



THE UNIVERSITY
of NORTH CAROLINA
at CHAPEL HILL

1. **Wetlands and their roll in the landscape**
2. **Wetland identification and delineation**
3. **What are the functions and values of wetlands?**
4. **Federal wetland policy**

Introduction to Wetlands

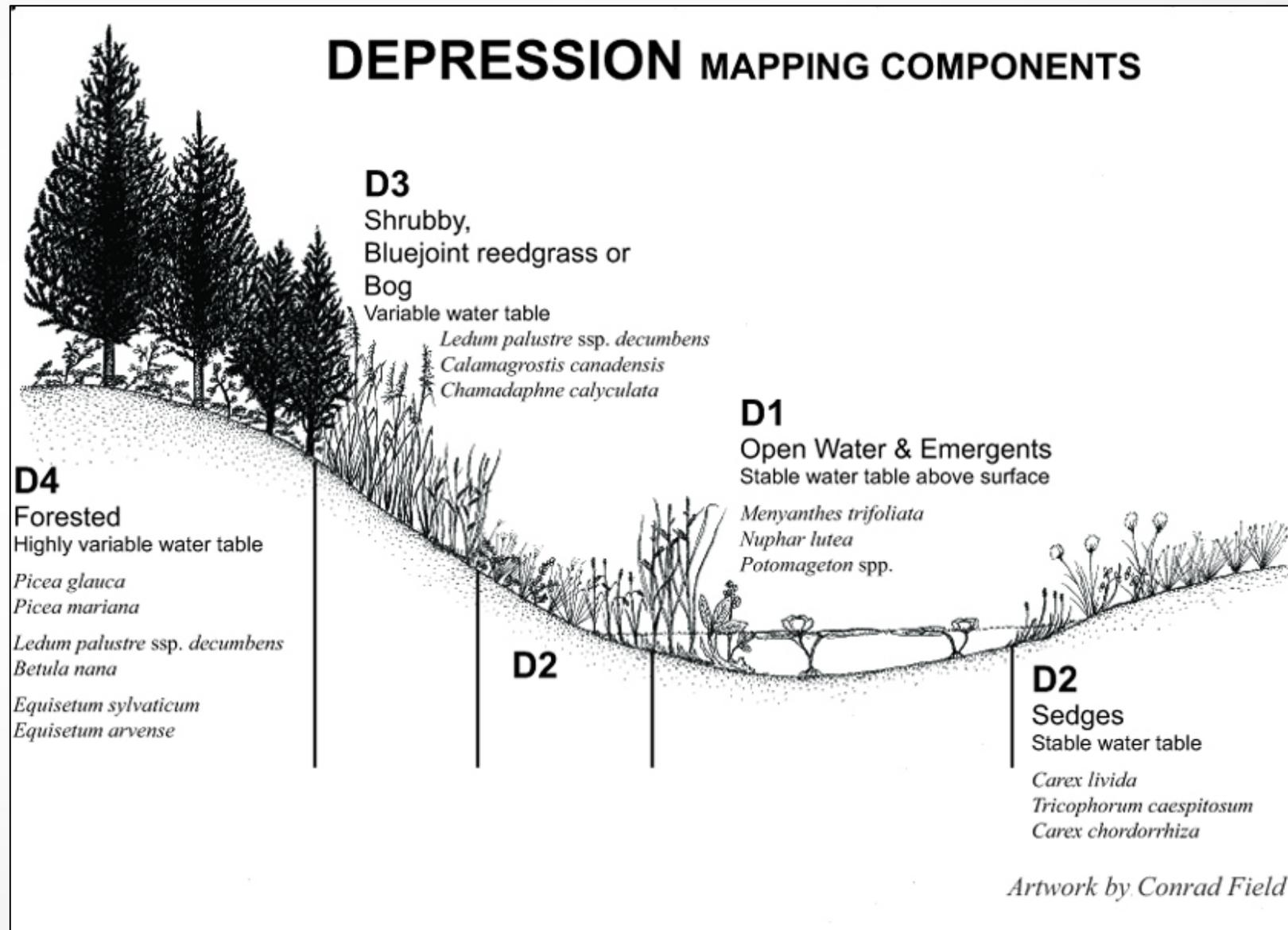
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Wuhan 2017

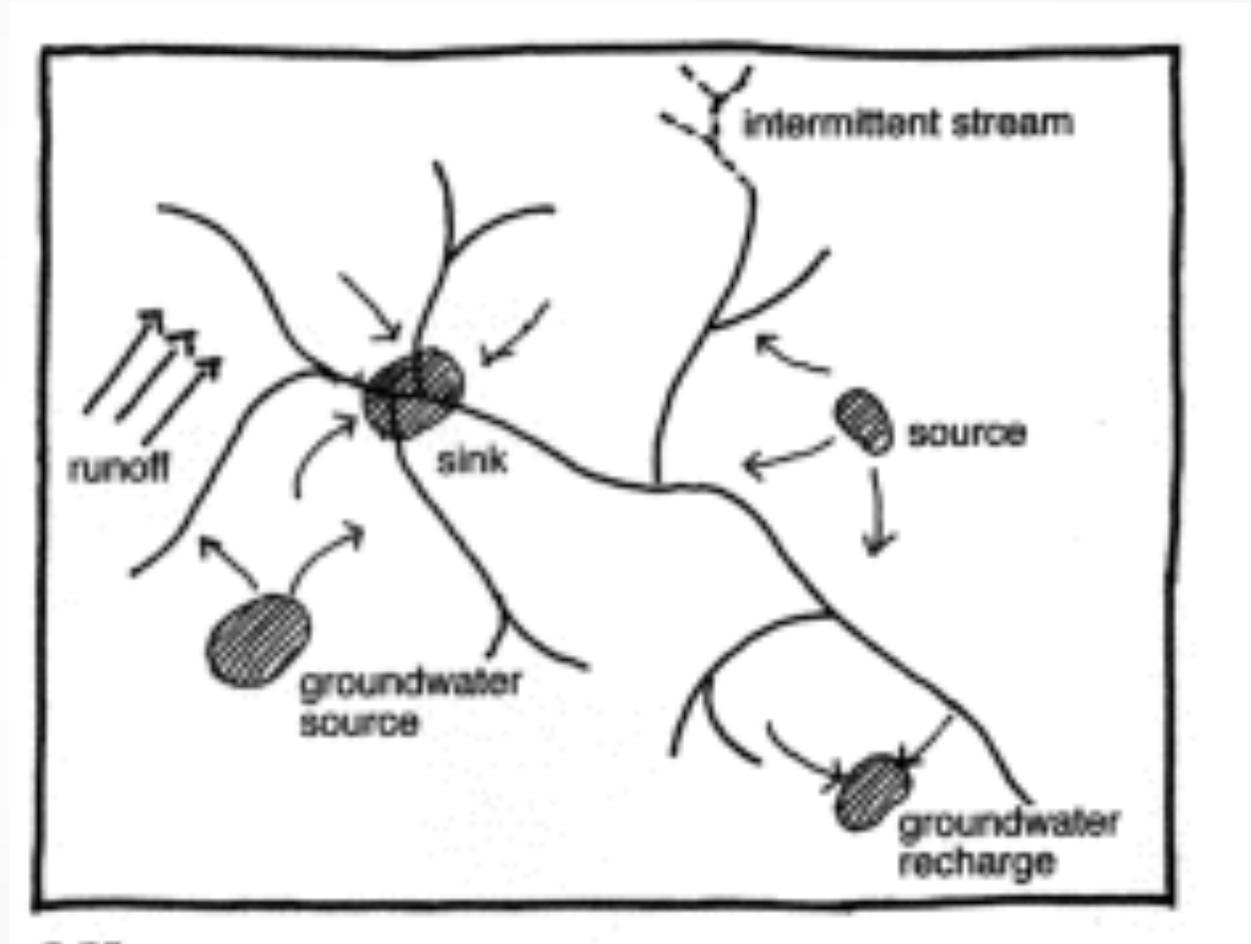
Wetlands naturally form by:

1) surface water collection (overland flow and depressional areas); or 2) groundwater discharge

Interdependency of Wetland with Surrounding Landscape



“Sources” and “Sinks” in water movement patterns



Scientific Criteria for Wetland Identification and Delineation

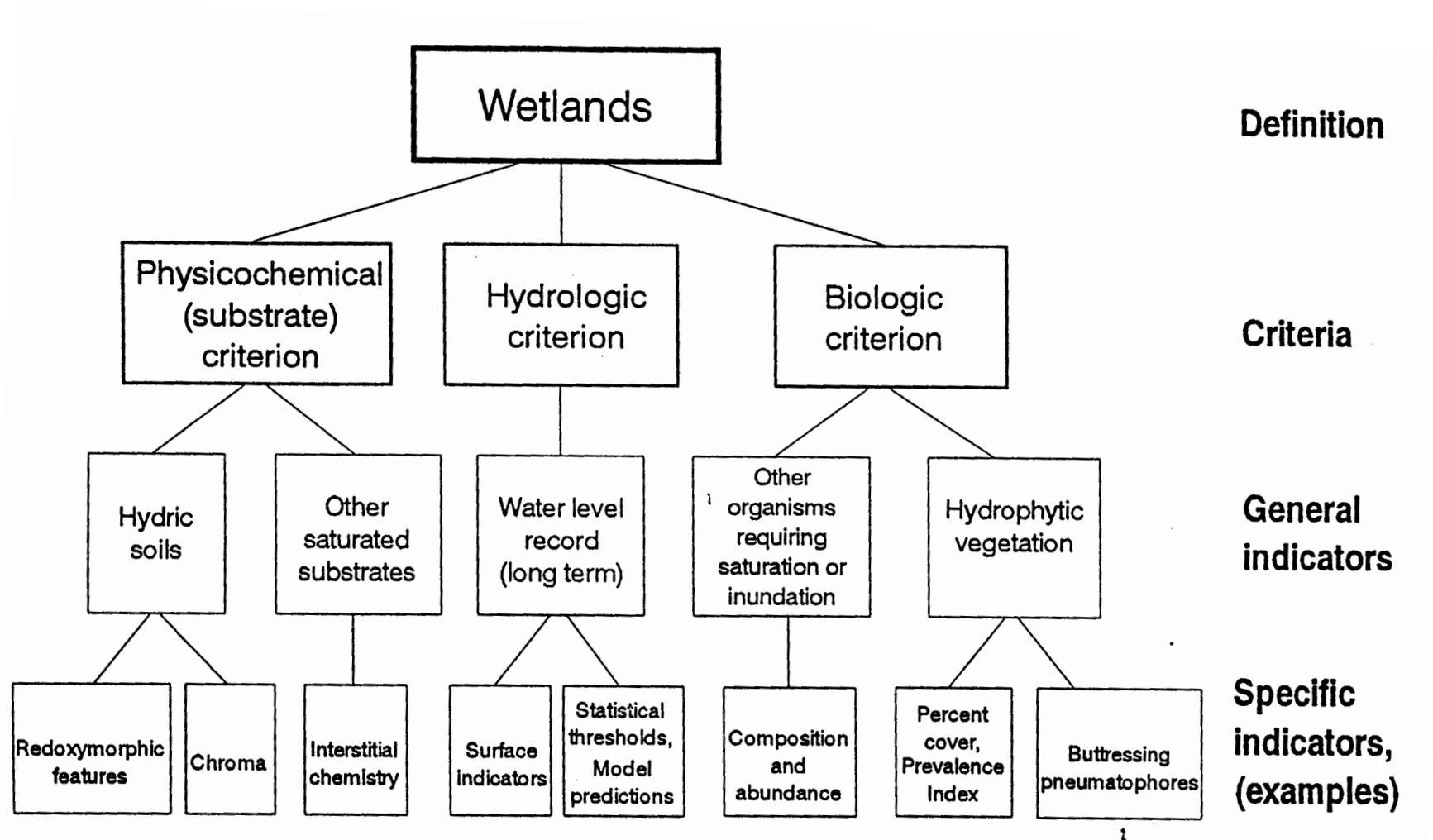


FIGURE 3.1 Diagram of relationships between the reference definition, criteria, general indicators, and specific indicators for wetlands.

Wetland Hydrology: Main Factors

1. Duration of wetness
 - When do anaerobic conditions (oxygen depletion) set in?
 - 7 days, 15 days, 21 days, or more?
2. Frequency of wetness
 - Relative wetness given climatic conditions
 - 35 days once of three years in arid locations (Australia)
 - 15 days every other year in U.S. (east of Mississippi River)
3. Depth of saturation
 - About 6 inches to 2 ft depending on plant type
4. Timing or seasonality of wetness
 - Growing versus non-growing season
 - Definition: “Wetland hydrology should be considered to be saturation within 1 foot of soil surface for 14 days or more during growing season every other year” (National Research Council 1995)



Soils

- Long-term saturation of soil creates anaerobic conditions
- Prevents aerobic decomposition of dead plant material
- Accumulation of dark organic materials at soil surface
 - peat
 - muck



Slow burn peat fire



Soils

- Mineral soils that are poorly drained



Vegetation

- Floating mats
 - Duck weed
 - Pond lily
 - Surface algae



Vegetation: Shrub

Peat moss



Vegetation

- Bald cypress, red maples
 - Buttressed trees for stability
 - Shallow root systems to capture limited periods of oxygen during dry spells
 - Adventitious root systems (die and re-grow quickly)
 - Fast growing seedlings



Vegetation: Emergents

Reeds



Rushes



Sedges



Cord grass



Source: Richardson (1994)

Wetland Functions

1. Hydrologic flux and storage
 - a. Aquifer (ground water) recharge to wetland and/or discharge from the ecosystem
 - b. Water storage reservoir and regulator
 - c. Regional stream hydrology (discharge and recharge)
 - d. Regional climate control (evapotranspiration export = large scale atmospheric losses of H₂O)
2. Biological productivity
 - a. Net primary productivity
 - b. Carbon storage
 - c. Carbon fixation
 - d. Secondary productivity
3. Biogeochemical cycling and storage
 - a. Nutrient source or sink on the landscape
 - b. C, N, S, P, etc. transformations (oxidation/reduction reactions)
 - c. Denitrification
 - d. Sediment and organic matter reservoir
4. Decomposition
 - a. Carbon release (global climate impacts)
 - b. Detritus output for aquatic organisms (downstream energy source)
 - c. Mineralization and release of N, S, C, etc.
5. Community/wildlife habitat
 - a. Habitat for species (unique and endangered)
 - b. Habitat for algae, bacteria, fungi, fish, shellfish, wildlife, and wetland plants
 - c. Biodiversity



Wetland Values Arise From Functions

Functions

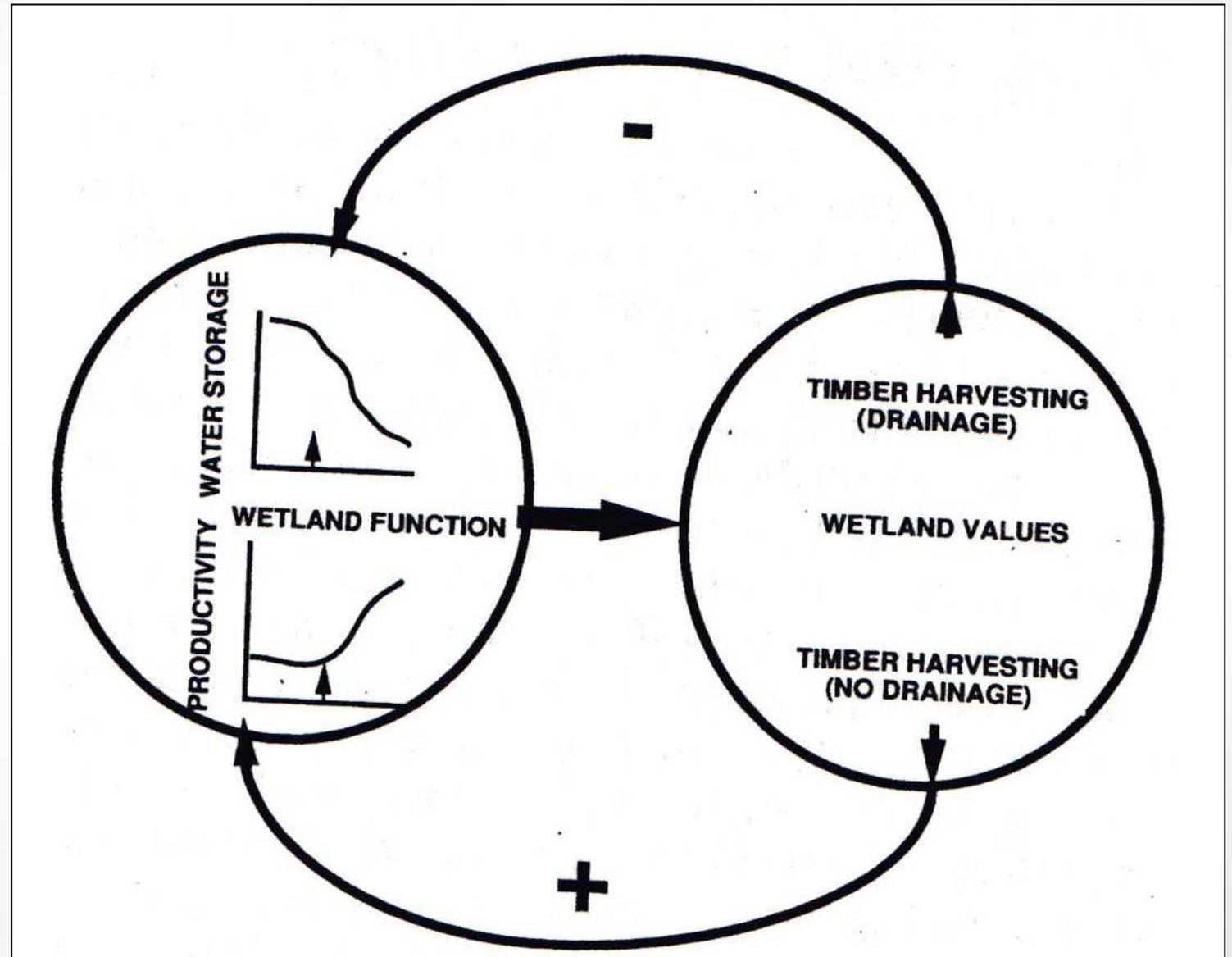
1. Hydrologic flux and storage
2. Biological productivity
3. Biogeochemical cycling and storage
4. Decomposition
5. Wildlife habitat

Values (rank order of function #)

1. Flood control & storage (1, 2)
2. Waste water treatment (3, 2)
3. Nutrient removal from runoff (3, 2)
4. Open space (1, 2, 5)
5. Medical (5, 4)
6. Education & research (1-5)
7. Food production (2, 5)



Relationship Between Wetland Functions and Values (Richardson 1994)



Four Core Principles of Wetland Management (Richardson 1994)

- All wetlands are not of equal function or equal value on the landscape.
- A restored or newly constructed wetland may or may not be equal to a natural wetland in terms of ecological function or value.
- Wetland ecosystem functions and values are coupled to other systems on the landscape.
- Wetlands often provide functions and values beyond their boundaries and far from adjacent ecosystems.



