Eastern Shore Master Gardeners

Overview of Ground Water on the Eastern Shore

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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
ESVA Ground Water Committee

• Formed in 1990 by Accomack & Northampton to study and plan for ground water protection and management

• 11-member Committee meets monthly
  • 2 County Administrators, 4 County Supervisors, 4 County-appointed members, A-NPDC Executive Director

• Coordinated by A-NPDC with funding from Counties & VA Coastal Zone Management Program

• Contracts consulting hydrogeologist to advise Committee

• Activities:
  • Develop protection and management plans
  • Ground Water Research: USGS, VA Tech, Randolph-Macon
  • Public Workshops & Educational Materials
  • Review/comment on state withdrawal permit applications and federal environmental assessments
  • Coordinate with state/federal governments on ground water-related regulations
  • ESVA Ground Water Model
  • ESVA Ground Water Award Program
  • Household Hazardous Waste Collection
Presentation Overview

1. Ground Water Conditions
2. DEQ Permit Process
3. Tyson Water Use
4. Overall Ground Water Use
Ground Water Conditions on the Eastern Shore
Ground Water is not like an underground river!

- Groundwater flows through porous soils and sediment that includes gravels, sands, silts, and clay.
Soil/Sediment type determines if it can be used as a source of water

An Aquifer is a Source for Groundwater and is:
Any coarse grained material (sand, gravel) that can supply sufficient water for a beneficial use

A Confining Unit Impedes Movement of Groundwater and is:
Any fine grained material (silt, clay) that can significantly restrict vertical movement of groundwater such that the resulting groundwater is under pressure.
Aquifers are defined by where they appear relative to a confining layer

- **Water Table**
  - Water is not “under pressure”
  - Well yield is lower than comparable confined aquifers
  - Replenished (recharged) directly by precipitation
  - More vulnerable to contamination from surface activities

- **Confined aquifer**
  - Water is under pressure, confined by an overlying layer(s) of silt and clay
  - Replenished from vertical flow through the confining unit (recharge is much lower than a water table aquifer)
  - More vulnerable to saltwater intrusion
All Groundwater Aquifers on the Eastern Shore

- Fresh Groundwater is restricted to the Columbia (Water Table) aquifer and significant portions of the Yorktown-Eastover aquifer.

- Brackish groundwater is found in portions of the Yorktown-Eastover, all of the St. Marys Aquifer, Piney Point, and Potomac aquifers.

- The Columbia, Yorktown-Eastover, and Piney Point aquifers are found throughout the Eastern Shore.

- St. Marys and Potomac Aquifers are absent in the southern portion of the Shore.

Source: McFarland and Bruce, 2006
How Much Water Recharges the Aquifers?

- All fresh water comes from precipitation falling directly on the Shore.
- About 88% of the precipitation never infiltrates to the groundwater.
Recharge amounts vary across the Shore

Recharge to Surficial Aq

Estimate Recharge Rates

Recharge to Y-E Aq
Recharge rate to the Yorktown has increased over time due to pumping

- Current Yorktown-Eastover Aquifer use exceeds recharge by approximately 1 MGD
- Recharge will increase as use increases – but will NOT keep pace with pumping

Source: USGS Eastern Shore Model
Water Table / Yorktown Dilemma

Little Use

High Inflow

Little Storage

WATER TABLE AQUIFER

Low Inflow

Large Storage

DEEP AQUIFER

High Use
Ultimately the Balance of Recharge to Use Dictates Stability of the Fresh Water Lens

Fresh ground water is restricted to depths less than 350 feet

Estimated Recharge to Water Table Aquifer = 625 MGD approx
Estimated Recharge to Yorktown-Eastover Aquifer = 9 MGD approx
(based on USGS Eastern Shore Model)
Groundwater Use on the Eastern Shore
Ground Water Use and Ground Water Level Measurements

• Ground Water Use for permitted wells (wells pumping greater than 300,000 gallons-per-month) are submitted to VDEQ

• Ground Water Levels are routinely measured in Observation Wells by the USGS
Non-Agricultural Ground Water Use Trends
All Permitted Ground Water Use

Northampton Agricultural
Accomack Agricultural
Northampton Public/Commercial/Industrial
Accomack Public/Commercial/Industrial

Years: 1990-2007
Types of Groundwater Use

- 62% Commercial/Industrial
- 20% Municipal
- 18% Irrigation

Groundwater Use Distribution From Calendar Year 2002
Water Level Change and Monthly Use

Depth Below Ground Surface (ft): 67M, 13 SOW, 115D
Screen Depth = 239-249 ft
Monthly Water Use (GPD average)
Ground Water Levels Near Perdue Farms

Depth Below Ground Surface (ft)

Accomack County Office Buildings Waterworks
Perdue Farms Incorporated
Shore Life Care at Parksley
Byrd
Rew Farm
Burton Farm
Accawmacke Ornamentals

1 inch equals 4,000 feet

Legend
#Agricultural#Industrial/Commercial!Municipal@AUSGS Observation Well

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Water Level Change and Annual Use Near Perdue Farms

![Graph showing water level change and annual use near Perdue Farms. The graph includes two lines: one representing depth below ground surface and the other representing annual groundwater use. The data is displayed for the years 1982 to 2008.](image-url)
Effect of Irrigation Use

Observation Wells SOW 113 West of Wardtown

Depth Below Ground Surface (ft)

Legend
- Agricultural
- Industrial/Commercial
- Municipal
- AUSGS Observation Well

- 63J 1 SOW 113A - Screen Depth = 110-120 ft
- 63J 2 SOW 113B - Screen Depth = 215-225 ft
- 63J 3 SOW 113C - Screen Depth = 280-290 ft

Inset Map

YMCA Family Campground
YMCA Family Campground
Northampton Accomack Memorial Hospital
Grapeland Farm
Davids Nursery
Marshall/Johnson Farm
63J 3 SOW 113C
63J 2 SOW 113B
63J 1 SOW 113A

1 inch equals 4,000 feet

Long Term Decline from Irrigation Use

Observation Wells SOW 113 West of Wardtown

Legend

- Agricultural
- Industrial/Commercial
- Municipal
- AUSGS Observation Well

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Potential Threats To Water Table Water Quality

Sources:
Agriculture / Livestock
- Nutrients (Fertilizers)
- Pesticides / Herbicides
- On-site waste disposal

Waste Units
- Septic Systems / Drain Fields
- Public Sewers
- Underground Storage Tanks (USTs)

Residential
- Nutrients / Pesticides - Herbicides
- Petroleum and solvents

Function of amount (loading) and area of application
Potential Threats to Yorktown-Eastover Aquifer Water Quality

- Freshwater aquifer
- Confining unit
- Salt water aquifer
- Water Table
- Land Surface
- Sea level

Yorktown Aquifers

Freshwater
Salt water

Legend:
- Freshwater aquifer
- Confining unit
- Salt water aquifer

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Over a vertical distance of only 150 feet the chloride concentrations increase by almost 5,000 percent.

- **Fresh Ground Water**
- **Drinking Water MCL (fresh/brackish)**
- **Brackish Ground Water**

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Why the Eastern Shore of Virginia?

Most likely cause for a loss of fresh ground water is salt water intrusion due to over pumping
Thank You!

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