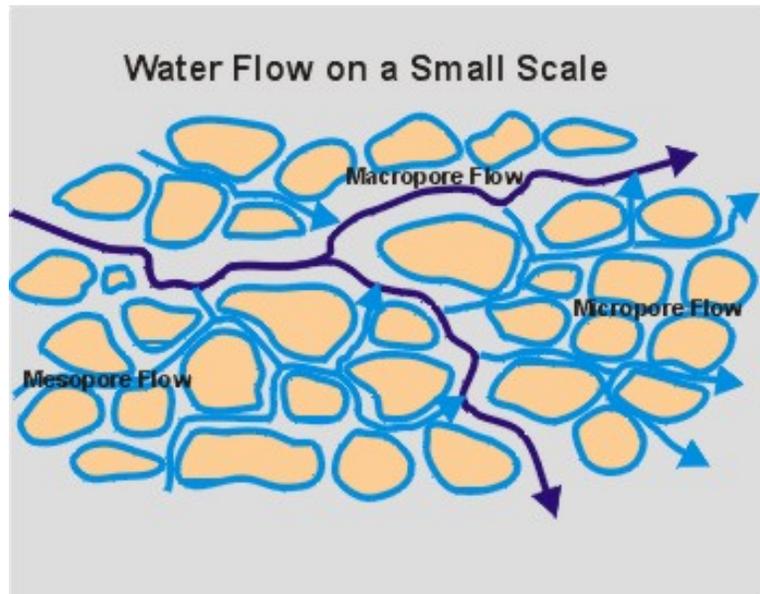
What is Groundwater?

- ▶ Groundwater is water that moves under the earth's surface through pores and spaces in soil and through tiny cracks in rocks.
 - ▶ Think of the land beneath our feet as being like a sponge through which groundwater moves.



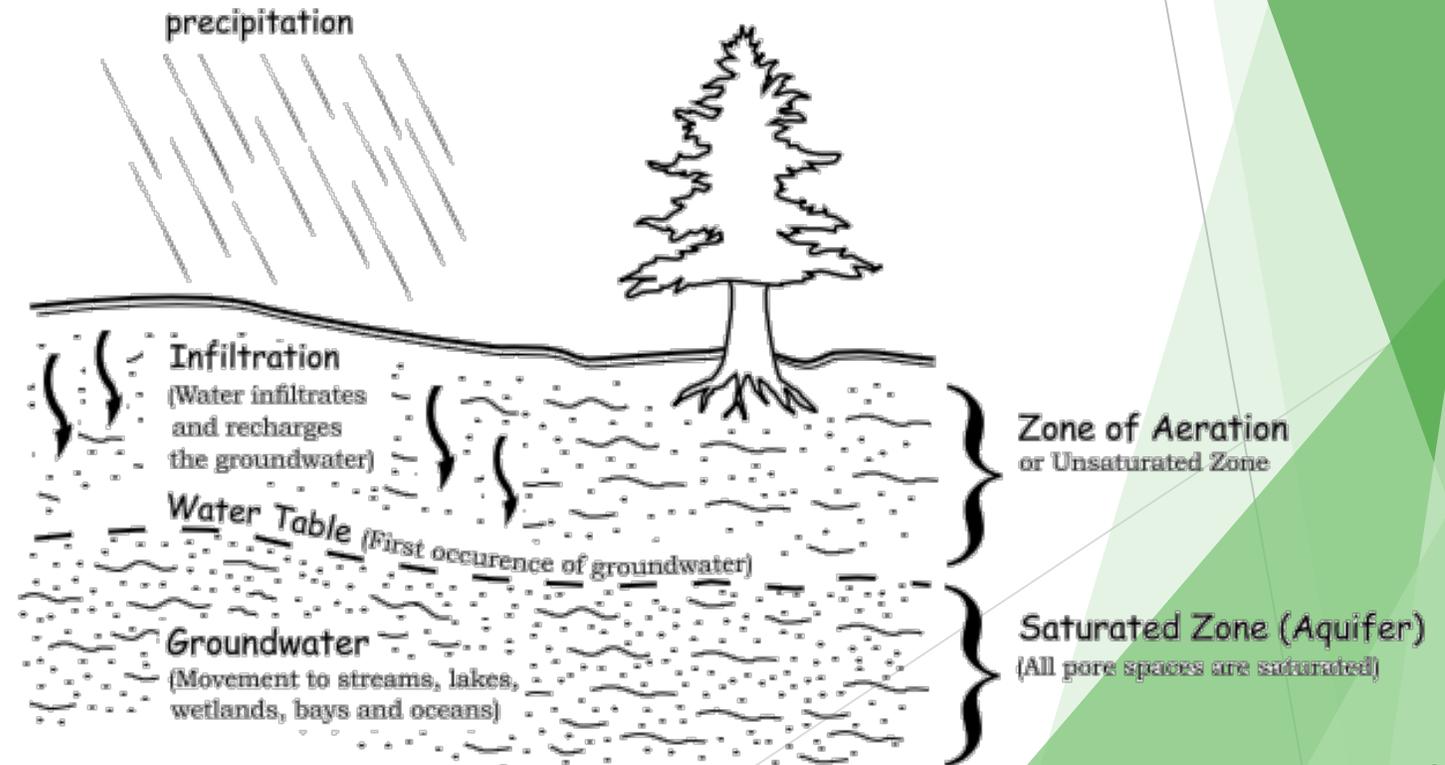
Groundwater is not like an underground river!

- ▶ Groundwater flows through porous soils and sediment that includes gravels, sands, silts, and clay.



How far below the surface is groundwater?

- ▶ On the Eastern Shore groundwater is shallow and can be found just under the ground surface, a few feet down in some areas. The first occurrence of groundwater is known as the *water table*.
- ▶ During the rainy season, the groundwater level rises, coming up closer to the surface and often to the surface, causing ponding in yards.



What is an Aquifer?

- ▶ Any coarse grained material (sand, gravel) that can supply sufficient water for a beneficial use.

What is a Confining Unit?

- ▶ Any fine grained material (silt, clay) that can significantly restrict vertical movement of groundwater such that the resulting groundwater is under pressure.



Eastern Shore Groundwater

WEST



Confining Unit



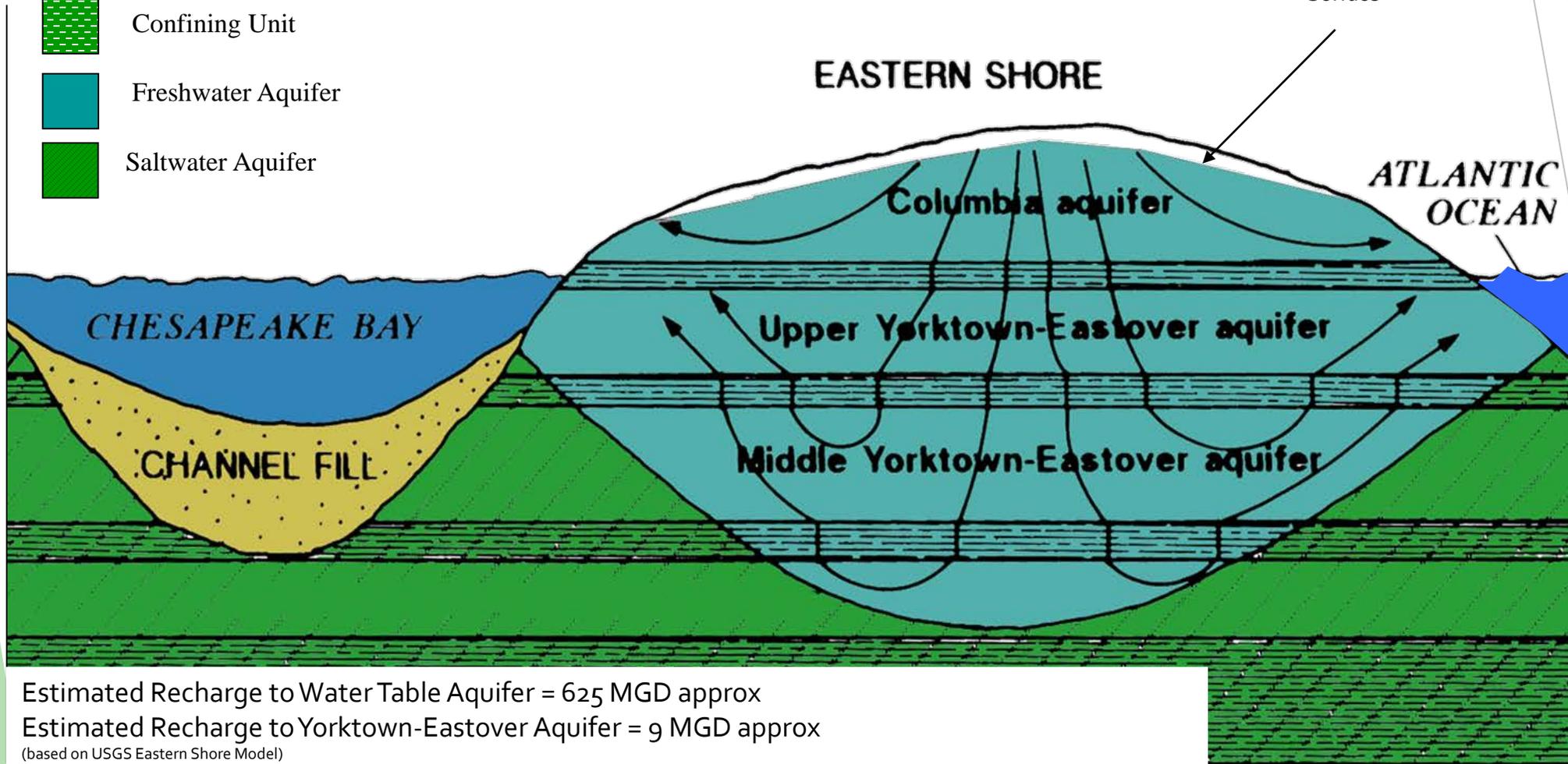
Freshwater Aquifer



Saltwater Aquifer

Water Table
Surface

EAST



Estimated Recharge to Water Table Aquifer = 625 MGD approx
Estimated Recharge to Yorktown-Eastover Aquifer = 9 MGD approx
(based on USGS Eastern Shore Model)





Columbia Aquifer -vs- Yorktown-Eastover (Confined) Aquifer

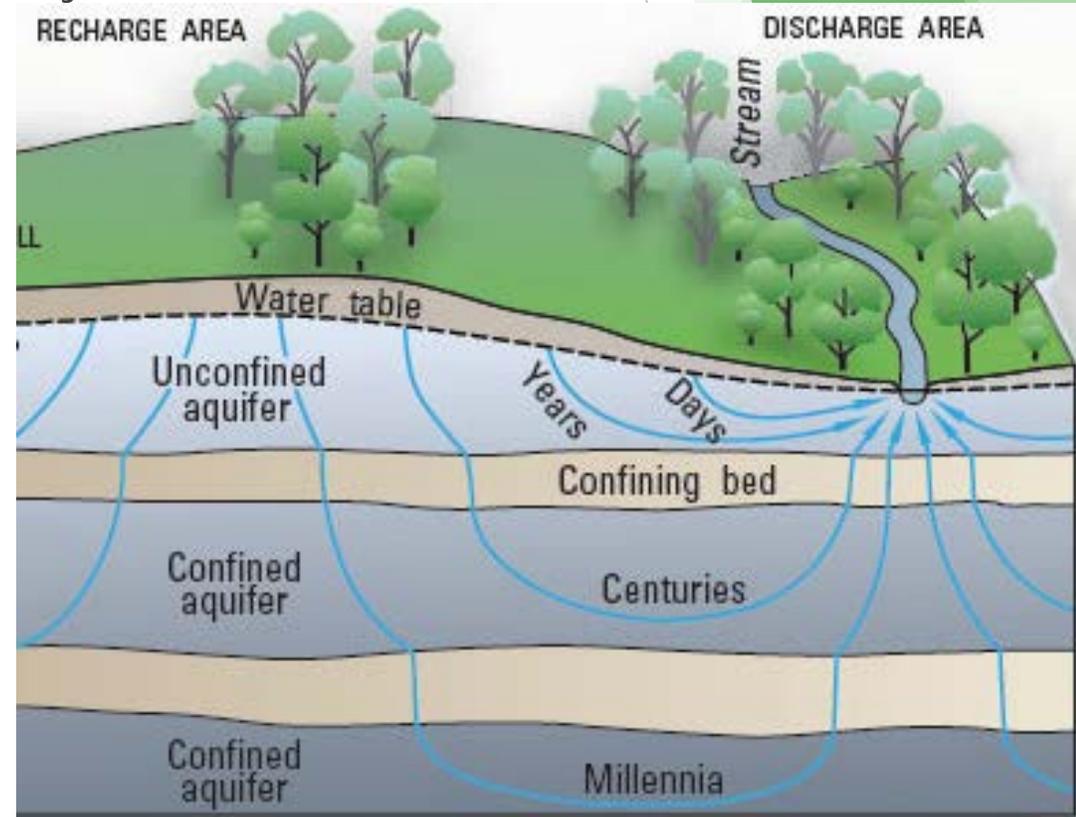
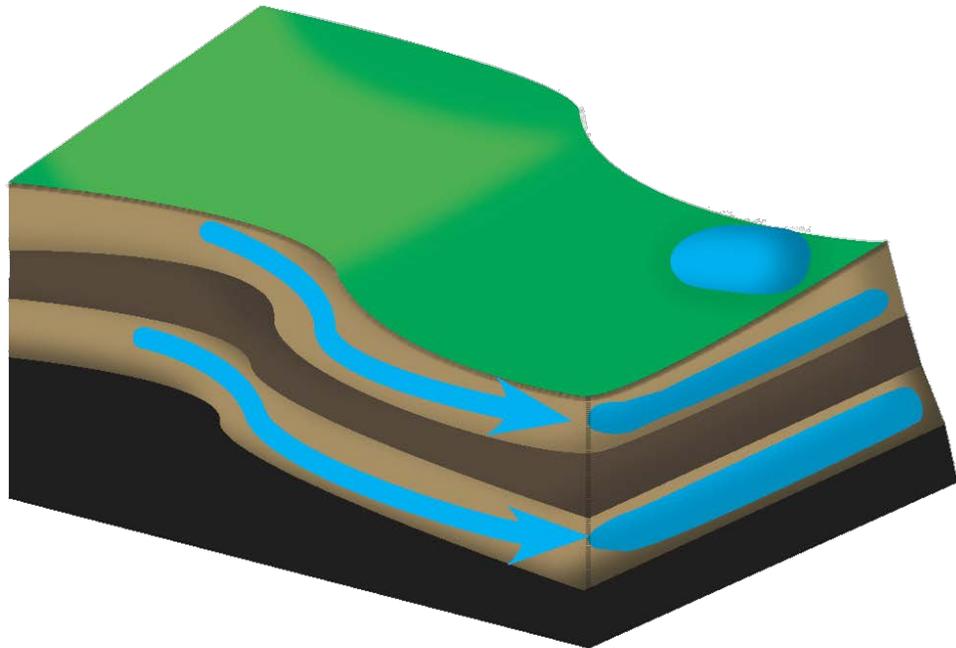
- ▶ Columbia Aquifer
 - ▶ Water is not 'under pressure'
 - ▶ Well yield often thought to be lower than comparable confined aquifers
 - ▶ Recharged directly by precipitation
 - ▶ More vulnerable to contamination from surface activities
- ▶ Yorktown-Eastover Aquifer
 - ▶ Water is under pressure, confined by overlying layer(s) of silt and clay
 - ▶ Recharged from slower vertical flow through the confining unit
 - ▶ More vulnerable to salt water intrusion





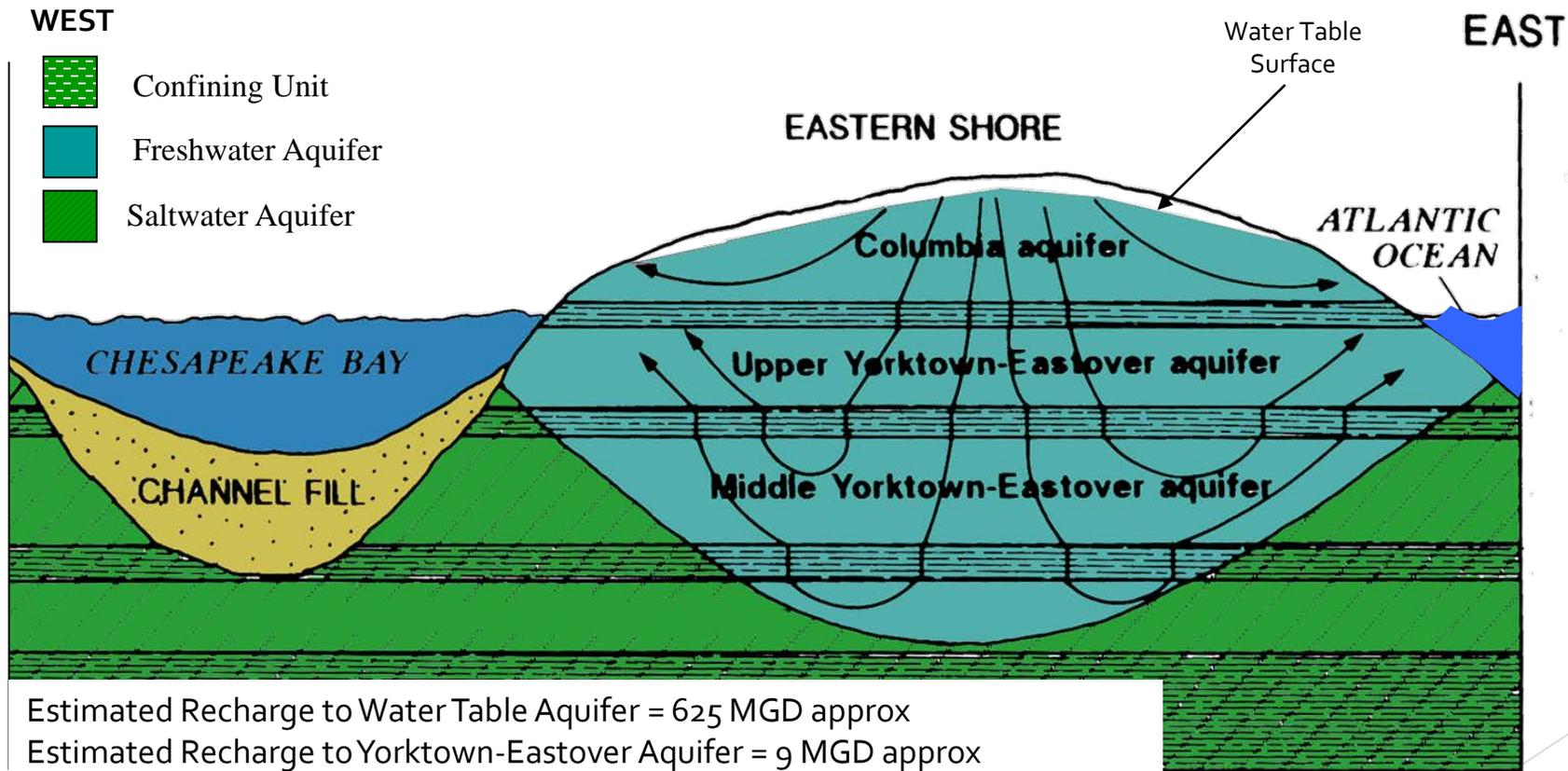
How does groundwater move?

- ▶ Like water on the land surface moves downhill, groundwater tends to move downhill with the direction of the land surface due to gravity and pressure.
- ▶ It moves very slowly, though its speed varies with different types of soil or rock. In most soils, groundwater only moves a few inches a day, as it needs to move in the spaces between rocks and soil.



Water Table and Fresh Water Confined Aquifers on the Eastern Shore - Sole Source Aquifer

Fresh ground water is restricted to depths less than 350 feet

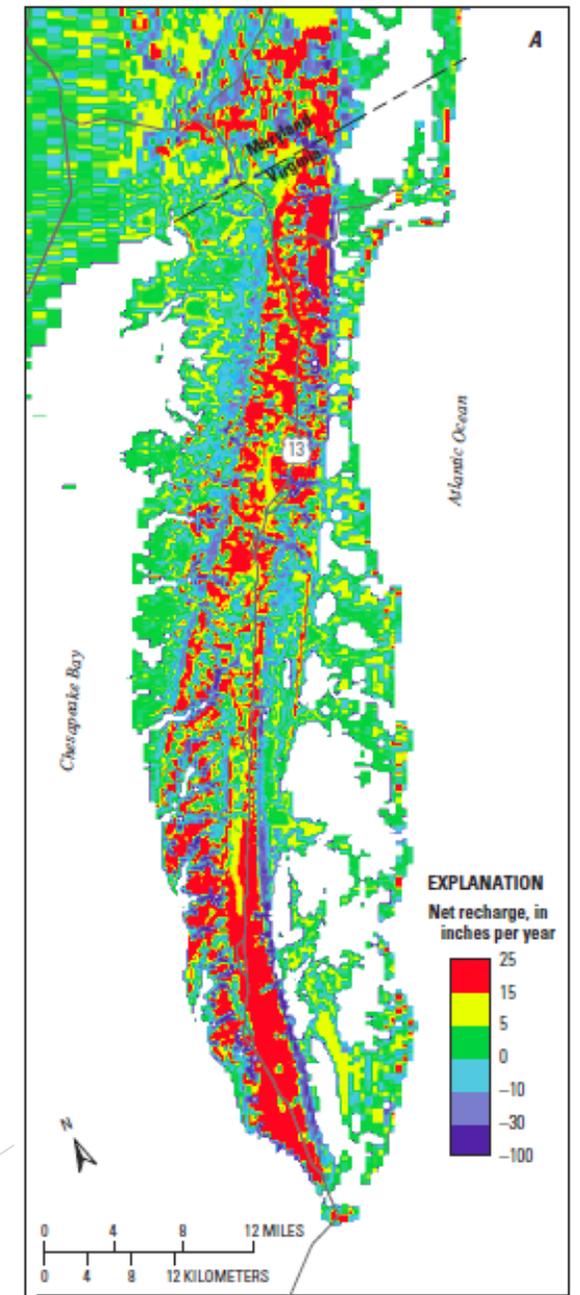
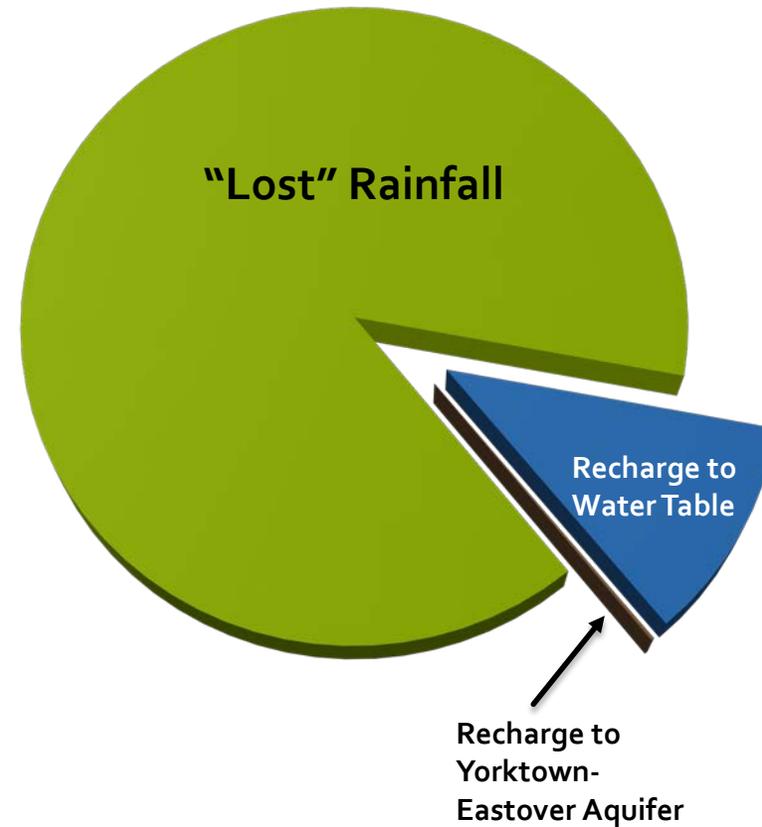


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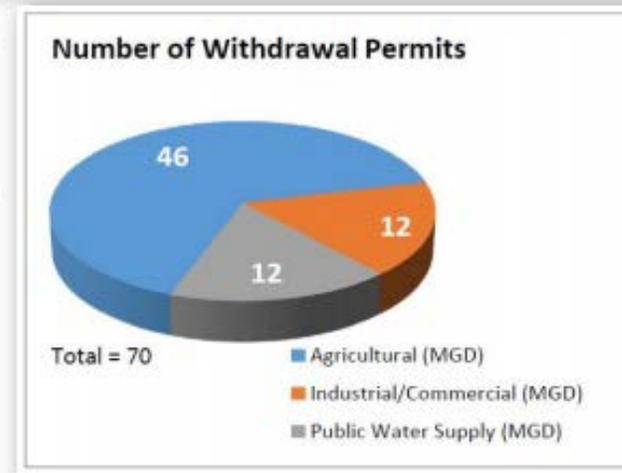
How Much Water Recharges the Aquifers?

- ▶ All fresh water comes from precipitation falling directly on the Shore
- ▶ About 84% of the precipitation never infiltrates to the groundwater
- **Limited Recharge:**
 - Of the 44-inches of annual precipitation only 5 to 6 inches infiltrate to the water table (625 MGD)
 - And only about 0.05 in/year make it to the confined aquifer (9 MGD)



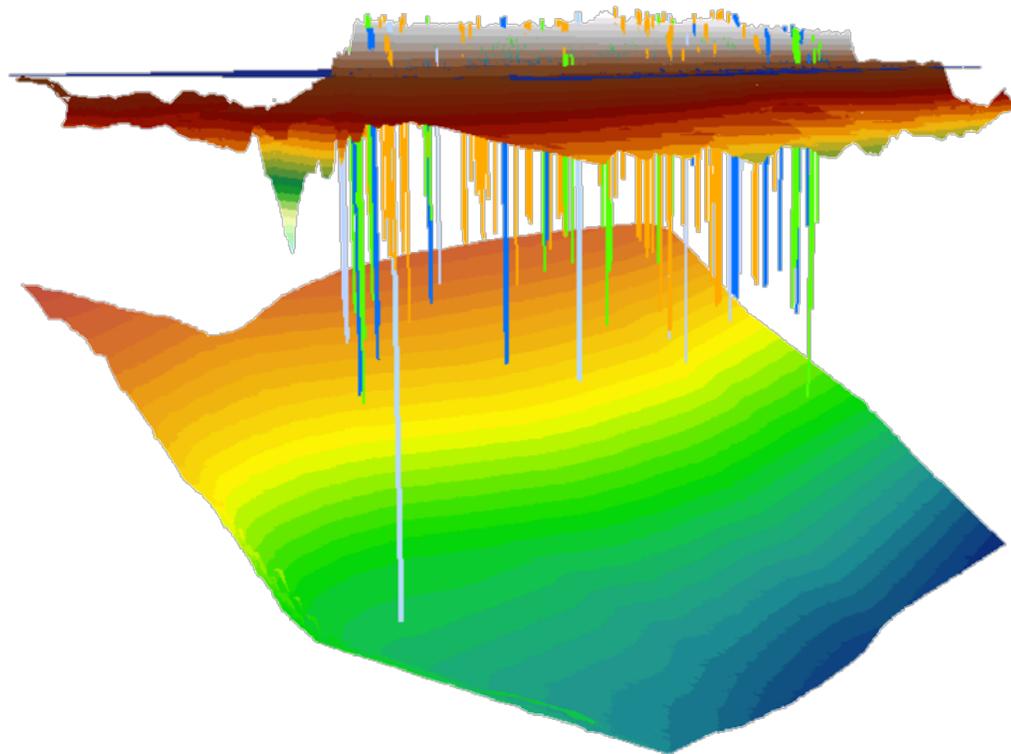
Ground Water Use and Groundwater Level Measurements

- ▶ Ground Water Use for permitted wells (wells pumping greater than 300,000 gallons-per-month) are submitted to Virginia Department of Environmental Quality (VDEQ)
- ▶ Ground Water Levels are routinely measured in Observation Wells by the United States Geological Survey (USGS)



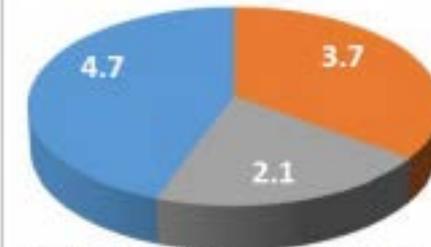
Above: Map illustrating locations of all permitted withdrawals and chart showing proportions of permitted use types in 2014. MGD = Million Gallons Per Day.

Groundwater Use on the Eastern Shore



Annual Permitted Withdrawal (MGD)

2014

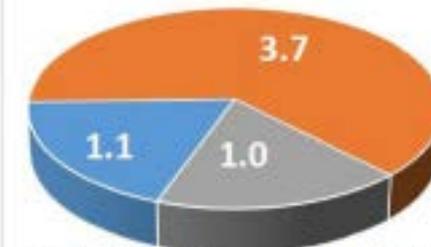


Total = 10.5 MGD

- Agricultural (MGD)
- Industrial/Commercial (MGD)
- Public Water Supply (MGD)

Annual Actual Use (MGD)

2014



Total = 5.8 MGD

- Agricultural (MGD)
- Industrial/Commercial (MGD)
- Public Water Supply (MGD)

Above: charts showing amounts and proportions of permitted use and actual reported use during 2014. MGD = Million Gallons Per Day.

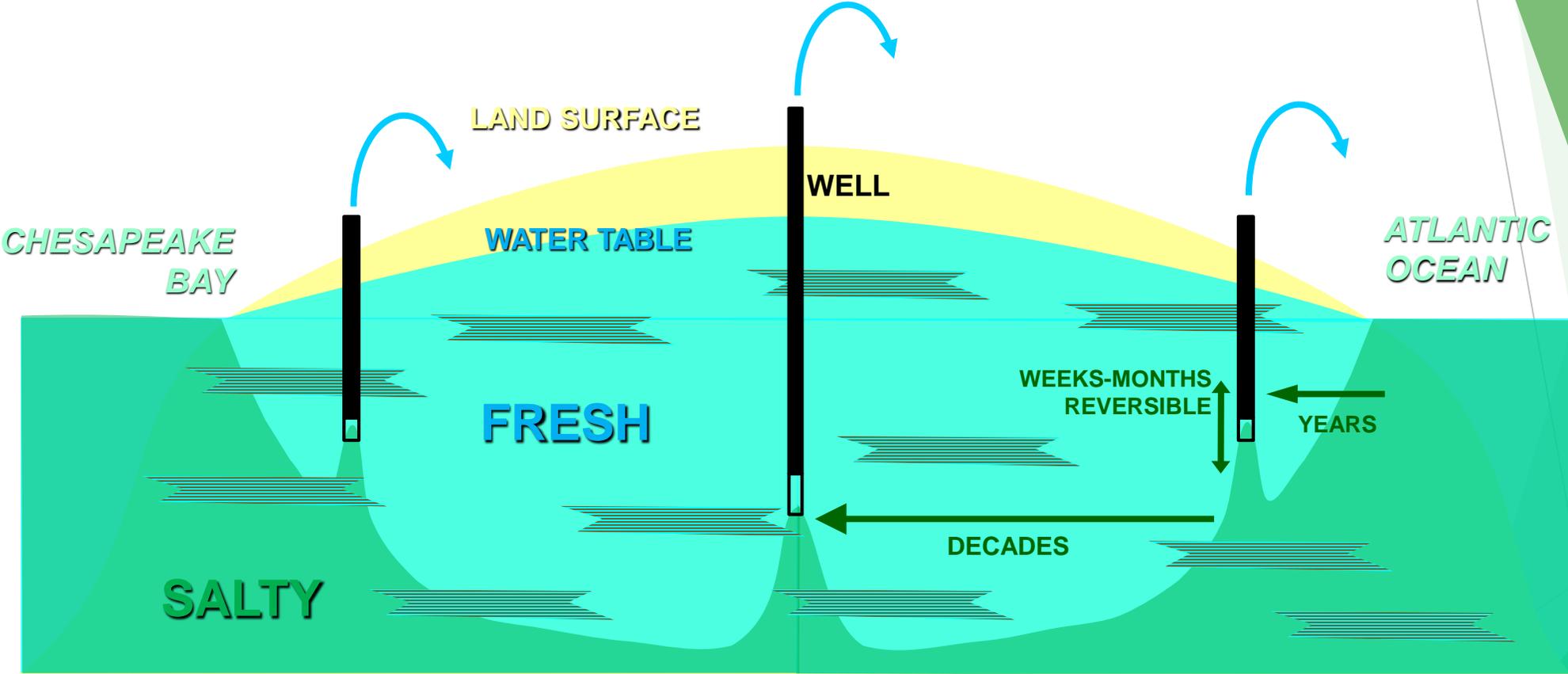


Why Measure Groundwater Levels?

- ▶ Groundwater use:
 - ▶ Lowers ground water levels, reducing available water to other ground water users
 - ▶ Reduces the size of the freshwater lens (less fresh water, more salt water)
- ▶ Impact of groundwater use can be evaluated:
 - ▶ Indirectly using models
 - ▶ Measured directly from pumping wells and observation wells

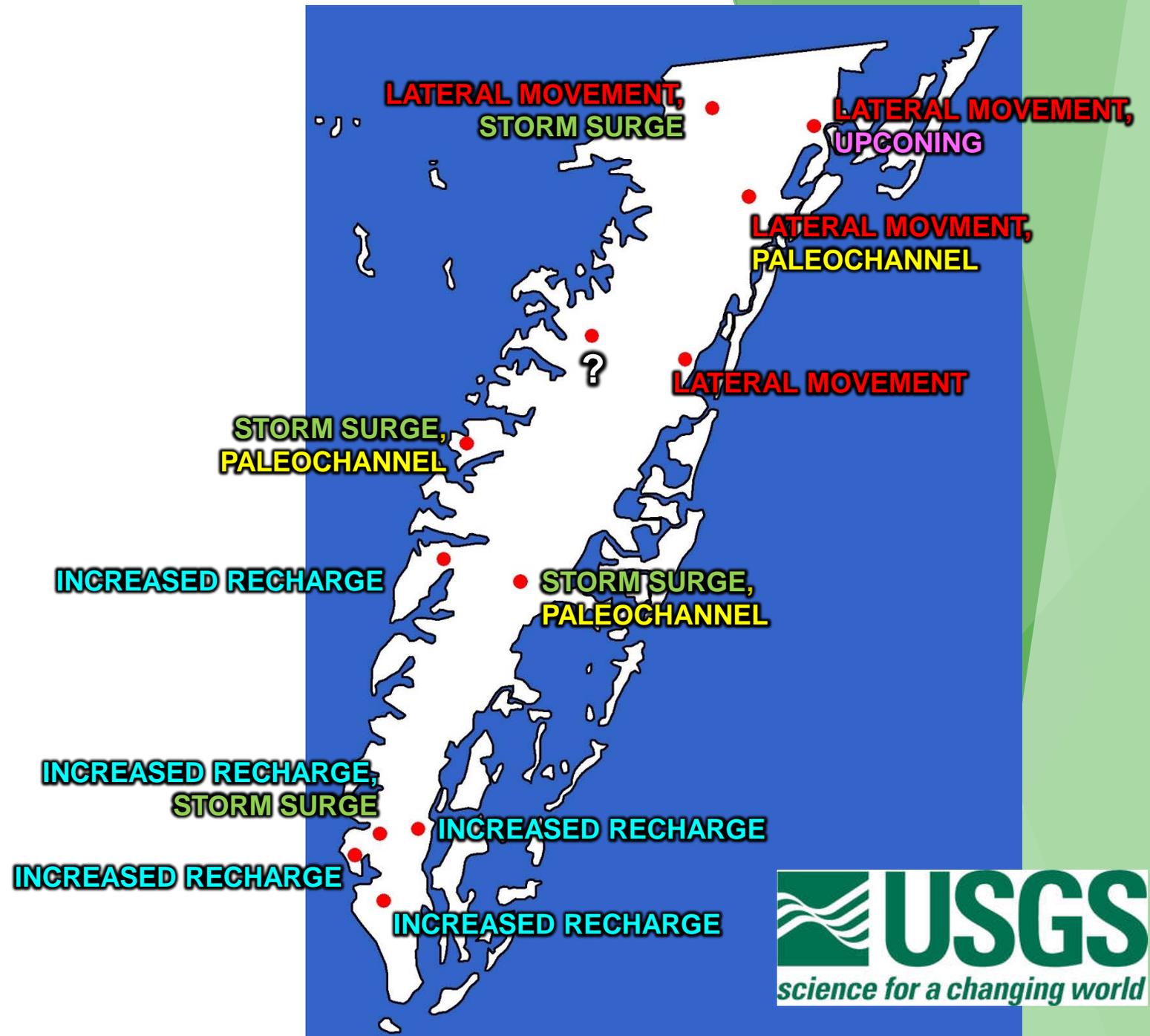


Pumping-Induced Saltwater Movement



Recent Research

- ▶ USGS logged 12 wells with the same method in August of 2008 & 2016
 - ▶ Small salinity changes in most wells
- ▶ Intend to contract USGS to sample annually for at least the next 5 years to get a better understanding of trends and causes of salinity changes



Groundwater Management and Water Supply Planning



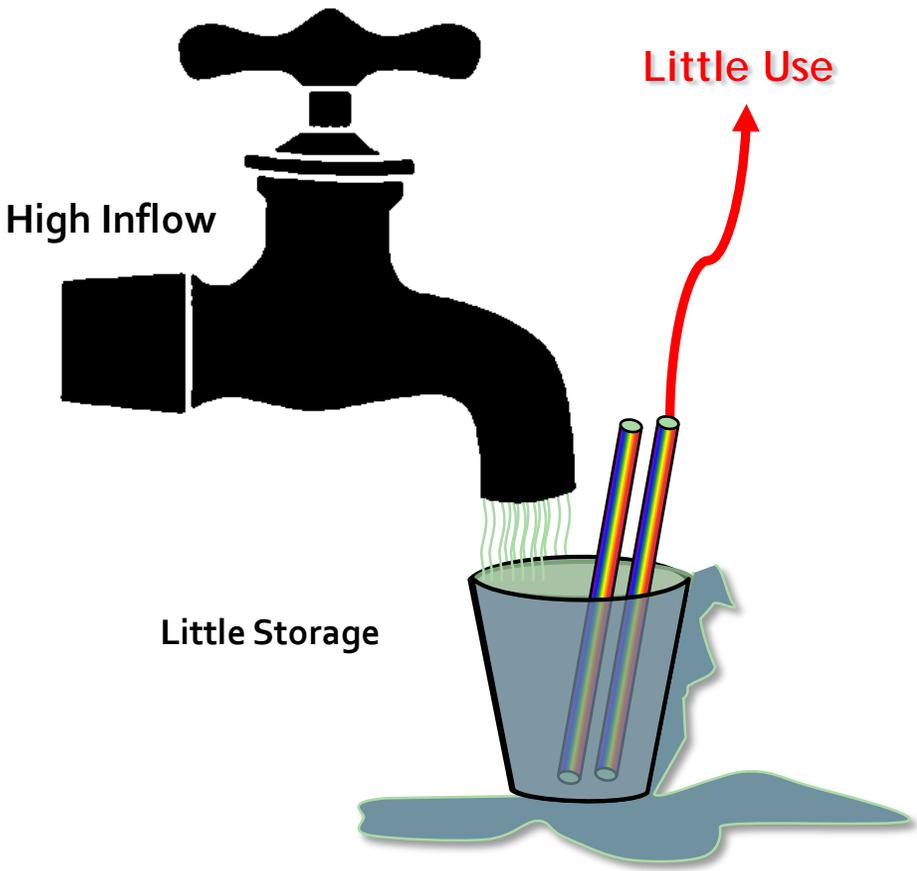
Eastern Shore of Virginia Ground Water Committee

- ▶ Formed in 1990 by Accomack & Northampton Counties
- ▶ 11-members:
 - ▶ 2 County Administrators, 4 County Supervisors, 4 County-appointed members, A-NPDC Executive Director
- ▶ Contracts consulting hydrogeologist to advise Committee: Britt McMillan, Arcadis-Malcolm Prime
- ▶ **ESVA Ground Water Resource Protection and Preservation Plan**
 - ▶ Original 1992; Updated 2013
 - ▶ Regional plan to ensure adequate & safe drinking water for citizens
- ▶ **Water Supply Plans - Accomack & Northampton Counties**
 - ▶ Regulations: 9 VAC 25-780
 - ▶ Adopted in 2011
 - ▶ Rewrites are due to VDEQ in 2018

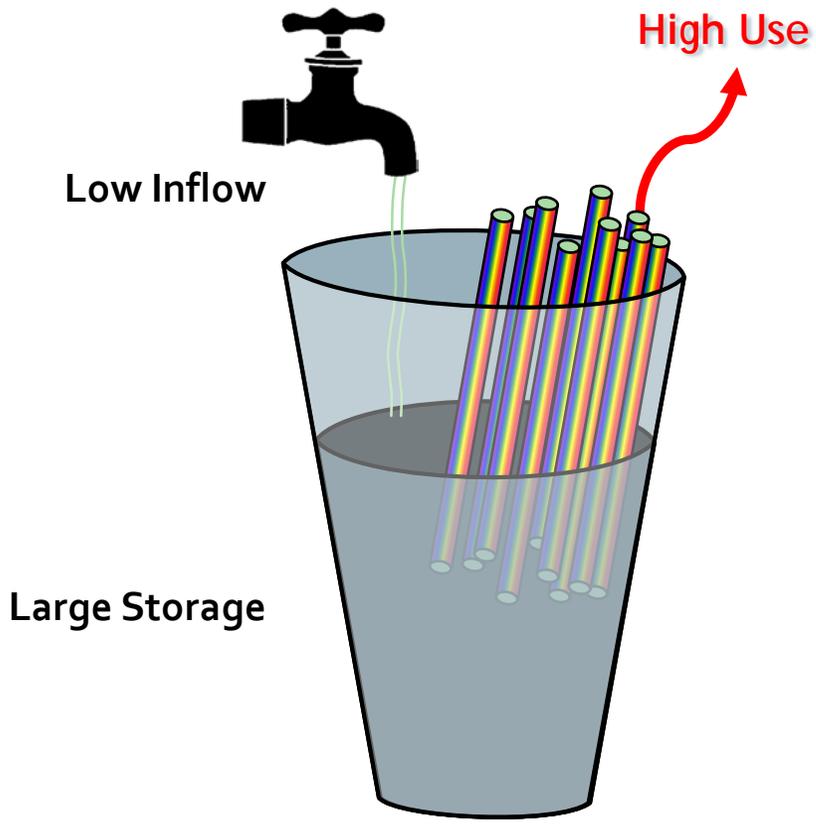




Columbia Aquifer / Yorktown-Eastover Dilemma



COLUMBIA AQUIFER (WATER TABLE)



YORKTOWN-EASTOVER AQUIFER (DEEP)





Ground Water Award

2015 Recipient: Home and Fitchett Farms

- ▶ Established the Award Program in 2004 to publicize local projects, individuals, and entities working towards water conservation, recharge area protection/preservation, aquifer preservation, recycling/reuse of water, pollution prevention and public education/community outreach.
- ▶ Mr. Buster Fitchett received the award on behalf of the Farms
 - ▶ All water for irrigation is sourced from the Columbia aquifer
 - ▶ Large permit allowance, demonstrates high yield from the Columbia aquifer wells



Groundwater Hydrology of the Virginia Coastal Plain – USGS, VDEQ, USEPA

- ▶ 3 Tasks on the Eastern Shore (much more on the western shore)
 - ▶ Evaluation of the hydrogeologic framework
 - ▶ Characterization of paleochannels
 - ▶ Delineation of the saltwater-transition zone





Conclusions & Relevancy

- ▶ The Eastern Shore has a limited Sole Source Aquifer from which to source all fresh water
- ▶ There is more research needed to accurately predict the effects of groundwater withdrawal
- ▶ The Columbia (unconfined) aquifer should be utilized whenever possible, as it recharges more quickly than the Yorktown-Eastover aquifer
- ▶ The Yorktown-Eastover aquifer is susceptible to salt water intrusion

- ▶ Efficient use of water is important for adjacent users and the longevity of our fresh water aquifer
- ▶ Proper maintenance of septic systems is important to ensure safe drinking water and clean surface waters



~Thank you!~

Shannon Alexander

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Well and Septic Systems: Options, Installation, & Maintenance



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On-Site Sewage & Water Services: Permitting & Design Services



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