Hydric Soils, Anthropogenic Disturbance, and Water Quality

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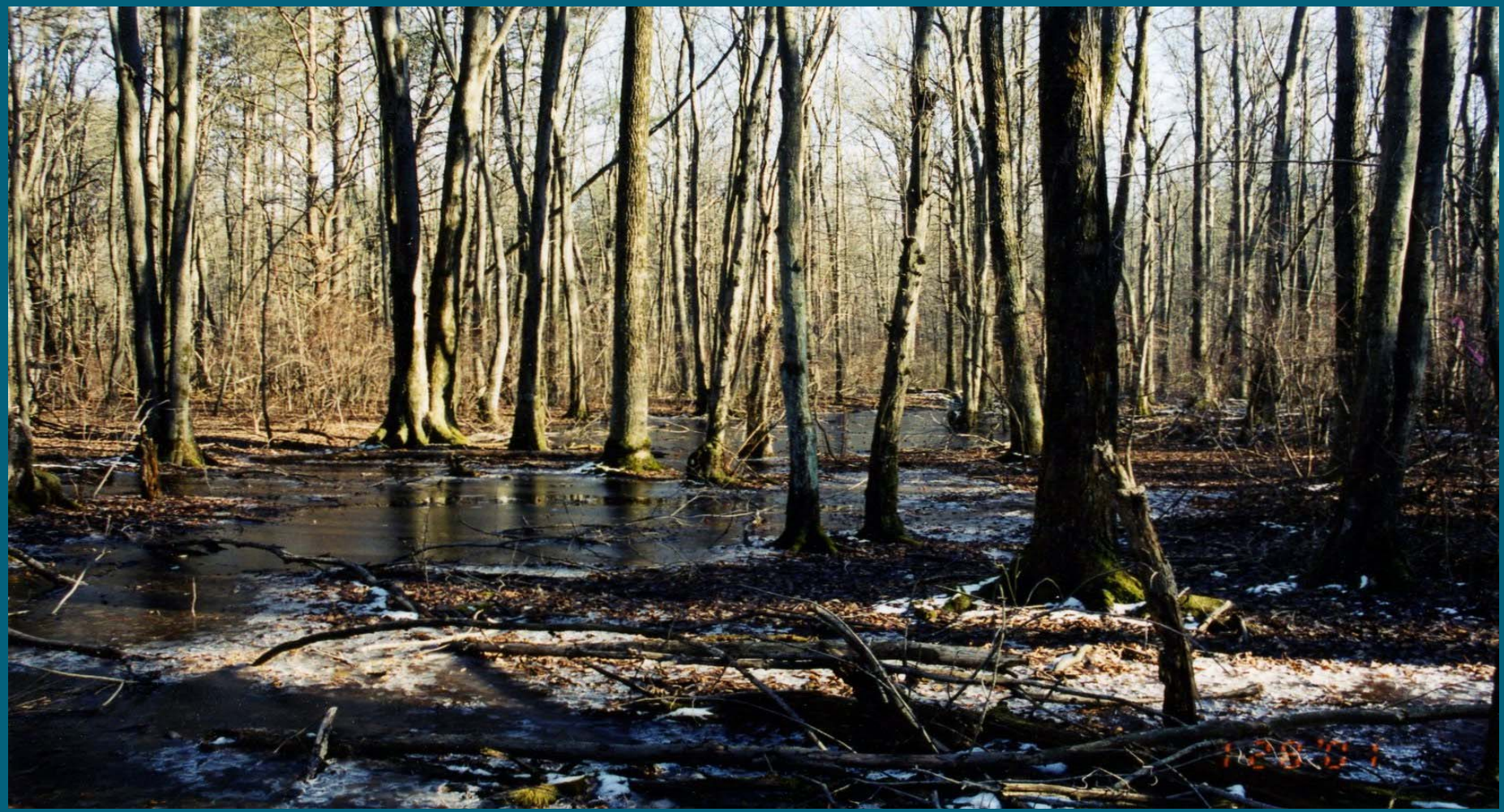


Hydropedology-Univ. Delaware

Relationship between water quality in wetlands

1. Soil morphology
2. Hydrodynamics
3. Anthropogenic disturbance

Anthropogenic Disturbance & Water Quality

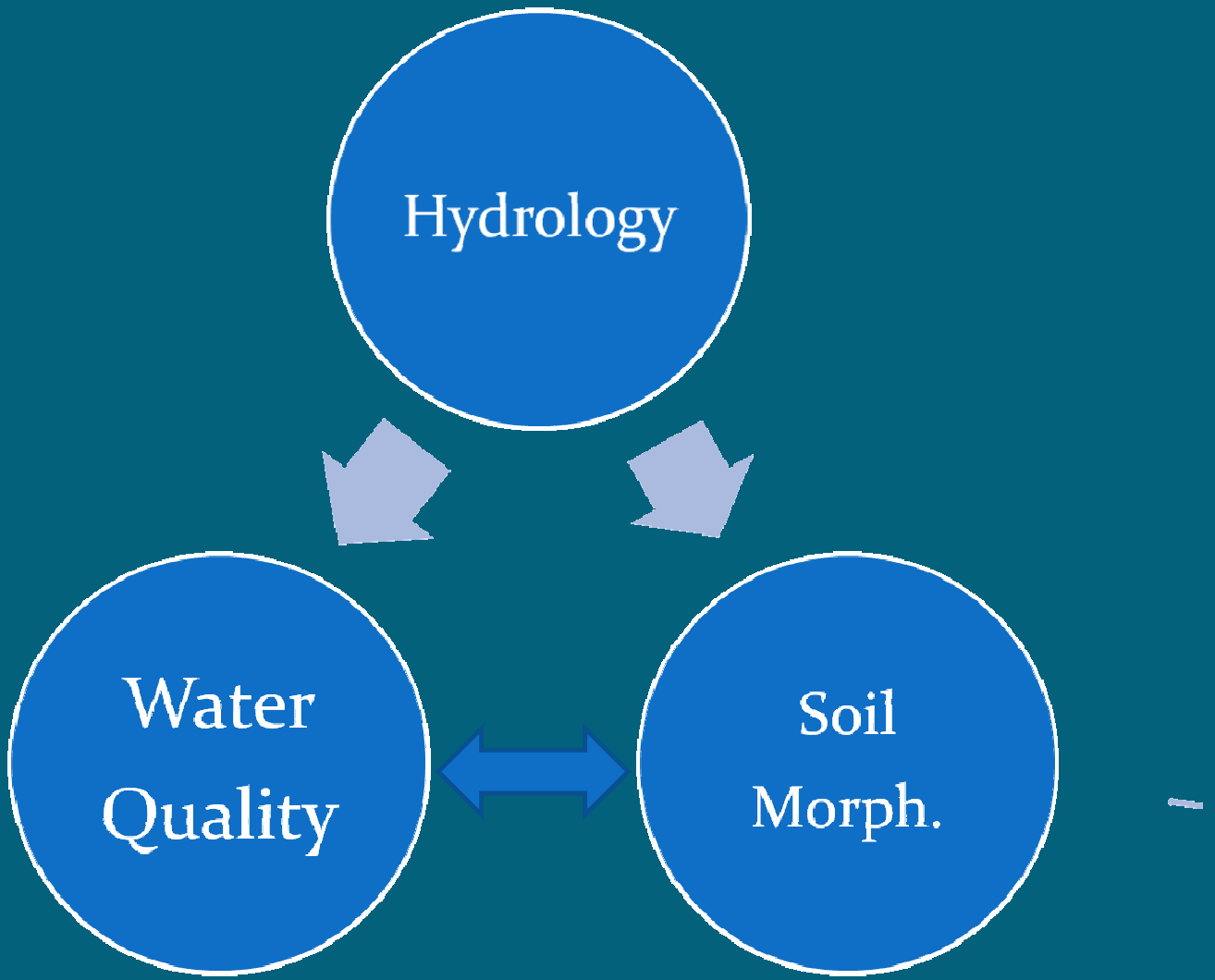
- Wetlands protected through the Clean Water Act
- State agencies (MDE, DNREC) are assessing wetlands
- Assessment based on level of anthropogenic disturbance
- What is the relationship between water quality & level of anthropogenic disturbance?
- Is there a relationship between hydric soil morphology and water quality?

Common Examples of Anthropogenic Disturbance

- Artificial drainage
- Plowing
- Logging
- Topographic alterations
- Chemical loading
- Sediment loading

Anthropogenic Disturbance

Scale	Assessment process
Wetland: delineation	Visual characteristics
Buffer: fixed radius	Subjective
	Relative scores
Catchment area	DEMs, arial photos, GIS
Watershed	Less subjective


Hydrology
Water Quality
Soil Morph.

Wetland Function-Denitrification

Requirements

- Nitrate loading
- Aerobic/anaerobic zones
- Soluble organic carbon

Factors

- Initial water source
- Surrounding land use
- Spatial variability
  - Microtopography
- Temporal variability
  - Fluctuating water table
- Woody debris and leaf litter
- Soil organic matter
- Live plant roots

Methodology Outline

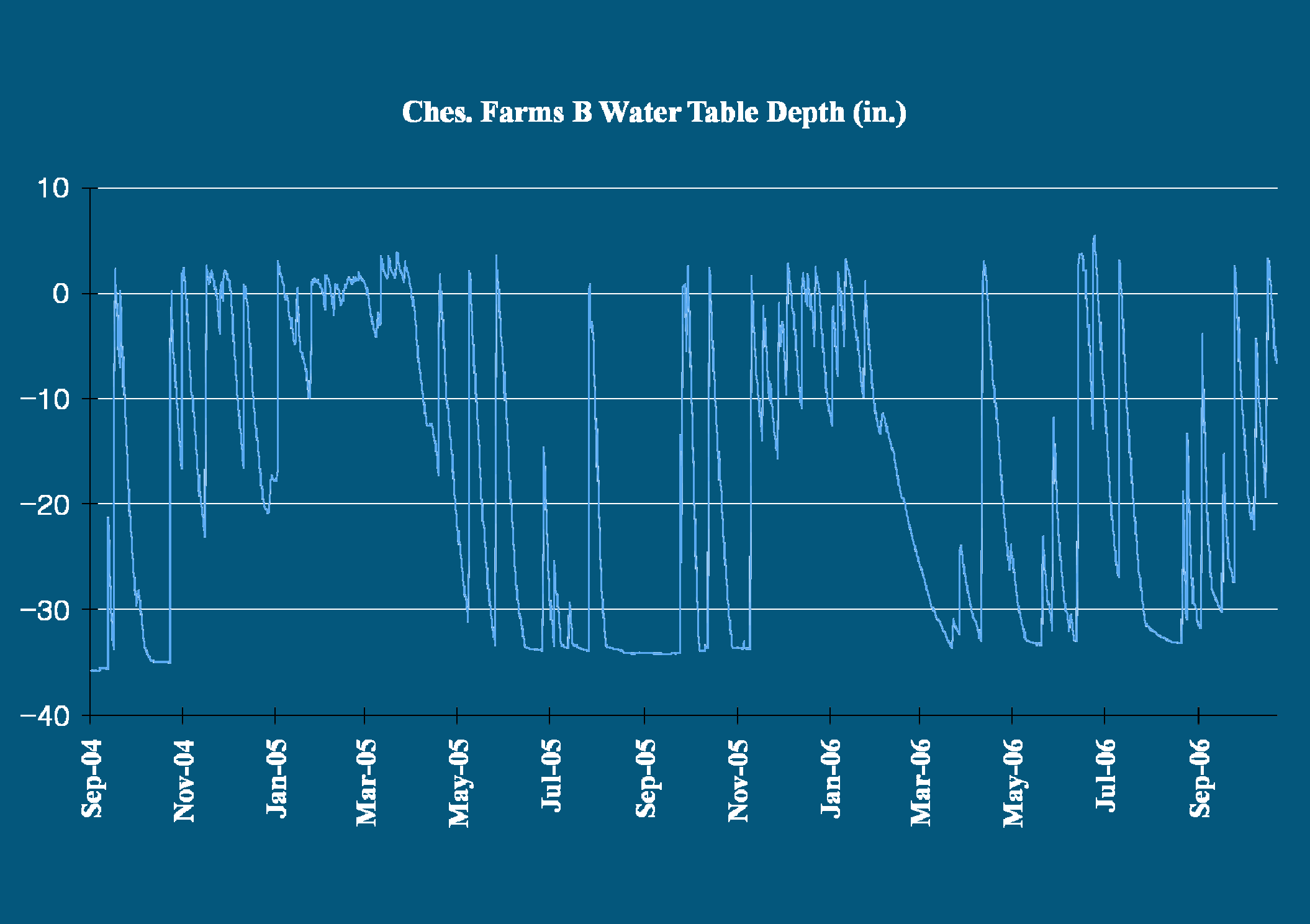
- Site locations: MD, DE, PA
- Physiographic regions: Piedmont, Coastal Plain
- # wetlands: 6 per region
- Wetland types: slope, depression, mineral soil flat
- Hydroperiod range: perm. inundated to seas. saturated

Methodology Outline-Parameters

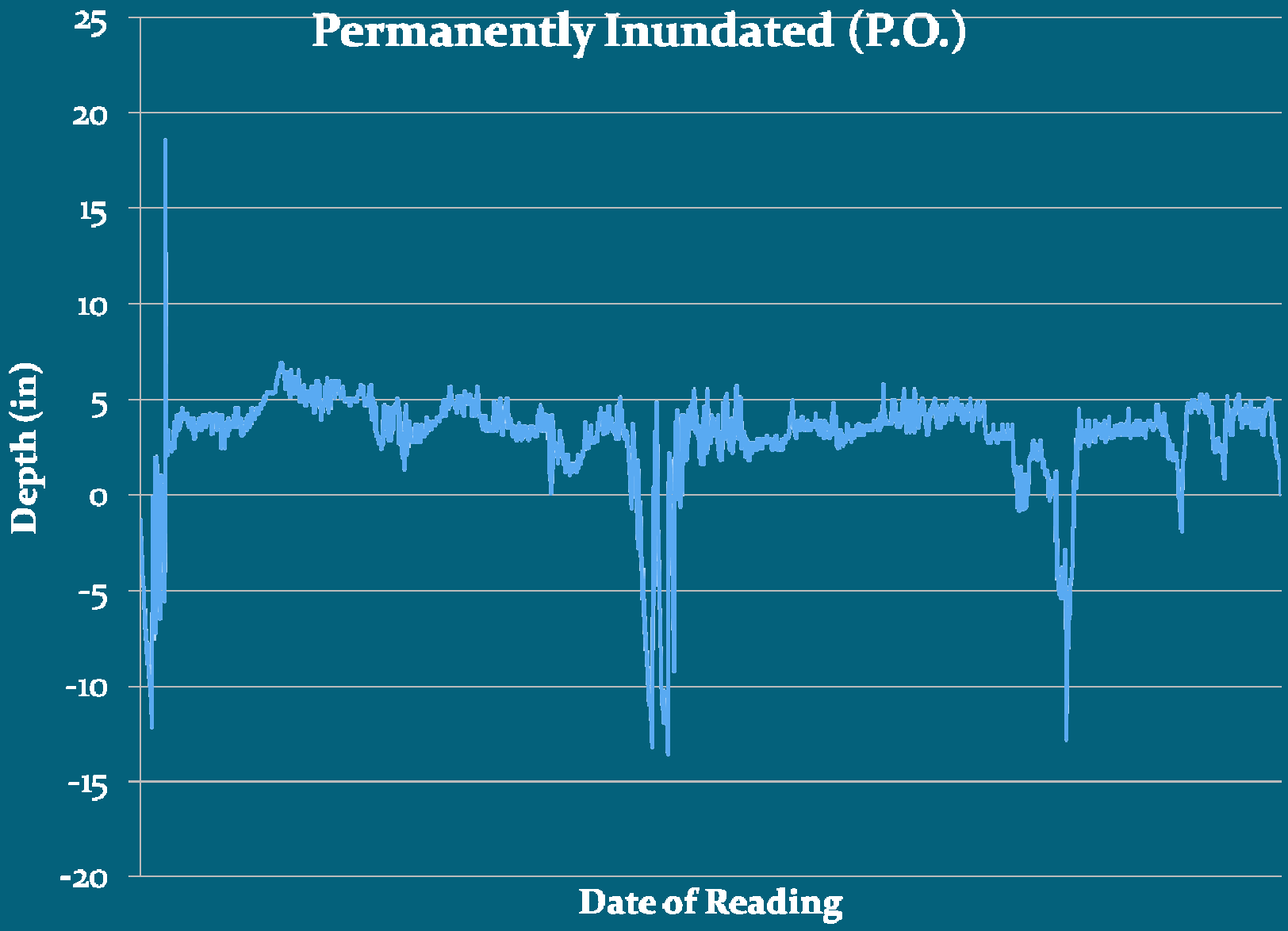
- Full pedon characterization: field, lab
- Soil redox
- Groundwater chemistry
  - Nitrate, orthophosphates
  - Monthly or bi-monthly sampling for 3 years
- Hydroperiod: monitoring wells

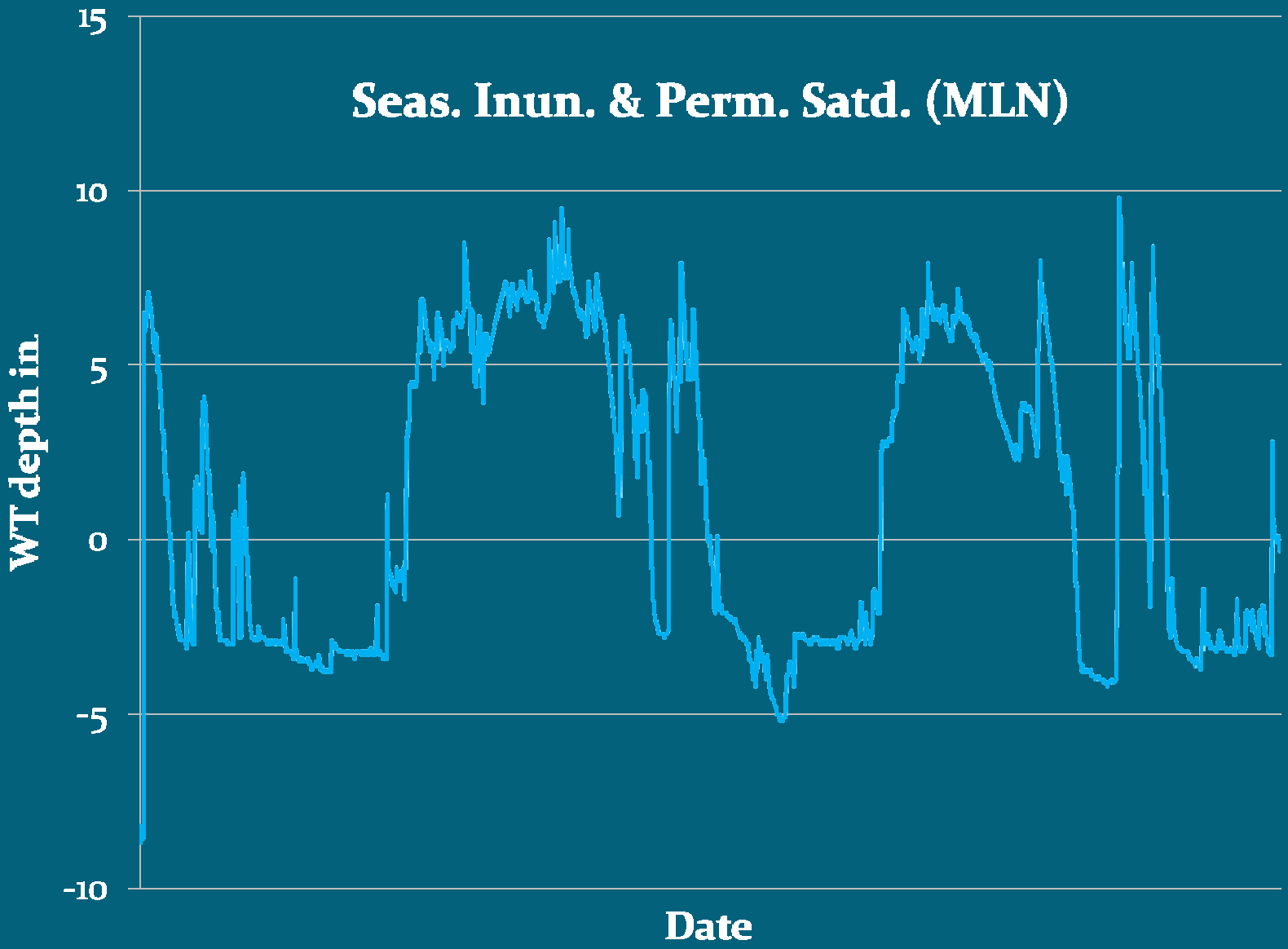
Wetland hydrodynamics

- Hydroperiod-seasonal pattern of water table depth
- Speed and direction of water flow
- # wet/dry cycles per year


Ches. Farms B Water Table Depth (in.)
10
0
−10
−20
−30
−40
Sep-04
Nov-04
Jan-05
Mar-05
May-05
Jul-05
Sep-05
Nov-05
Jan-06
Mar-06
May-06
Jul-06
Sep-06


Permanently Saturated (P.H.)
30
20
10
0
-10
-20
-30
Depth (in)
Date of Reading


Permanently Inundated (P.O.)
25
20
15
10
5
0
-5
-10
-15
-20
Depth (in)
Date of Reading


Seas. Inun. & Perm. Satd. (MLN)
15
10
5
0
-5
-10
WT depth in.
Date

Classification of Hydroperiod

Piedmont

- Toe-slope seeps
  - Seasonally saturated
- Side-slope seeps
  - Permanently saturated
  - Permanently inundated

Coastal Plain

- Mineral soil flats
  - Seasonally saturated
- Depressions
  - Seasonally inundated/perm. saturated

Computational challenges to assigning water nutrient values to wetlands.

- Seasonal variability
- Maximum value
- Mean value
- Median value

- Values below detection limits (<dl)
  - Computation of mean values
- % sample values below detection limits

Frey Water [Nitrate]