Agricultural Adaptation to Saltwater Intrusion on the Delmarva Peninsula

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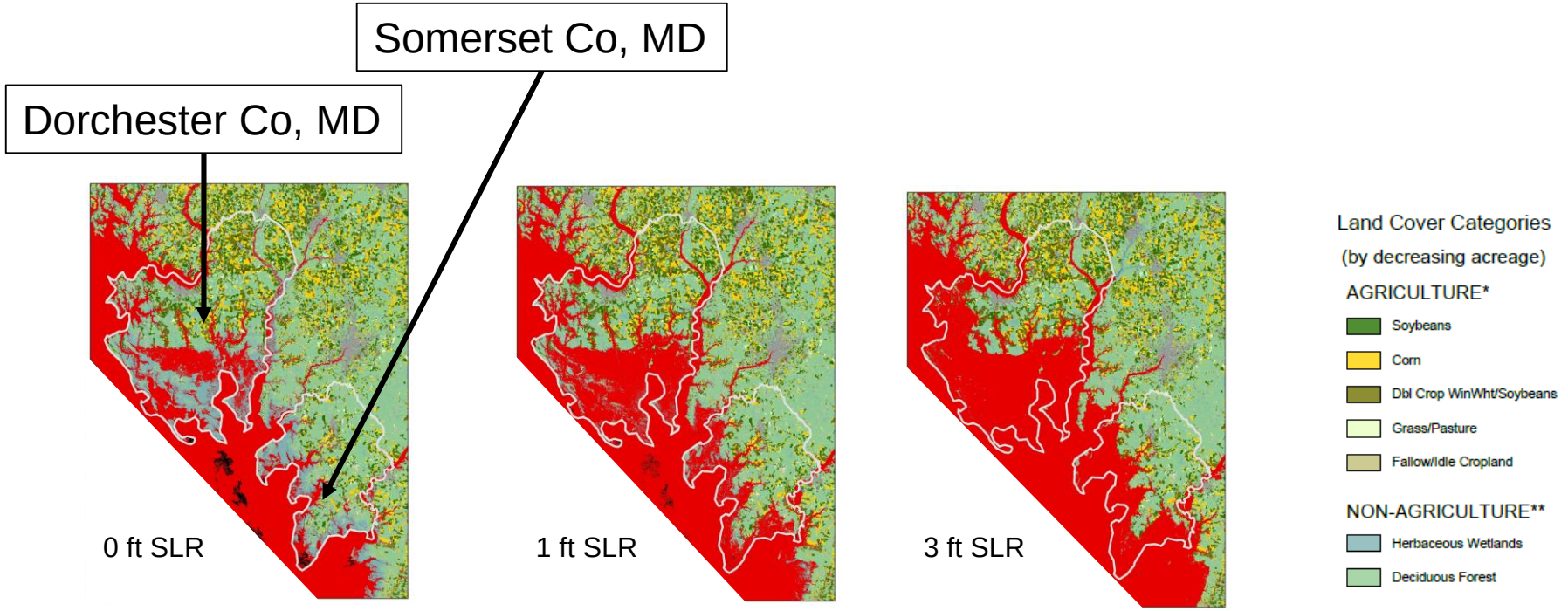
Subsidence and Sea Level Rise

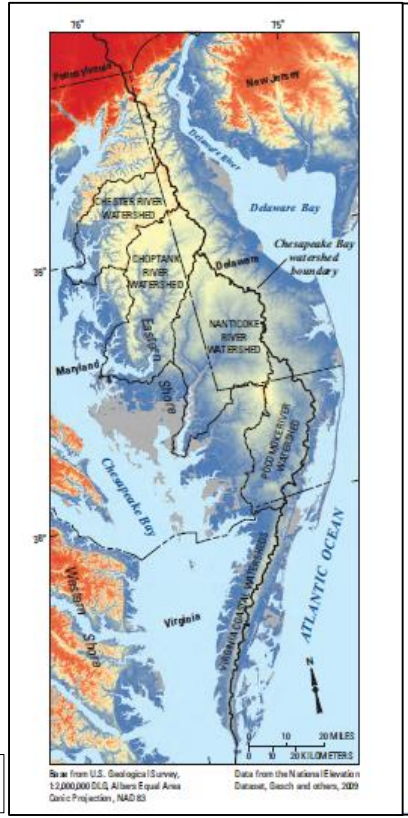
- Saline soils should be uncommon in the east, however……
- Groundwater drawdown causes subsidence
- Climate change causes sea level rise

Sea-levels in MD expected to rise 1-2 ft by 2050

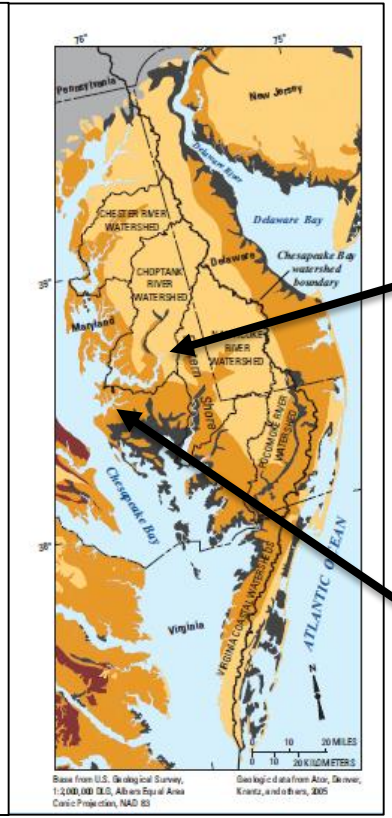


USDA 2008 and NOAA 2017

Parent Material and Elevation



Elevation



Sediment Texture

USGS

Figure 12.—Profile of Fort Mott loamy sand. The coarse surface and subsurface horizons are within a depth of 24 inches. Scale is in feet.

NRCS

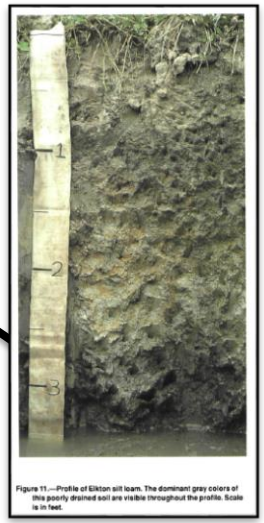
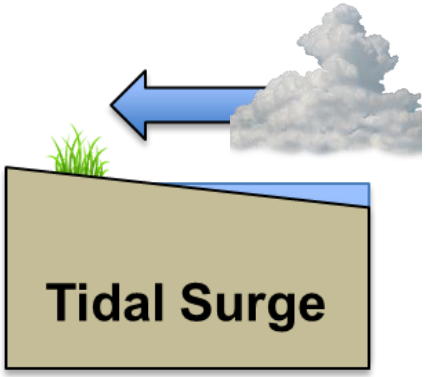
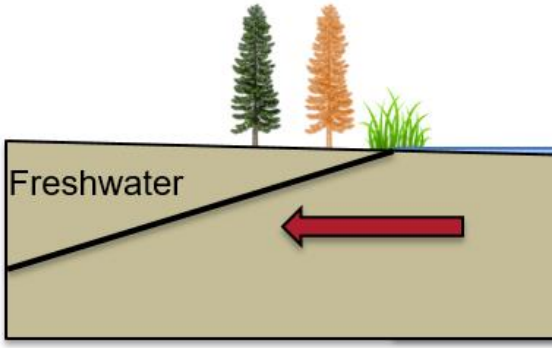


Figure 11.—Profile of Elkton silt loam. The dominant gray colors of this poorly drained soil are visible throughout the profile. Scale is in feet.

Types of Saltwater Intrusion on Delmarva



High tides and ditches



Rising seas and saline groundwater ★

Conversion on Delmarva

Consistent/persistent additions of salts to soils reduces crop and tree survivability

Bare area where nothing survives, until possibly area is wetter?

Marsh, weeds, invasive species move in.

Farmer Pathways to Manage SWI

Protect

1. Ditches
2. Tidal Gates
3. Gypsum

Accommodate

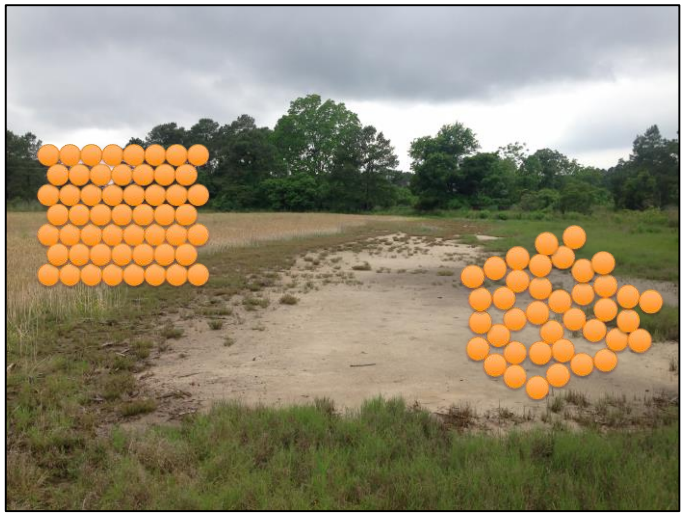
1. Salt tolerant crops
2. Conservation/ Conversion

Retreat ★

Costs and Benefits to Farmers with Management Decisions

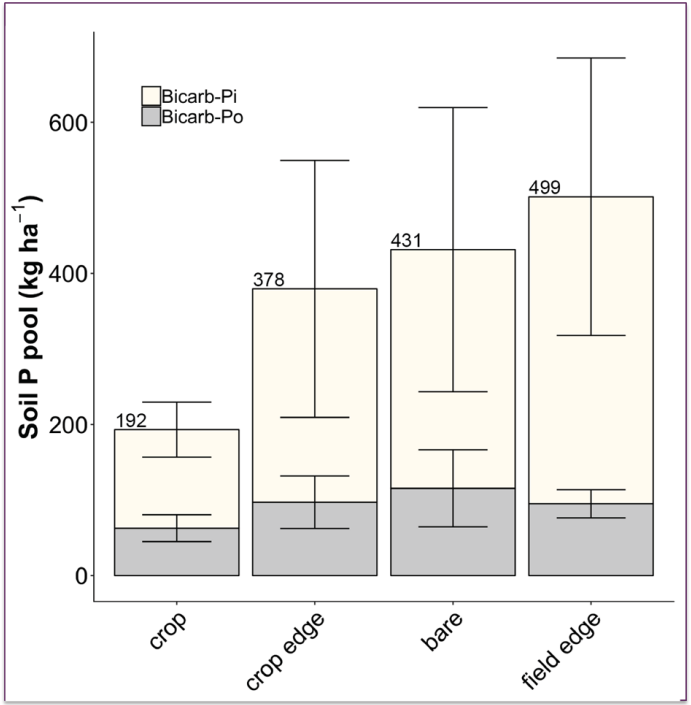
Management	Cost	Benefit	Long Term?
No-tillage	Weed pressure/herbicides	Drainage through soil aggregates	Not if its groundwater
Tidal Gate	Installation, maintenance	Keeps saltwater out	Not if its groundwater
Alternative Crops ★	New Management, Market?	Keeps it in production	Only at the edge of salt tolerance
Gypsum	Application, time, material	Keeps it in production	Works best if Na is the issue
Conservation/Wetlands	Loss of arable land (happening anyway)	Conservation payment/recreation?	Sea level rise will keep pushing it back
Retreat	Loss of arable land (*still taxed on*) ★	Maybe for wetlands and buffers	Depends on your viewpoint

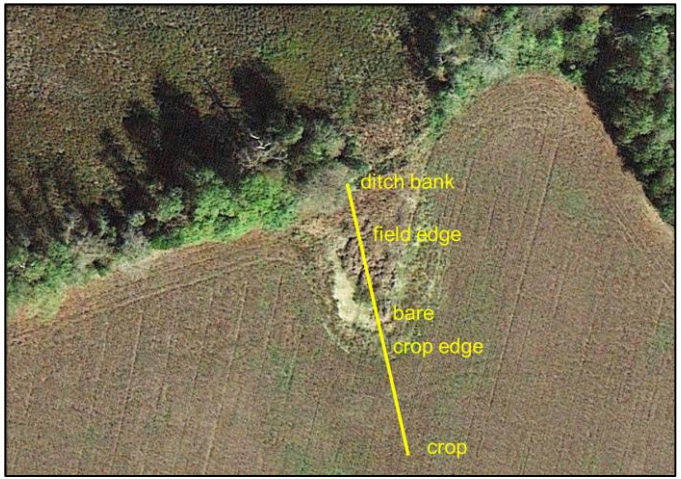
Impacts on Phosphorus Cycling



- P levels can be 50-500 ppm, sorbed to oxides
  - Oxides reduce under saturation
- EC above 3 mS cm^{-1} had higher inorganic P pools
- Edge of field has more non-crystalline iron, bonds to organic phosphorus

Phosphorus at Field Edge





- Did it move to edge by erosion?
- Subsurface transport?
- Potential source to tidal marshes

Our Alternative Crop Project

1. Salt “tolerant” Soybeans
2. Sorghum
3. Barley -> DC Soybeans

Agronomic

4. Switchgrass
5. Spartina Patens
6. Agricultural Weeds

Conservation

Also observing trends in water quality and soil characteristics

Questions?