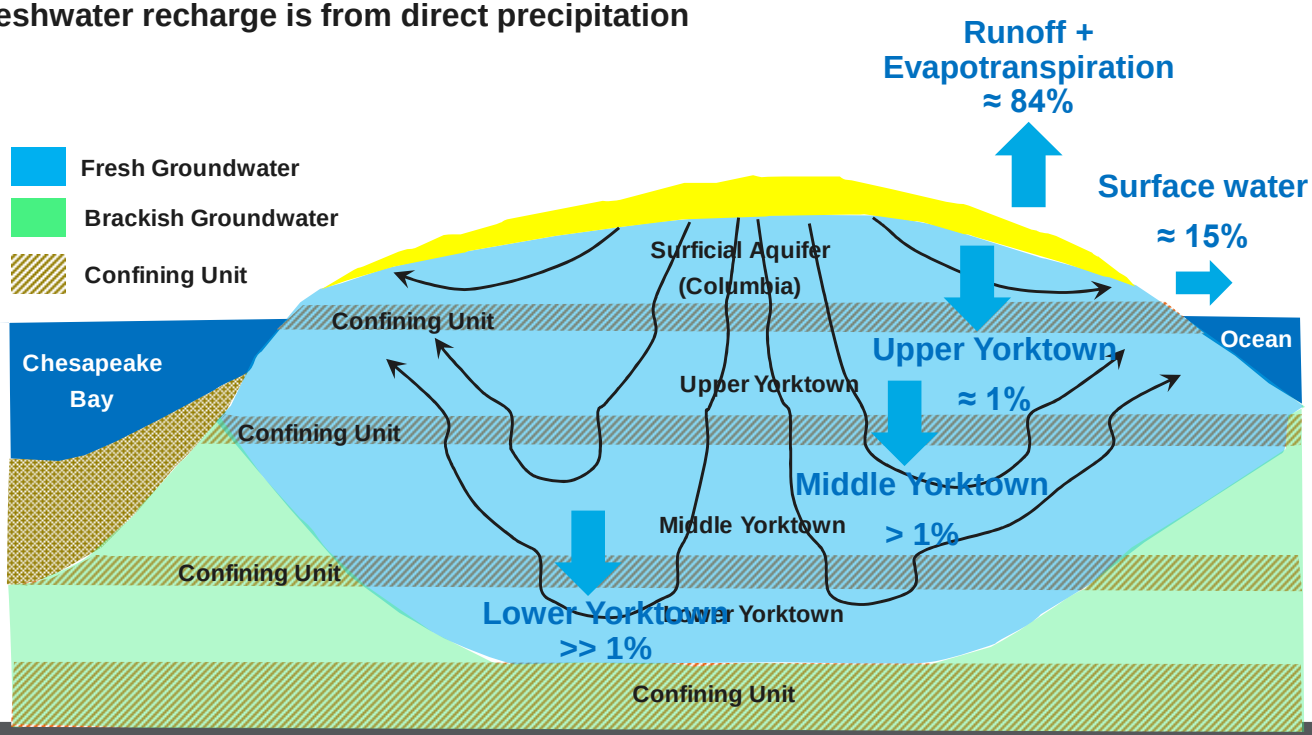
GROUNDWATER RECHARGE ON THE EASTERN SHORE OF VIRGINIA

April 2021

Source of Recharge

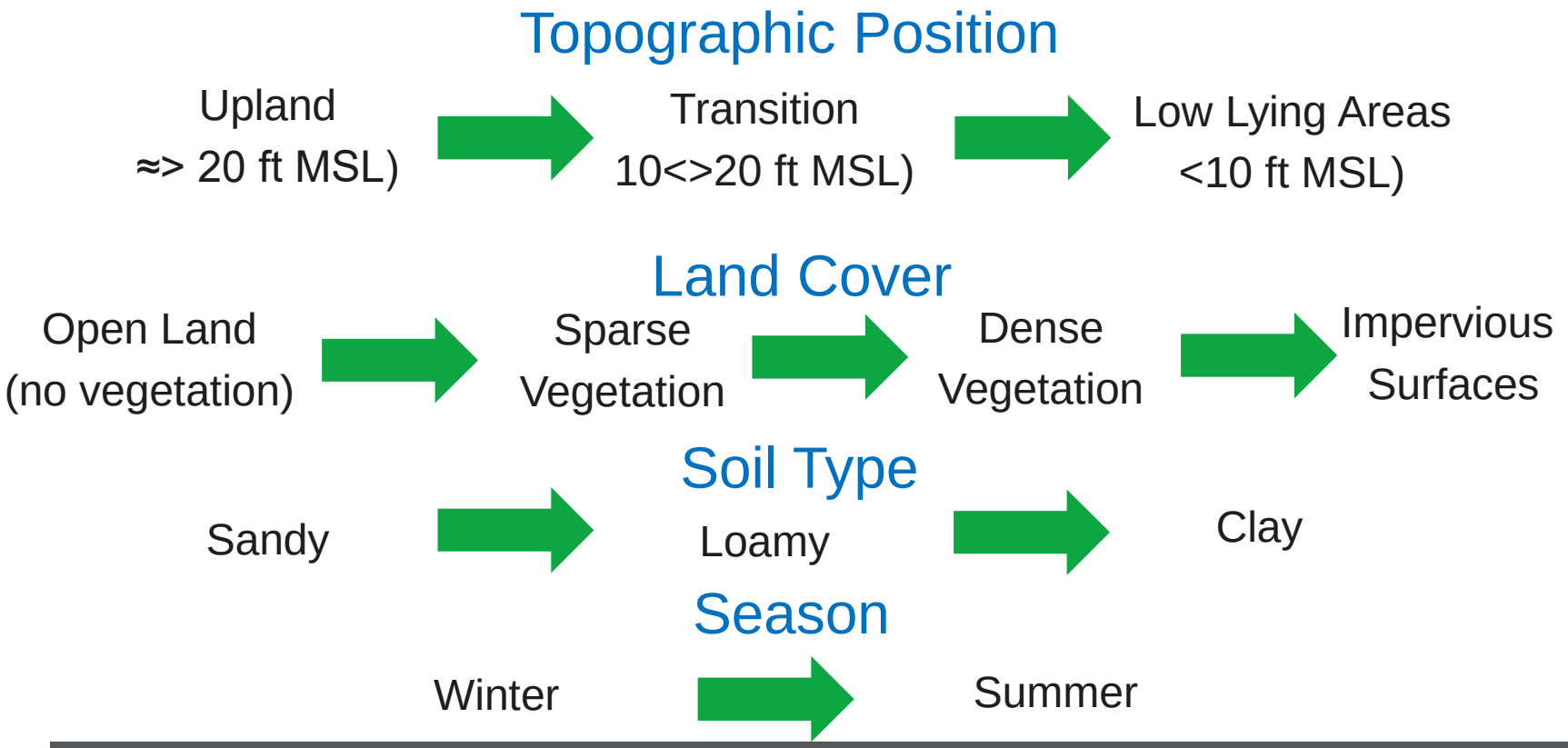
Fresh Water is Limited:

- **Designated by the USEPA as a Sole Source Aquifer: no significant fresh water from streams or rivers.**
- **Fresh groundwater restricted to a "lens" less than 350 feet thick.**
- **All freshwater recharge is from direct precipitation**



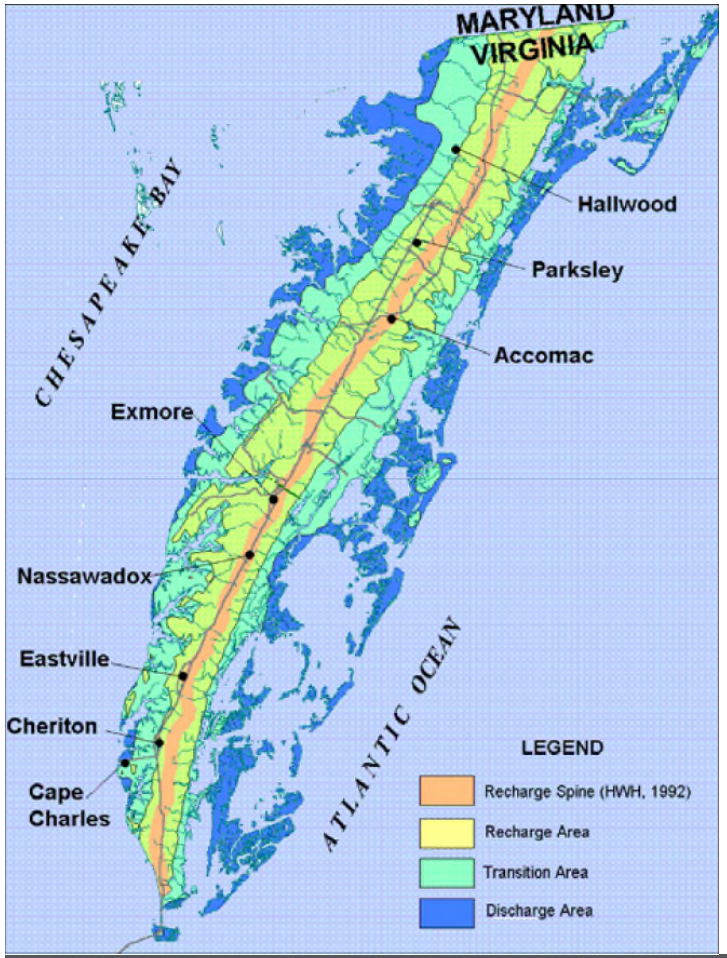
Recharge first occurs at the surface of the Surficial aquifer (Columbia aquifer)
Recharge to the Yorktown-Eastover aquifers are much less, with the Lower Yorktown recharged the least
Estimated from Eastern Shore Model water balance: Estimates will be improved as model is improved over time

Factors influencing Recharge to the Surficial Aquifer



All factors contribute to the amount of recharge to the surficial aquifer.
Arguably topographic position is most important followed by land cover.

Recharge to Surficial Aquifer by Topographic Position



- Precipitation on upland recharge areas have the greatest potential to recharge the surficial aquifer
- Low lying areas are in close proximity to surface water and depth to groundwater is often within rooting depth for many plants (higher evapotranspiration)
- Within each topographic position land cover and soil type contribute to the amount of recharge that occurs

Recharge is controlled b several factors working together

Factors influencing Recharge to the Yorktown-Eastover Aquifers

Thickness the Confining Unit(s)

< 30 ft → > 30 ft

Occurrence of Paleochannels

Main Channel → Tributaries → >> distance from paleochannel

Recharge is also "induced" by pumping ➔but the amount of increased recharge is a small fraction (<10%) of the water pumped

ARCADIS Design & Consultancy for natural and built assets

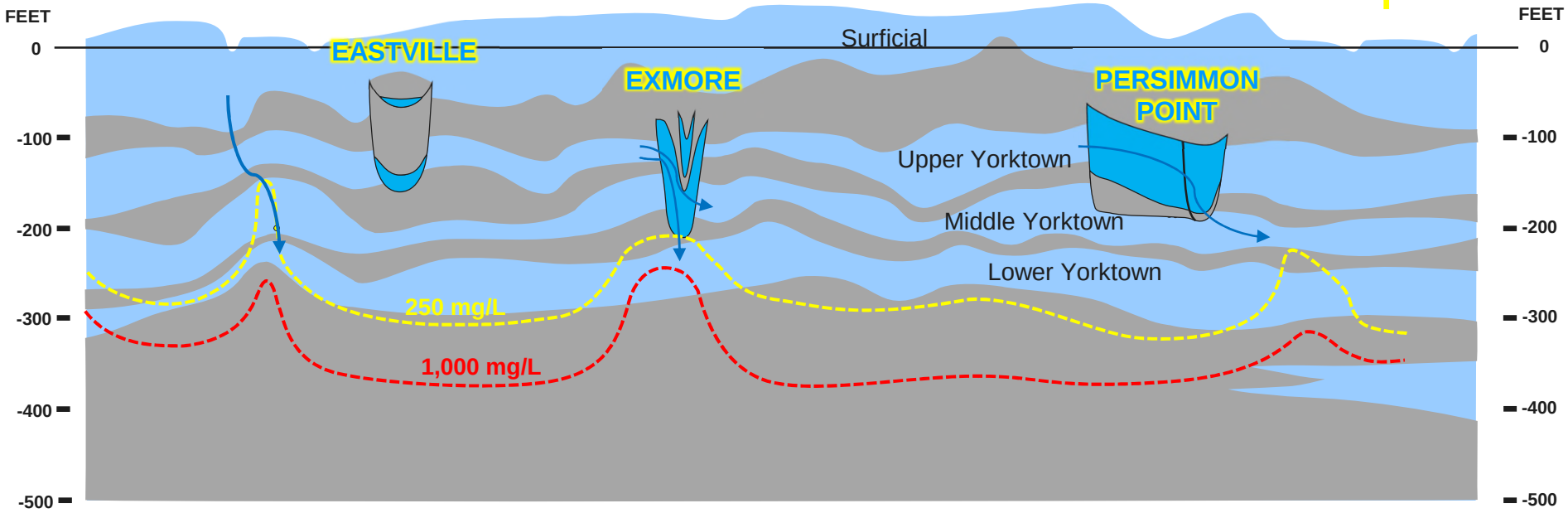
SOUTH

Greater recharge where the confining units are thinnest

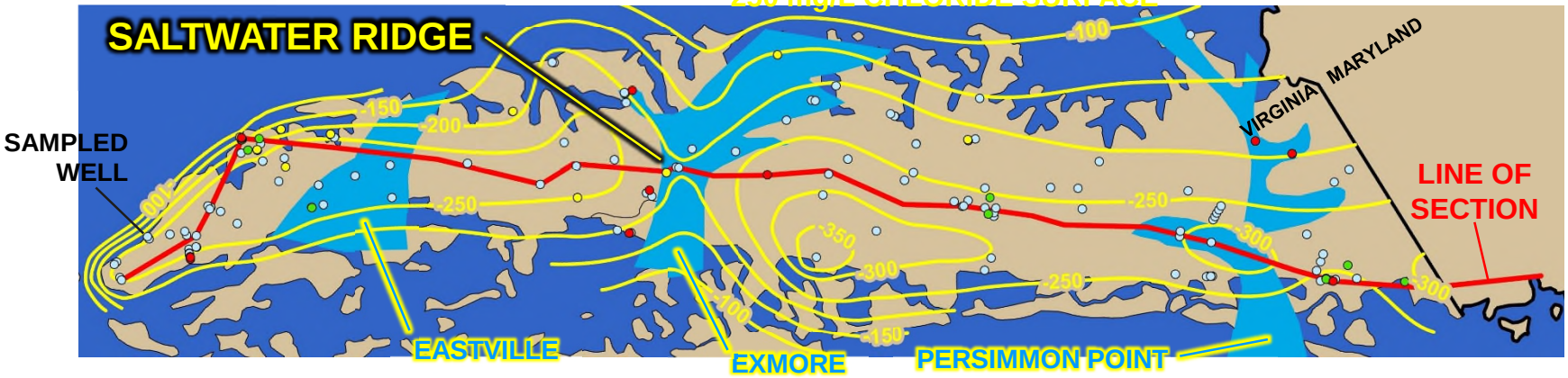
Preferential recharge occurs with paleochannels

NORTH

VIRGINIA | MARYLAND



250 mg/L CHLORIDE SURFACE



VERTICAL EXAGGERATION 260X

Adapted from: USGS 2019 Presentation

Summary

- Groundwater recharge initially occurs at the surficial (Columbia) aquifer.
  - Recharge to the three Yorktown-Eastover aquifers is much lower, with each deeper aquifer receiving progressively less recharge.
  - The deepest aquifer (Lower Yorktown-Eastover) is most susceptible to overpumping.
- Recharge to the surficial aquifer is controlled by:
  - Topographic position
  - Land cover
  - Soil type
  - Seasonal variation
- Factors controlling recharge to the surficial aquifer, combined, determine how much recharge occurs in a specific area
- Most important factors controlling recharge to the Yorktown-Eastover aquifers are confining unit thickness and proximity to a paleochannel.
  - Distribution of sands and clays in the paleochannels are complex and groundwater flow path through the paleochannels are similarly complex
  - Hydraulic interconnection between aquifers near the paleochannels is poorly understood

USGS is in the process of updating the Eastern Shore Model. The update will provide additional beneficial information on recharge. The updated model will also help to identify data gaps and guide future research.