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# Wetland Hydrology Criteria and Field Indicators

# Criteria for Wetland Hydrology

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## Corps Manual:

Area is inundated or saturated to the surface for at least 5% of the growing season in most years

# Criteria for Wetland Hydrology

## National Food Security Act Manual:

- Area is inundated for at least 7 consecutive days during the growing season in most years, or
- Saturated at or near the surface for at least 14 consecutive days during the growing season in most years. Soils may be considered saturated if the water table is within:
  - 0.5 ft of the surface for sands
  - 1.0 ft of the surface for all other soils

# Growing Season

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The portion of the year when soil temperature (measured 20 inches below the surface) is above biological zero (41 °F or 5 °C).

# Growing Season

May be approximated by:

- Period when air temperatures are above 28 °F at a frequency of 5 years in 10
- Data sources:
  - Soil survey reports
  - WETS tables

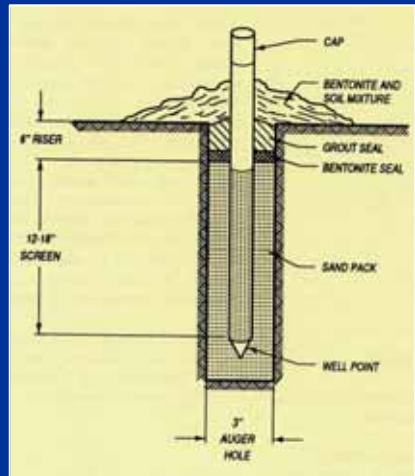
# Kinds of Hydrologic Data

## Tide and stream gages



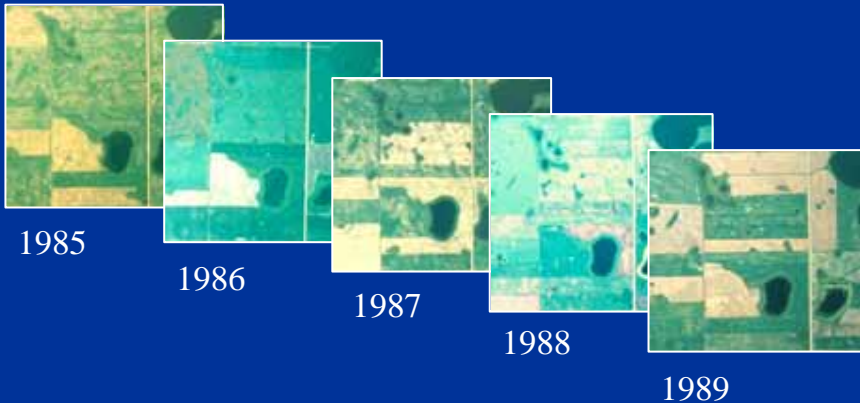
# Kinds of Hydrologic Data

## Groundwater wells



# Kinds of Hydrologic Data

## Repeated aerial imagery





# Sources of Hydrologic Data

- Corps District offices
- U.S. Geological Survey
- National Oceanic and Atmospheric Administration
- Natural Resources Conservation Service
- State, county, and local agencies
- Developers and consultants

# Evaluating Wetland Hydrology

Because hydrologic data are often unavailable for project sites, most wetland hydrology decisions are based on **indicators**



# Hydrology Field Indicators

## Primary Indicators

- Observation of inundation
- Observation of soil saturation
- Water marks
- Drift lines
- Sediment deposits
- Drainage patterns in wetlands

# Primary Indicators

Direct observation of inundation



# Primary Indicators – Soil Saturation

## COE Manual -

Condition in which all easily drained pores between soil particles are temporarily or permanently filled with water.



# Saturation

- Saturation
  - Water content definition – when all pores are filled with water, except those that contain entrapped air
    - Measured indirectly by tensiometers or on a weight basis
    - Field observation not reliable nor scientific
    - Is the basis of the word “saturation” in the COE 87 Manual
    - The only way the capillary fringe could ever be “saturated”
  - Water pressure definition – when its water has a pressure that is equal to or greater than atmospheric pressure
    - Field observation of the water table

# Water Table

The upper surface of groundwater, or the level at which water stands in an unlined borehole.

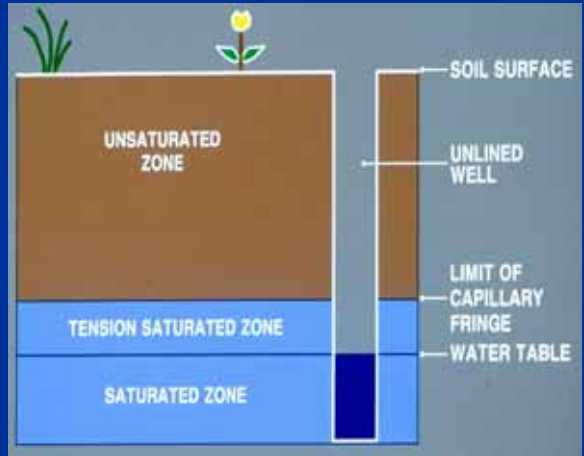
Water is at atmospheric pressure or greater



# Capillary Fringe

A zone immediately above the water table in which water is drawn upward by capillary action.

Water is at less than atmospheric pressure.

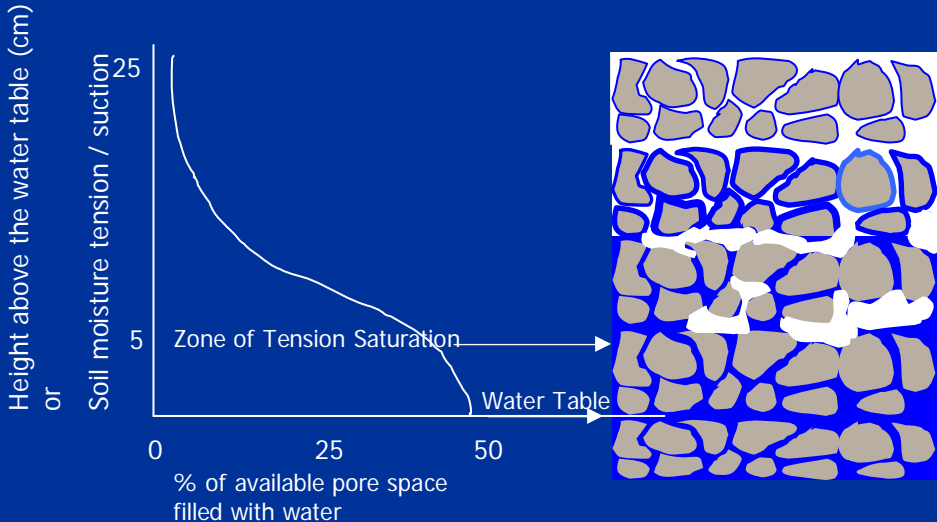




# Capillary Fringe

- "the soil is saturated to the surface at some time during the growing season of the prevalent vegetation." (Paragraph 26.b.3), and
- "the depth to saturated soils will always be nearer to the surface due to the capillary fringe." (Paragraph 49.b.2).
- Estimates of capillary fringe are based on soil texture alone\*

# Hypothetical Capillary Fringe



# Capillary Fringe - Reality

- Thickness of the cap. Fringe depends on:
  - Size of the largest pores
    - Texture, structure, OM
  - Whether water table is rising, falling, or static
  - Whether plants are extracting water from the soil

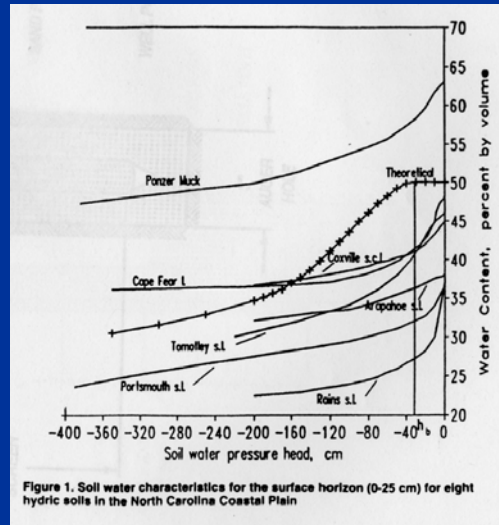


Figure 1. Soil water characteristics for the surface horizon (0-25 cm) for eight hydric soils in the North Carolina Coastal Plain

# Primary Indicators

## Water marks



# Primary Indicators - Drift Lines



# Primary Indicators

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Sediment deposits



# Primary Indicators

## Drainage patterns in wetlands



# Hydrology Field Indicators

## Secondary Indicators

(2 or more required)

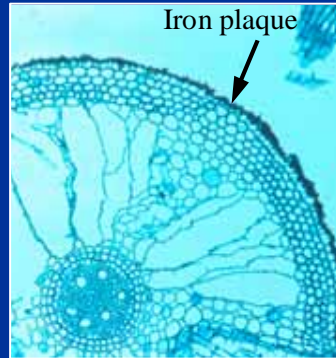
- Oxidized root channels
- Water-stained leaves
- Local soil survey data
- FAC-neutral test\*

\* Not used by New England COE



# Secondary Indicators

## Oxidized root channels (rhizospheres)



# Secondary Indicators

Water-stained leaves



# Secondary Indicators

Local soil survey data



# Secondary Indicators

FAC-neutral test

$$(OBL + FACW) > (FACU + UPL)$$



# Other

- Fe discharge
- Spagnum moss
- Biological
- ???



# Meteorological Considerations

To interpret hydrologic data or field observations, one must consider antecedent precipitation

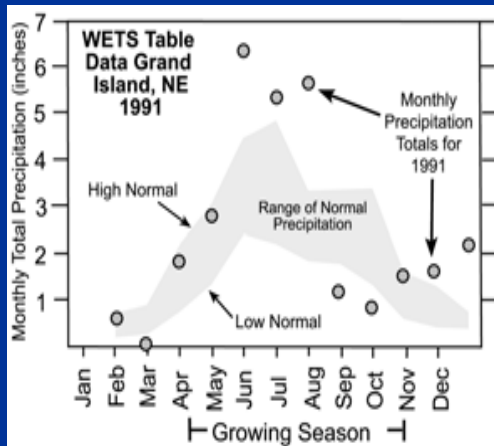
- Did it rain immediately before the site visit?
- Has long-term precipitation been “normal”?

# Evaluating Normal Rainfall

## Grand Island, NE

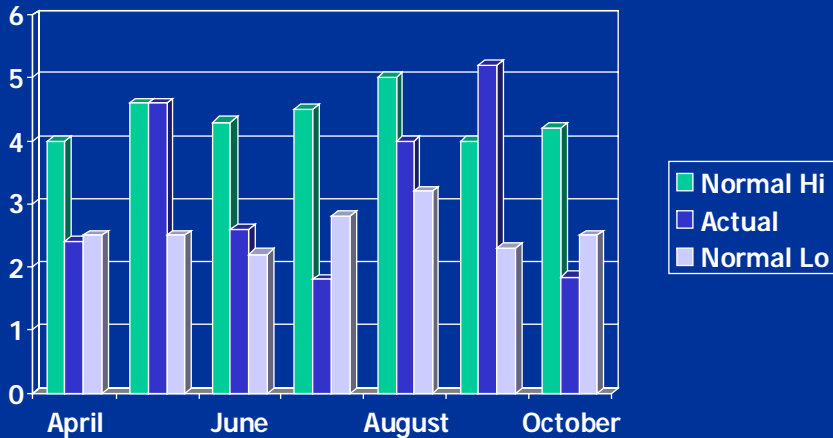
How representative of normal conditions are hydrologic data collected in:

- May 1991?
- August 1991?



# Normal Precip, Keene, NH

## April – October 2003





# Evaluating Normal Rainfall

## WETS tables

- USDA National Water and Climate Center
- Analyze monthly precipitation data from >8,000 National Weather Service stations
- Based on a standard 30 years of rainfall data
- Provide monthly and annual thresholds for:
  - Below normal rainfall (lowest 3 years in 10)
  - Above normal rainfall (highest 3 years in 10)

## EVALUATION OF ANTECEDENT PRECIPITATION FROM 30-DAY ROLLING TOTALS

Prior 30-day Block Site Visit: 4/30/04	Dates of Block (30,60,90 days prior)	Recency Weighting Factor	Block "Normality" above normal, below normal, or normal	Precip. Level weighting factor	Rating Value Product of c. 3 * c. 5
1 <sup>st</sup> 30 days prior	April 04	3	above	3	9
2 <sup>nd</sup> 30 days prior	March 04	2	below	1	2
3 <sup>rd</sup> 30 days prior	Feb. 04	1	below	1	1
Sum of c. 5					12

If sum is 6 – 9, then prior period has been drier than normal. If sum is 10 – 14, then prior period has been normal. If sum is 15 – 18, then prior period has been wetter than normal

# Further Information

- “Accessing and Using Meteorological Data to Evaluate Wetland Hydrology”
- “Guidelines for Conducting and Reporting Hydrologic Assessments of Potential Wetland Sites”
- “Installing Monitoring Wells/Piezometers in Wetlands”
  - <http://www.wes.army.mil/el/wrap/techtran.html#reports>

# Data Sources on the Web

- WETS tables
  - <http://www.wcc.nrcs.usda.gov/water/wetlands.html>
- USGS Real-Time Water Data
  - <http://water.usgs.gov/realtime.html>
- USGS Historical Stream Flow Data
  - <http://h2o-nwisw.er.usgs.gov/nwis-w/US/>