Effects of Coastal Urbanization: Hydrology and Soil Morphology

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Objectives

- Document hydrologic patterns in coastal riparian settings altered by the addition of HTM.
- Investigate the relationships between soil morphology and hydrologic patterns in coastal anthropogenic soils.

Our main focus in this study was to examine changes in hydrology and soil morphology that would indicate changes in the denitrification capacity of these systems because of the addition of human transported materials (HTM). We used to call HTM fill (now a four letter word).

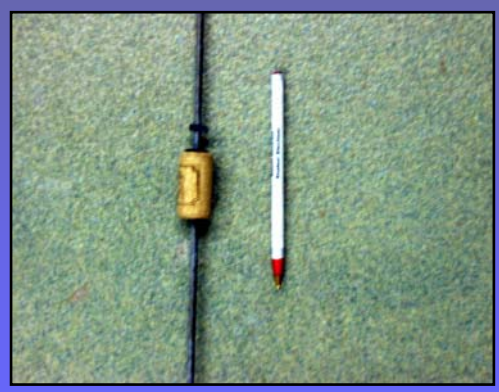
Site Selection:
Compare 1939 and 1997 Photos

1997 Orthophoto **1939 Aerial Photo**

What was once a marsh in 1939 is now a parking lot and boat ramp.

Water Table Wells In HTM

- Installed at least 2 wells per site
- Placed on a transect perpendicular to water
- Outfitted wells with MWTRD (Gizmo) (see Morgan and Stolt, 2004)

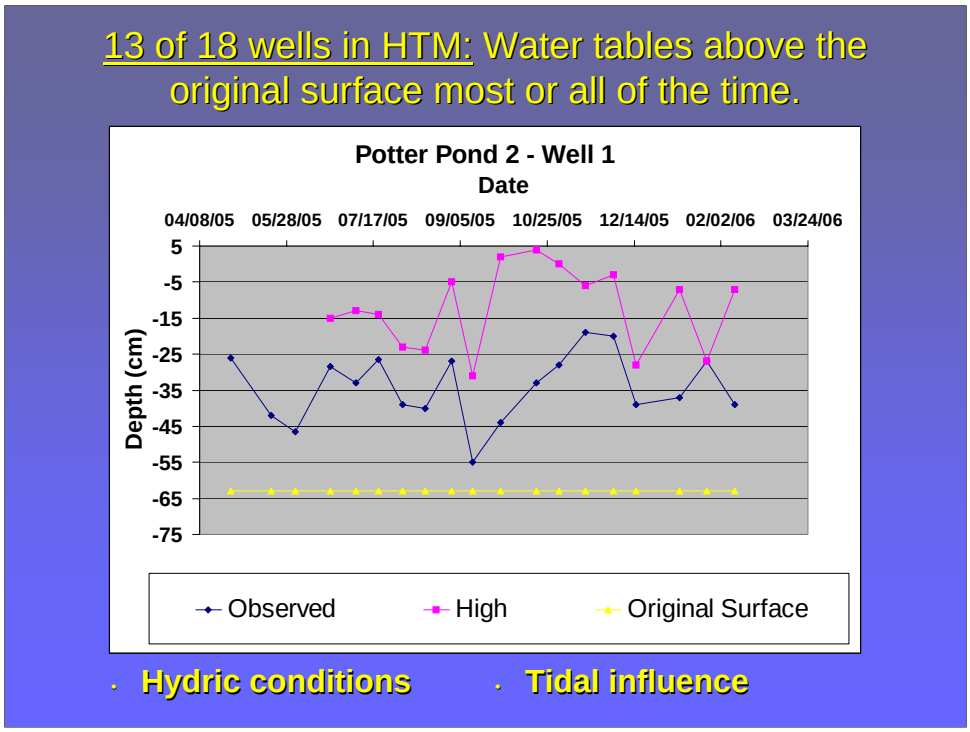


Wells were installed at each site. We inserted a maximum water table recording device (MWTRD-see SSSSAJ 2004) in the wells to record the highest level of the water table between the bimonthly readings.

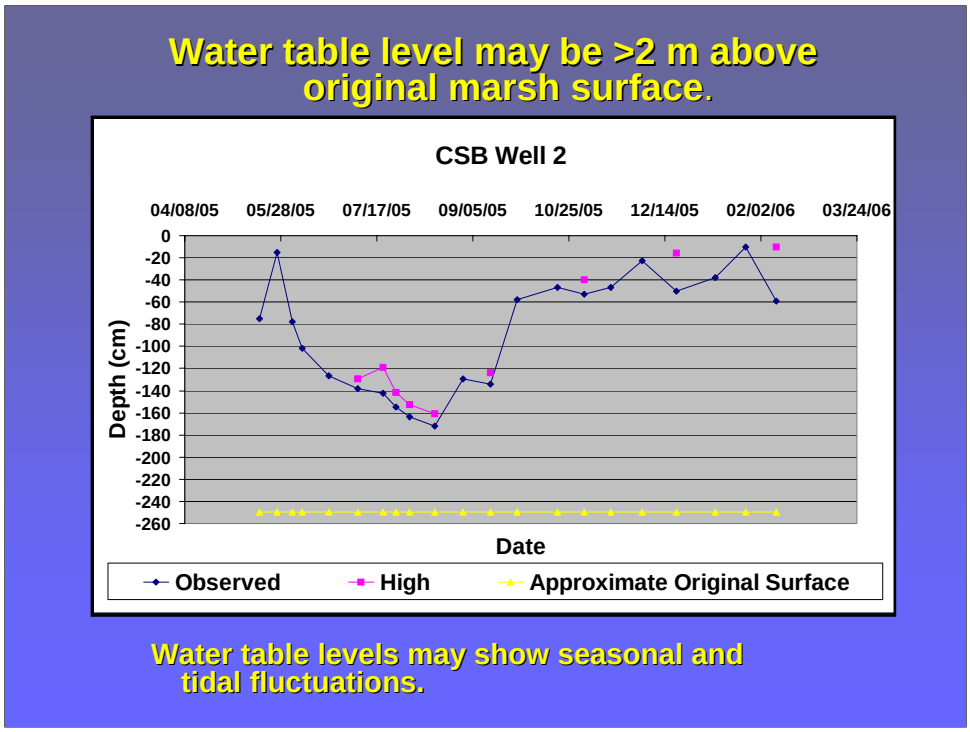
Observations On HTM in Estuarine Riparian Zones

- Thickness of 53 to 270 cm
- Typically sandy
- HTM Sources:
  - Dredged subaqueous soils
  - Offsite materials with and without artifacts

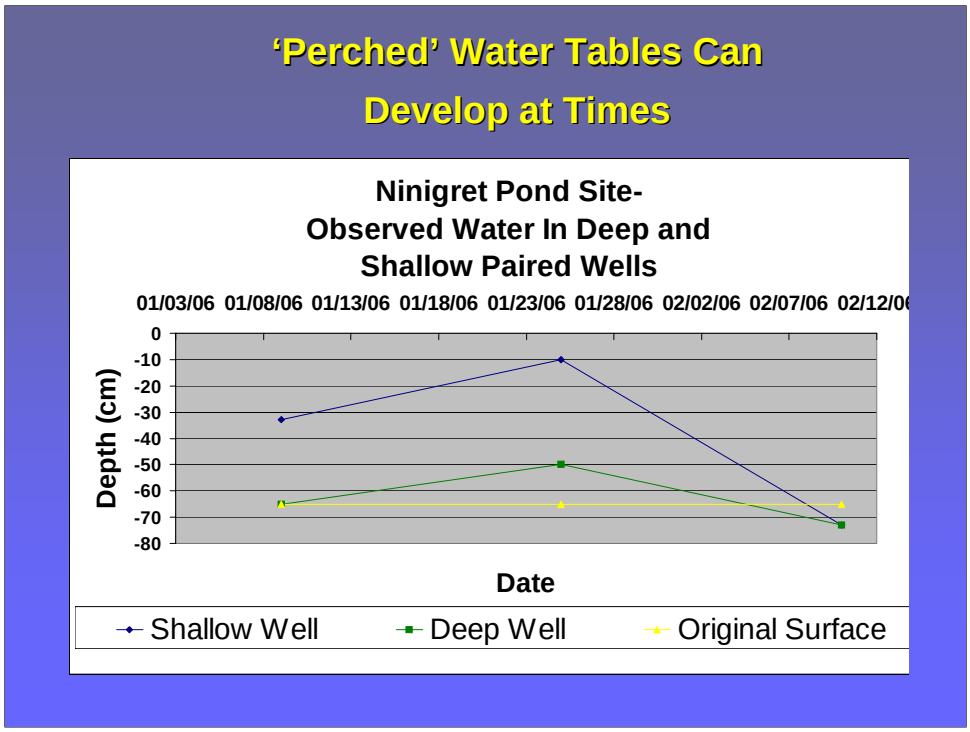
The thickness and composition of the HTM varied between sites. In general the HTM was sandy, 0.5 to 2.5 m thick, and dredged from nearby waters or brought in from offsite.



A common question is how will the water table and effects of the tidal cycle change when HTM is added to a a marsh. In this case evidence of the tidal cycle continued and the highest water table readings were at the current soil surface, 65 cm above where the soil surface was prior to the addition of the HTM. Little seasonal effects could be observed.

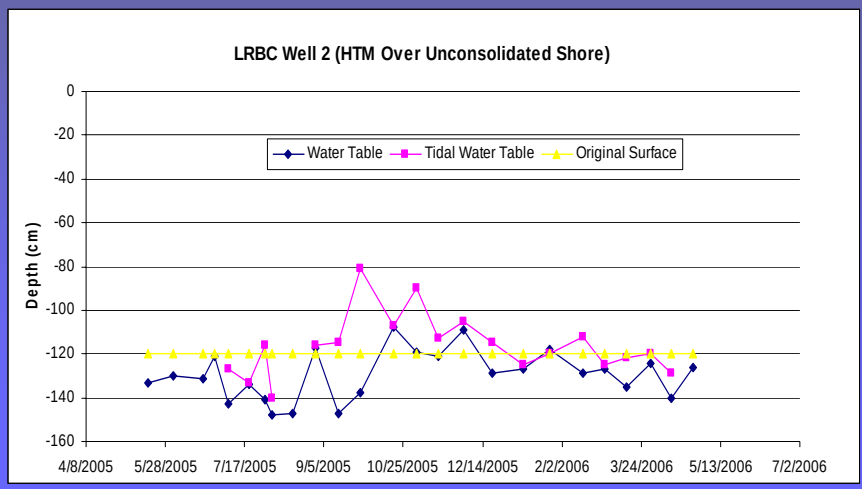


In this case, The water table was well above the original marsh surface and the water table fluctuations was controlled be seasonal effects (mainly evapotranspiaration).



Several sites appeared to have confining layers so we tested for the presence of episaturation or a "perched water table". In this case, the water table at times is perched as much as 40 cm above the regional level.

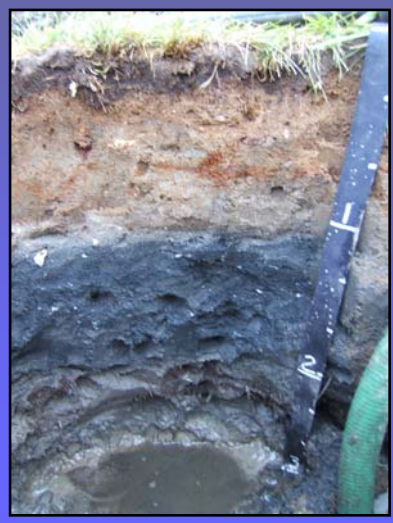
Water levels remained at or below original surface when unconsolidated shore materials were covered.



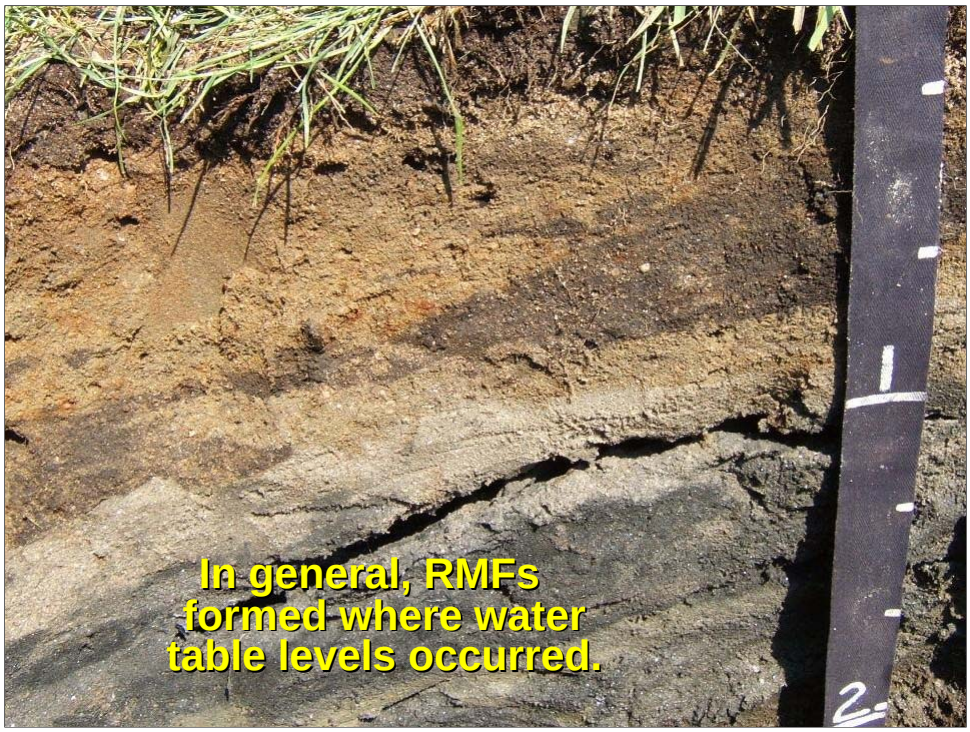
The filling of unconsolidated shorelines (i.e. sandy and gravelly beaches had minimal effect on the water table levels.

Morphologic Observations of Coastal Soils formed in HTM

- Redoximorphic features
- Gleization
- Humification
- Sulfidization (?)



A number of morphological features were observed in the HTM including the formation of redoximorphic features, gleization, and sulfidization suggesting that these indicators can be used in HTM to predict water table levels.



In most cases we used the presence of redoximorphic features (RMFs) to indicate the depth of the water table. These indictors appear to also work in HTM.