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United States Department of Agriculture

Soil Science Division

Natural Resources Conservation Service

Source Waters, Soils, and Wetlands

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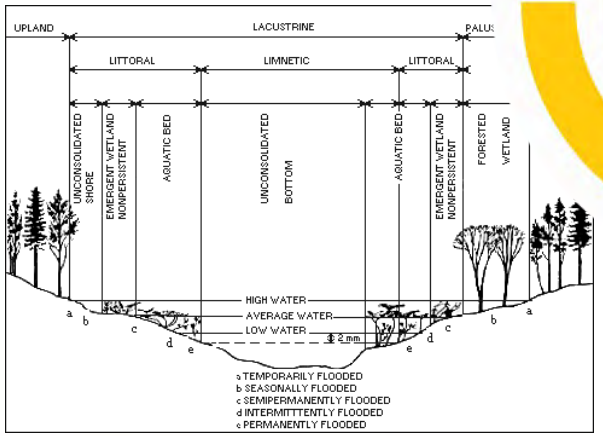
1. How Source Waters and Soils Define the Character of a Wetland
2. Introduction to HGM
   - What it is
   - What it can tell you
   - How it can be used
   - What planners should know and when they should ask for help



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Defining a “Wetland”

1. Water is present at the soil surface or within the rooting zone;
2. Soil conditions are unique and differ from “uplands”;
3. Hydrophytic vegetation present, flooding-intolerant biota absent

Mitsch, WJ. and J.G. Gosselink. 2007. Wetlands, fourth ed. John Wiley & Sons, Inc. New York, NY.

What causes water to be present at the soil surface or within the rooting zone?

1. **Depth to water table**
2. **Soil textures/particle size**
3. **Restrictive layers**
   - Fragipans
   - Bedrock
   - Abrupt textural changes
4. **Frequency and intensity of water inputs**

→These things affect rate of infiltration, available water holding capacity, residence time, flooding frequency, and ponding depth and duration.

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Soil Properties Indicative of Wetlands

- Color/Chroma
- Presence of redoximorphic features
- Flooding frequency
- Ponding duration
- Shallow depth to water table

→These properties combine to drive anaerobic conditions, soil saturation within the rooting zone, and potential presence of water at the surface of the soil for periods of time throughout the growing season.

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Wetland and Riparian Classification Systems and Resources

Cowardin/USFWS (Cowardin et al. 1979)

- USFGDC 2013 revision

HGM (Brinson 1993)

- Regional Guidebooks
- Functional Assessments

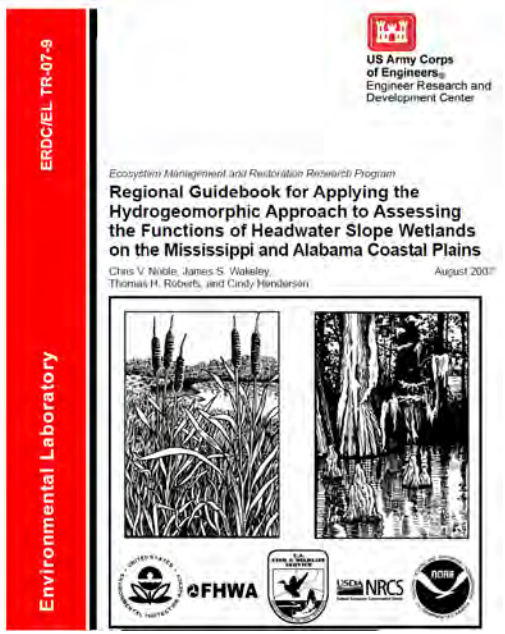
Ecological Site Descriptions (NRCS)

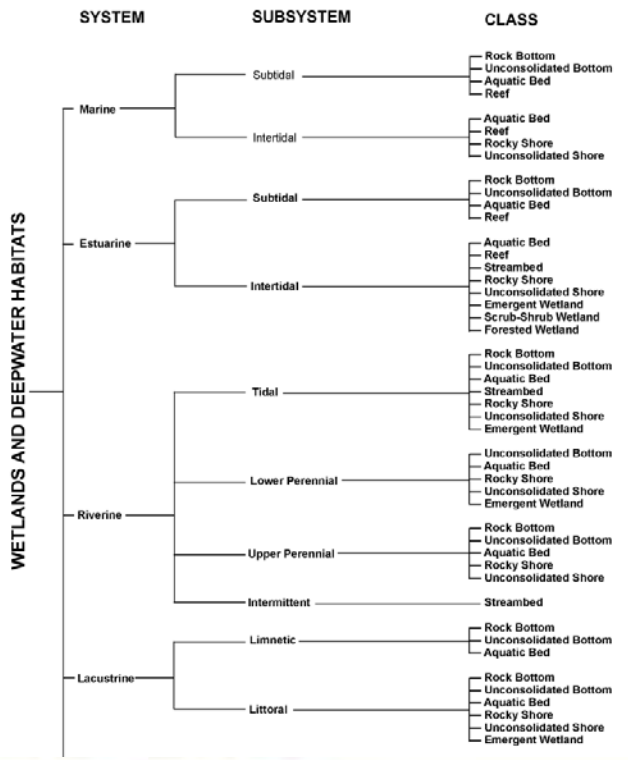
- Web Soil Survey
- Field Office Techncial Guides
- Ecological Site Information System (ESIS)

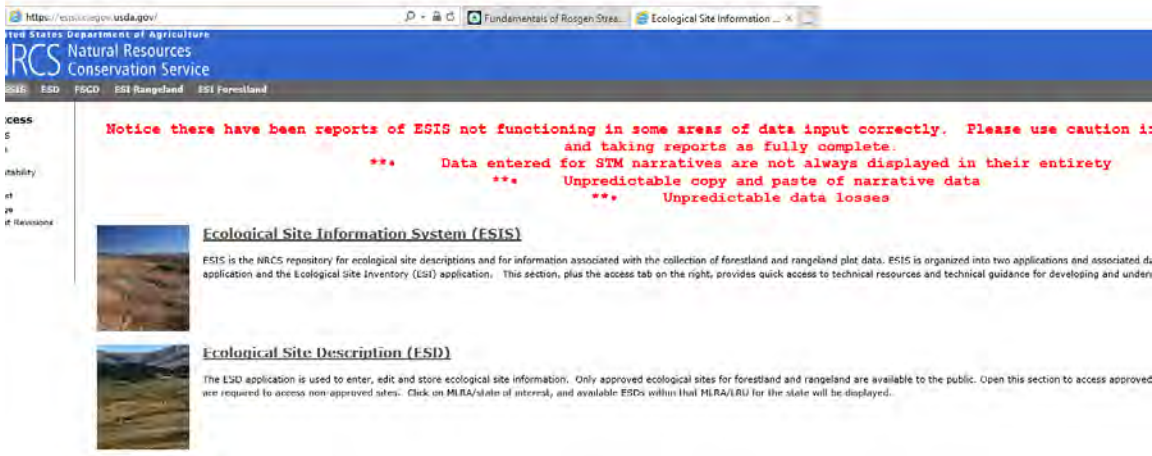
Rosgen Stream Classification (Rosgen 1996)

Other

- NatureServe Ecological Systems (Comer et al. 2003)
- State Agency/Heritage Programs
- Local Publications (Eggers/USACE 1997)

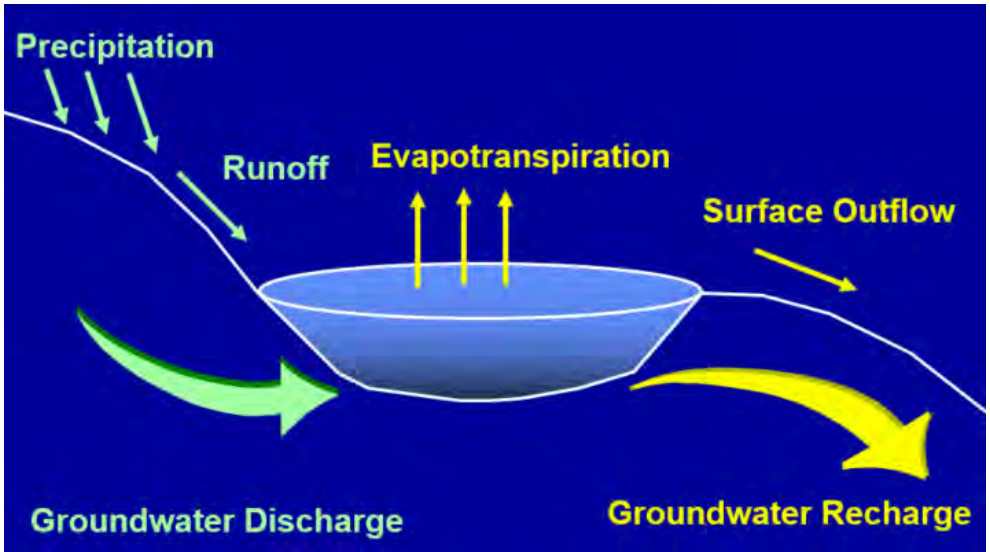






“Hydrogeomorphic”

- **Hydrology - the study of water**
  - flow of water
  - characteristics of flow
  - interaction with the wetland
- **Geomorphology - the study of the earth’s surface and its formation**
  - the contours of the earth’s surface and how that “depression” got there
- **Geomorphic setting**
  - the landform of a wetland (depressional, valley, interfluve)
  - geologic evolution (layering of geologic and soil materials, which affect water flow)
  - topographic position in a landscape (top, middle or bottom of a watershed; stream order)



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Introduction to Hydrogeomorphic (HGM) Classification

Objectives:

- **Use technically sound information and terminology to document hydric soils and potential wetlands**
- **Understand and explain where (and why) hydric soils and wetlands are likely to occur on the landscape**
- **Using your knowledge of landscapes, soil, and hydrology, identify potential sources of water into the wetland**

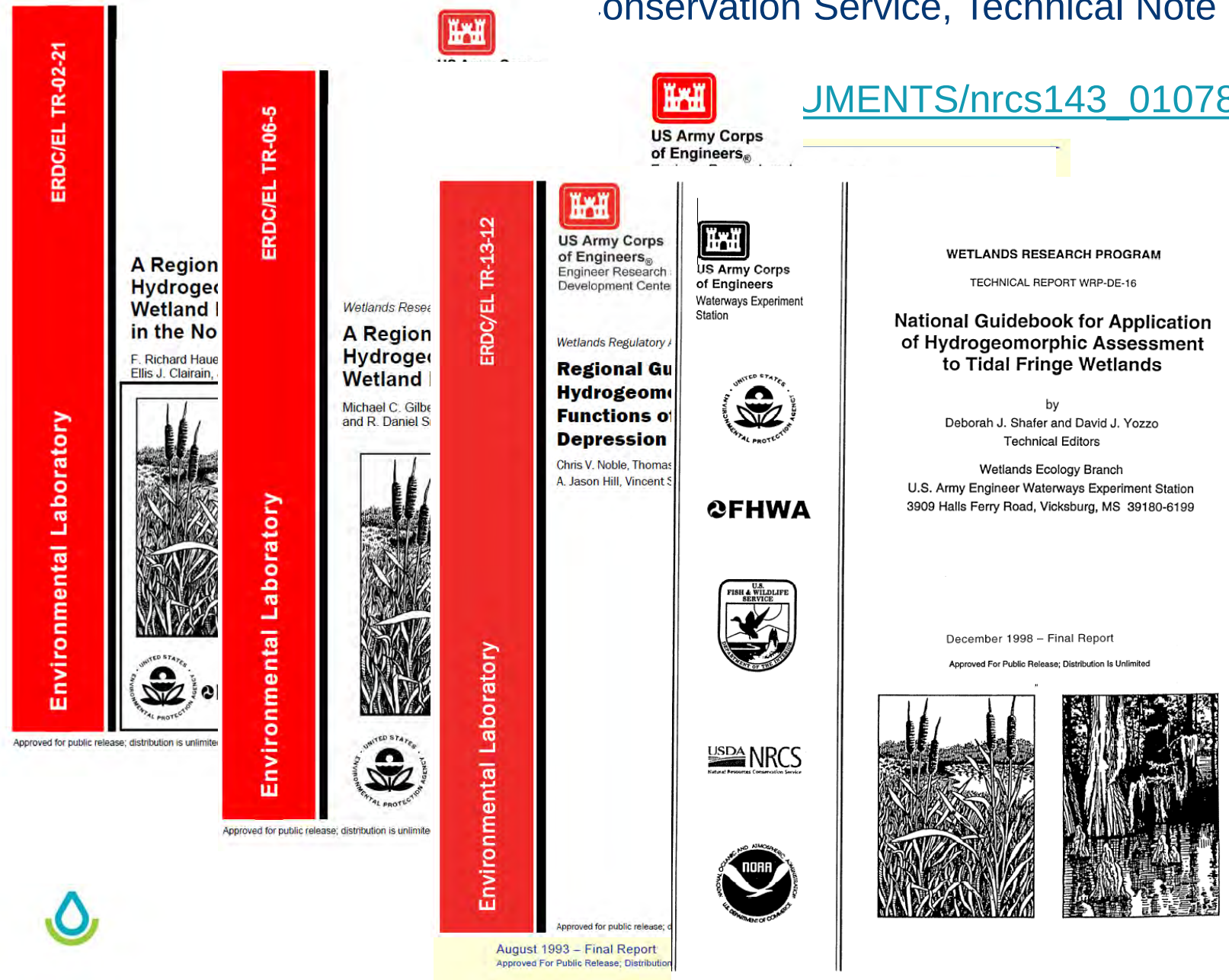
→These things will make you a more informed and effective communicator and conservation planner.

National and Regional Guidebooks:

https://wetlands.el.erdc.dren.mil/guidebooks.cfm

onservation Service, Technical Note No. 190–8–

JMENTS/nrcs143_010784.pdf



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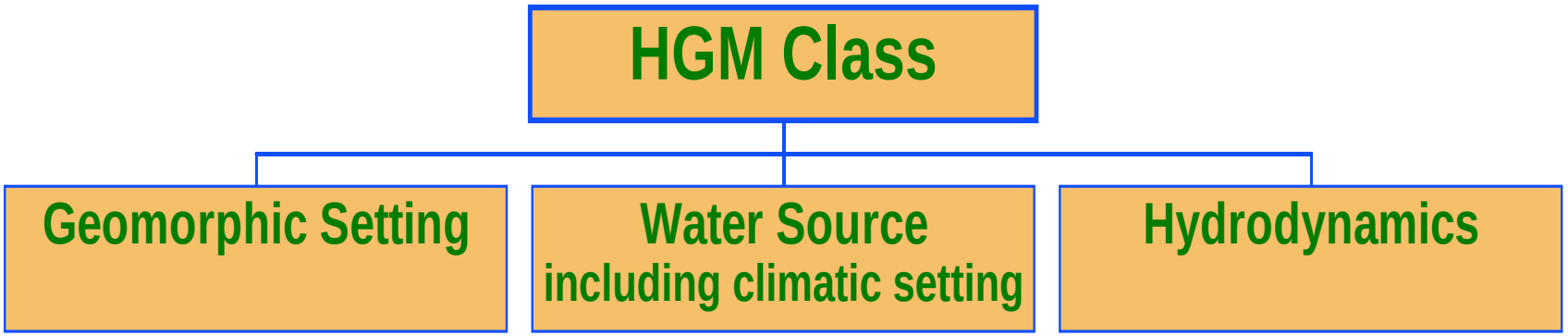
Hydrogeomorphic Classification is Based on Three Factors



The Seven HGM Classes

- RIVERINE
- SLOPE
- MINERAL SOIL FLAT
- ORGANIC SOIL FLAT
- ESTUARINE FRINGE
- LACUSTRINE FRINGE
- DEPRESSION

Depressional: Carolina Bay

Estuarine Fringe: Oregon

Slope: Puerto Rico

Mineral Flats: Indiana Flatwoods

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Slide courtesy of Richard Weber

RIVERINE

Occur in floodplains/riparian corridors in association with stream channels (Cowardin palustrine wetlands on floodplains)

Landscape Position
- Floodplains

Dominant Water Source
- Surface Flooding/Overbank Flow
- Groundwater Inputs/Lateral hydraulic connection with stream

Hydrodynamics
- Horizontal,
- Bi-Directional

SLOPE

Topographic and Stratigraphic

Landscape Position

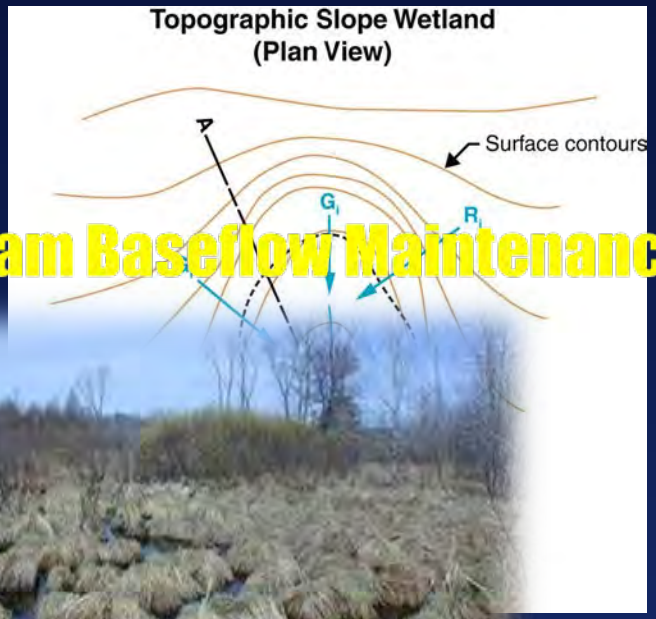
- Concave Topographic (Headwaters)
- Slopes above restrictive layers

Dominant Water Source

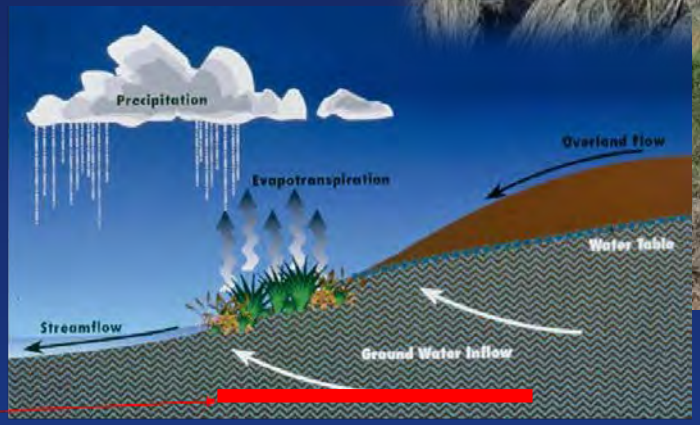
- Groundwater

Hydrodynamics

- Horizontal,
- Bi-Directional



Downstream Baseflow Maintenance



Impermeable strata

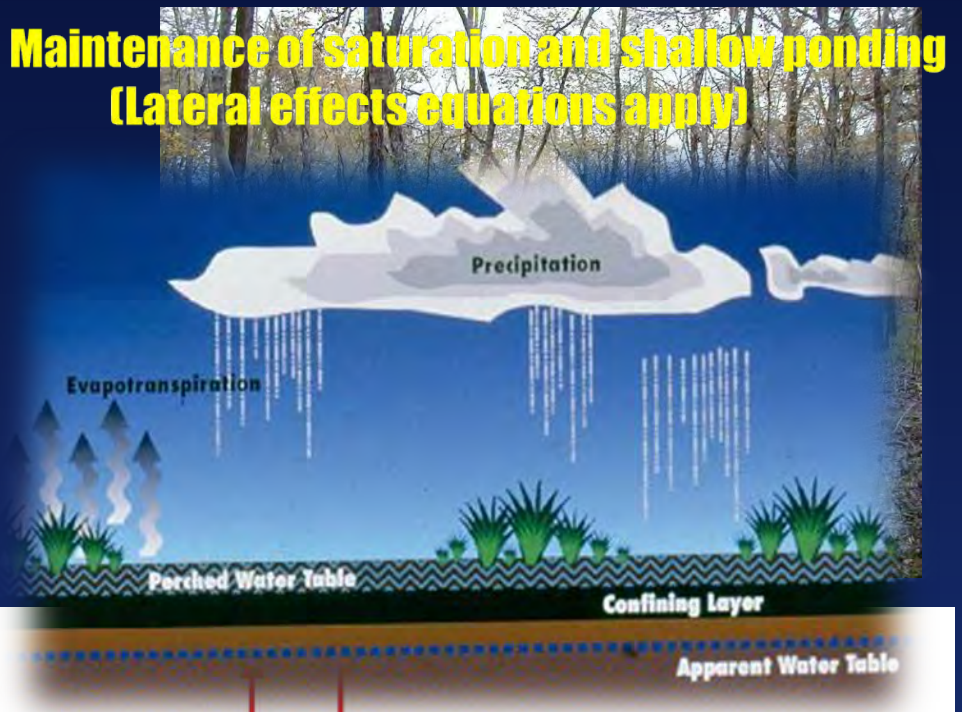
MINERAL SOIL FLAT

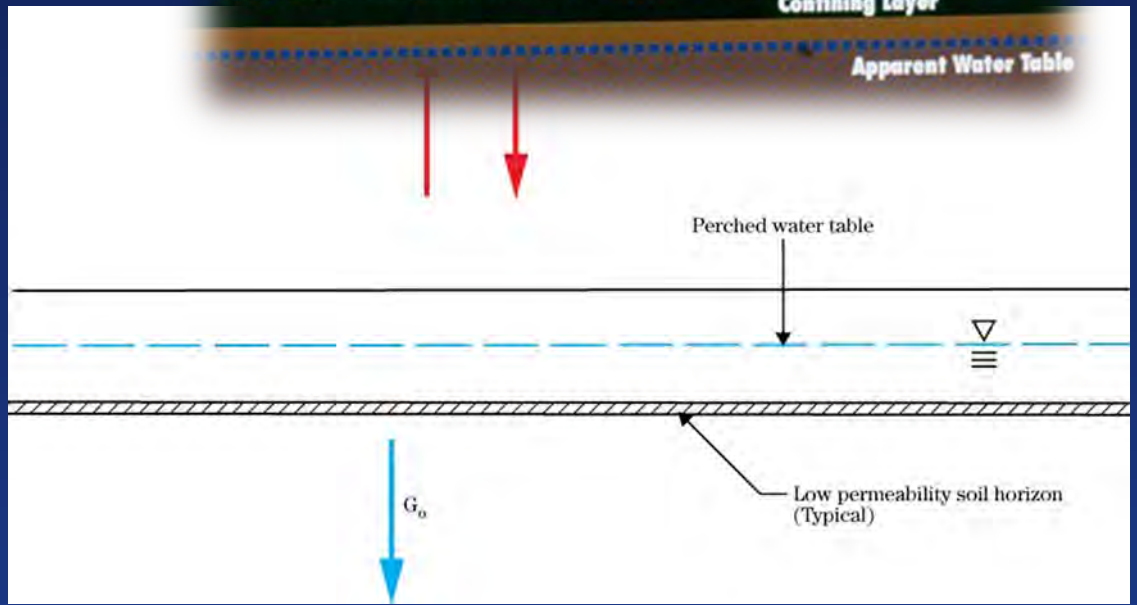
Landscape Position
- Broad interfluves*
- Extensive relic lakes
- Large historic floodplain terraces

Dominant Water Source
- Direct Precipitation

Hydrodynamics
- Vertical

*uppermost level area of a hill





ORGANIC SOIL FLAT

Extensive Peatlands, Ombotrophic Bogs

Landscape Position
- Flat interfluves
- Depressions with enough peat to be flat

Dominant Water Source
- Precipitation

Hydrodynamics
- Vertical

* Category 1 Wetlands, because they are impossible to recreate through compensatory mitigation.

ESTUARINE FRINGE

Under the influence of sea level

Landscape Position

- Coasts
- Estuaries

Dominant Water Source

- Tides

Hydrodynamics

- Bidirectional

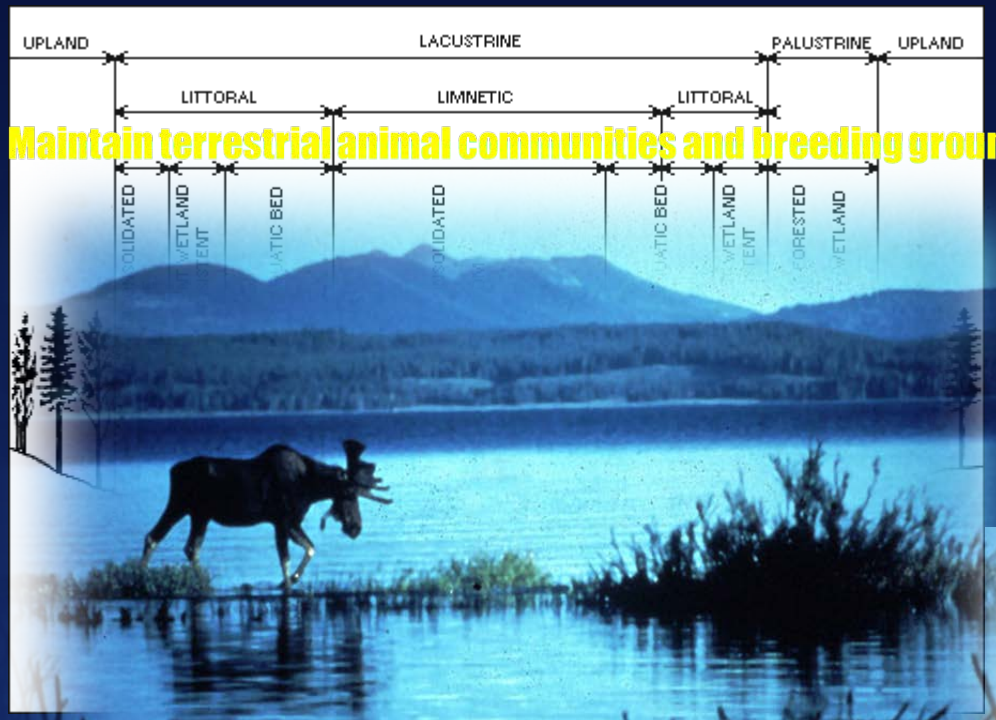
* Category 1 wetlands because they are relatively rare/limited and provide unique natural resources that are considered to be valuable to society.

LACUSTRINE FRINGE

Landscape Position
- Adjacent to lakes

Dominant Water Source
- Lake fluctuations

Hydrodynamics
- Bidirectional
- Horizontal



DEPRESSIONAL

Landscape Position
- Topographic depressions

Dominant Water Source
- Surface Runoff
- Groundwater
- Precipitation

Hydrodynamics
- Vertical (seasonal)
- May have any combination of inlets and outlets, or lack them entirely

Photo courtesy of Richard Weber

DEPRESSIONAL

Recharge

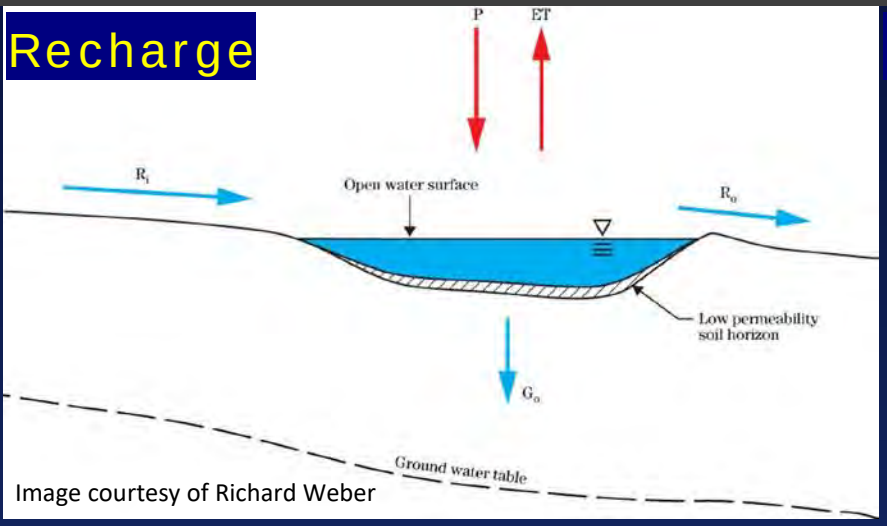
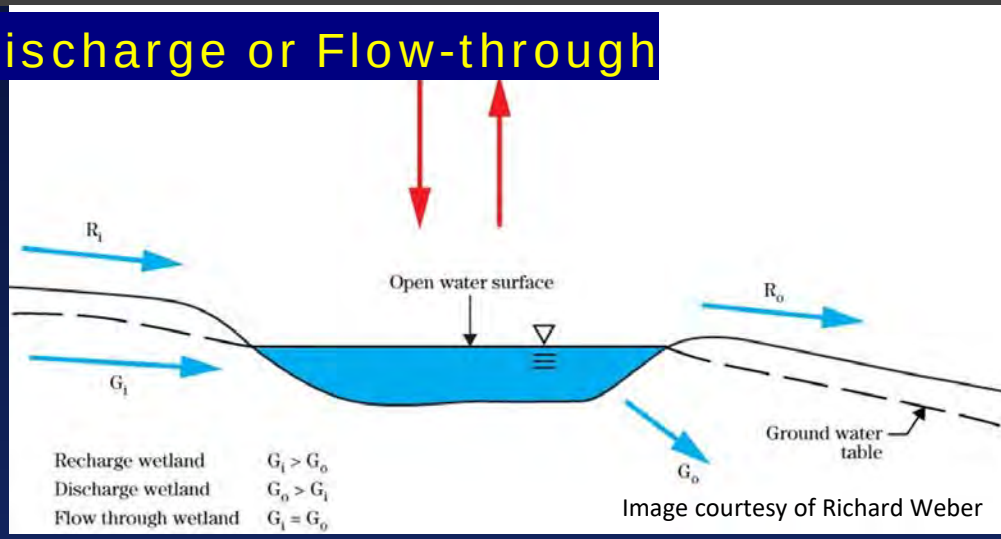


Image courtesy of Richard Weber

Discharge or Flow-through



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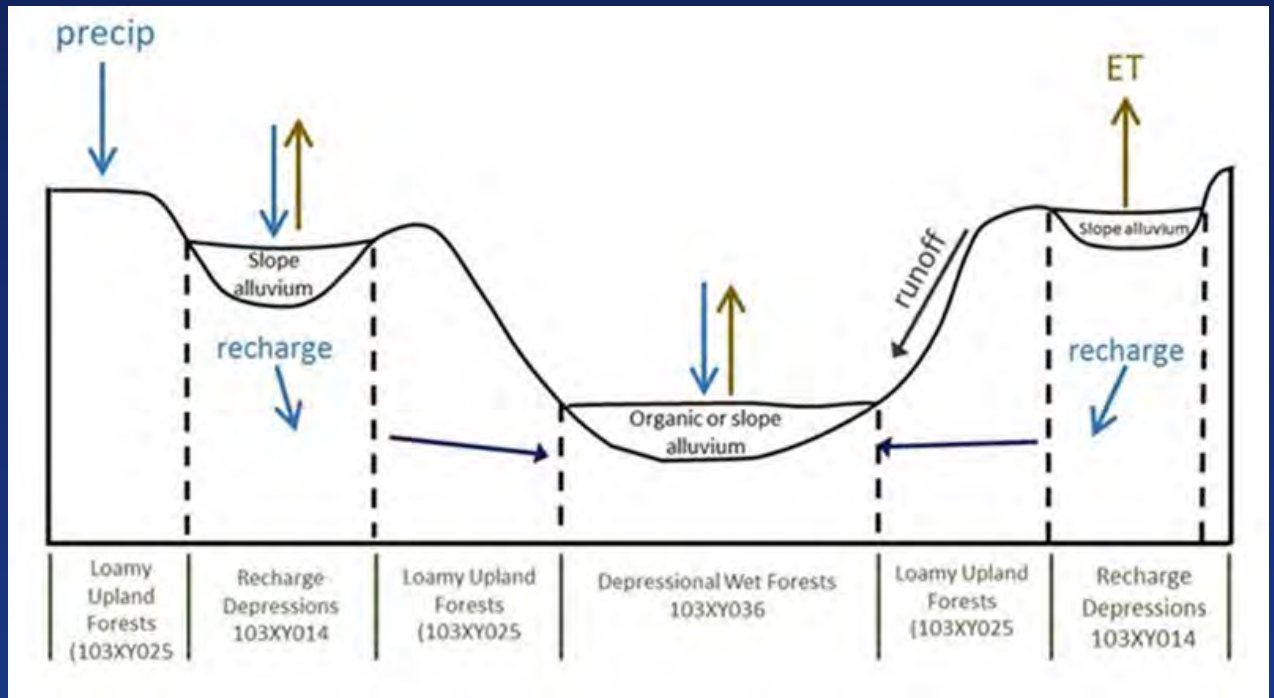

HGM Subclasses

- **Provides more detail into the characteristics of the wetland and primary hydrologic influence**
- **Based on morphology, water source, and/or hydrodynamics**
- **Can be single-phase or multi-phase**
- **Terms can include:**

  --alluvial plain, basin, lowland, arroyo, barrier flat, bog, fen, oxbow, slough, terrace, pothole, interdune, recharge, discharge, flow-through, etc.

Examples:

“DEPRESSIONAL—recharge”

“RIVERINE—oxbow”

“MINERAL FLAT—alluvial plain”

“SLOPE—fen”

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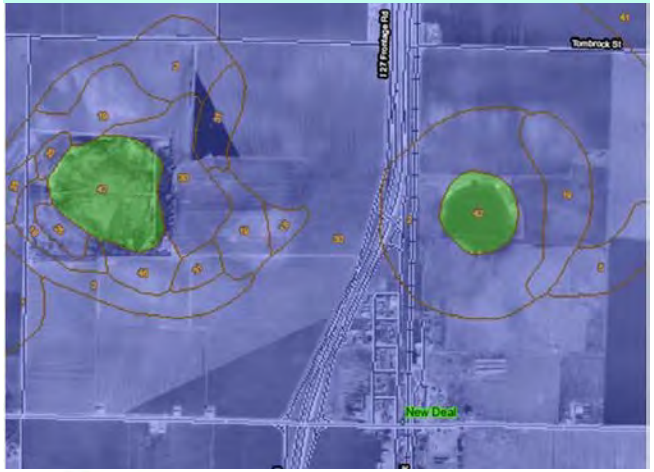
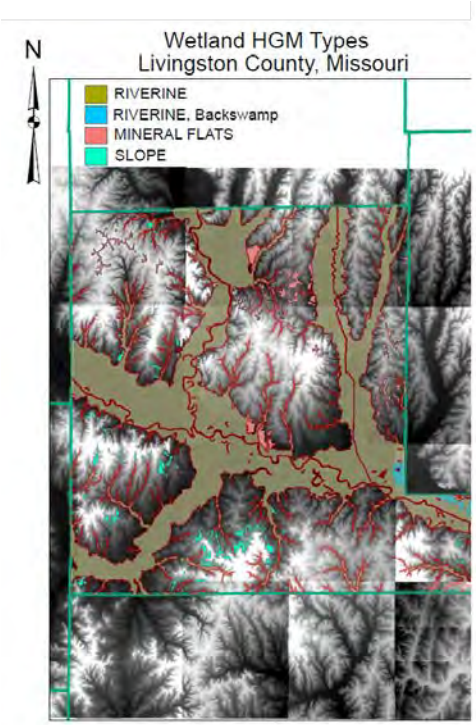
How HGM Can Be Used

- **Ecological Site Descriptions**
- **HGM Models/Functional Assessments/Minimal Effects**
- **Wildlife Habitat Restoration (Initiatives)**
- **Conservation Planning**
- **NEPA Evaluations**
- **Program Allocation and Prioritization**

Texas Playas – **DEPRESSIONAL**, Recharge

Soil: Randall Clay





		Floodplain Soils	
compname	hydricrating	geomdesc	taxsubgrp
Tice	No	flood-plain steps on river valleys	Fluvaquentic Hapludolls
Nodaway	No	flood-plain steps, river valleys	Mollic Udifluvents
Zook	Yes	flood-plain steps, river valleys	Cumulic Vertic Endoaquolls
Portage	Yes	flood plains, river valleys	Vertic Endoaquolls
Wabash	Yes	flood-plain steps, river valleys	Cumulic Vertic Endoaquolls
Sandover	No	flood plains on river valleys	Aquic Udifluvents
Carlow	Yes	flood plains on river valleys	Vertic Endoaquolls
Tice	No	flood plains on river valleys	Fluvaquentic Hapludolls
Wabash	Yes	flood plains, river valleys	Cumulic Vertic Endoaquolls
Zook	Yes	flood plains on river valleys	Cumulic Vertic Endoaquolls
Vesser	Yes	flood-plain steps on river valleys	Argiaquic Argialbolls
Colo	Yes	flood-plain steps, river valleys	Cumulic Endoaquolls

HGM Challenges

Common Challenges, and When to Seek Expert Advice:

1. **Difficulty differentiating between wetland type(s)**
   - "tweeners", gradation, lack of information

2. **Identification of Subclasses for site-level planning;**
3. **Development of functional assessment models at the local level;**
4. **Evaluation of models for minimal effects determinations;**
5. **Whenever you are *not* sure about what you are doing!**

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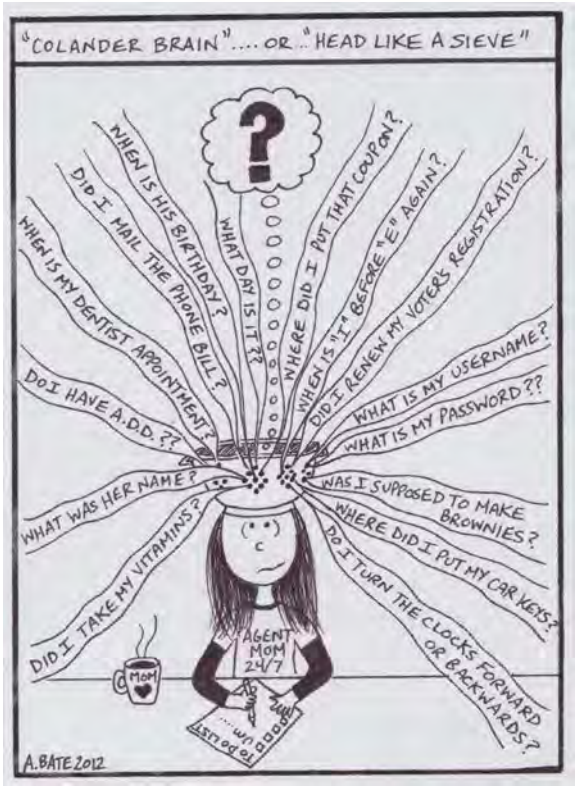
Summary

What Planners Should Understand:

1. What landforms and landscape positions are, and how they affect wetland type;
2. Soil properties that are characteristic of wetlands;
3. Potential sources of water for wetlands;
4. Functions, Values, and Ecosystem services that are unique to wetlands;
5. Differences between wetland types and their functions;
6. How to obtain data needed to identify wetland type(s)



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