

Wetland Classification as per Cowardin et al. 1979

PSS01-e0tg

Ω

PEM01-f0tg

PAB03-h0tg

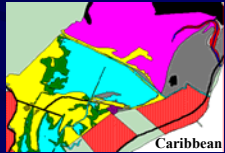


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Why Classify Wetlands?

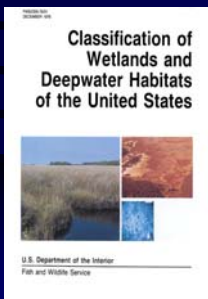


- 1) Delineate their edges
- 2) Estimate their area
 - Boundary of development
- 3) To create maps
 - Management, Excavation, Mitigation



Classification of Wetland and Deepwater Habitats of the United States

<http://www.npwrc.usgs.gov/resource/1998/classwet/classwet.htm>



FWS/OBS-79/31
December 1979

Lewis Cowardin (USFWS)
Virginia Carter (USGS)
Francis Golet (URI)
Edward LaRoe (NOAA)

Biological Classification System

- Wetlands
- Deepwater Habitats

Jurisdictional → USACE 1987 Manual

Boundary Between Wetland and Deepwater Systems

Non-tidal: Emergent Plants!
 >2 m (6.6 ft) in Depth
 (low water level—fall)
 Permanently flooded rivers and lakes



Tidal: Extreme low water level (spring tides)



Permanently flooded brackish marshes or marine areas

The Classification System

Hierarchical Structure

Systems (5), Subsystems (8), Classes (11), Subclasses (28), Dominance Type, Modifiers (3)

Marine



Estuarine



Riverine



Lacustrine

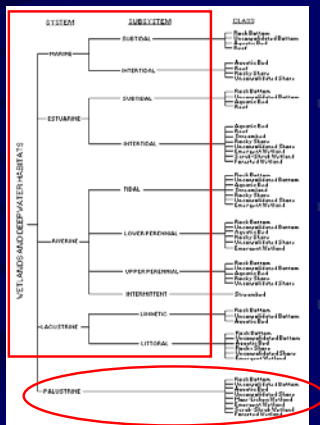


Palustrine



- Hydrologic
- Geomorphic
- Chemical
- Biological

Hierarchical Structure



Palustrine System

All freshwater wetlands dominated (>30% coverage) by trees, shrubs, **persistent** emergents, or emergent mosses and lichens

•Non-tidal or tidal

Also, all wetlands lacking above vegetation (or dominated by **non-persistent** emergents) having all these 4 characteristics:

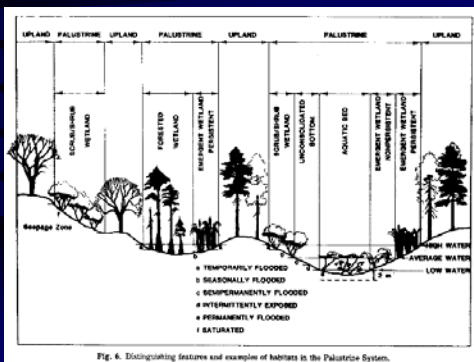
- 1) <8 ha in size
 - 2) No active wave formed shoreline
 - 3) Depth <2 m
 - 4) Salinity <0.5ppt
- No subsystem!!*

Palustrine System

No subsystems!!



Palustrine Illustration



Classes For Palustrine System

Describe the *general appearance* of the wetland in terms of either the dominant **vegetation** or **substrate** composition

If Horizontal Vegetative Cover (HVC) is **>30%**:

Class is distinguished based on the **uppermost** layer of vegetation (i.e., tallest) with HVC >30%
(e.g., 50% HVC of Trees over 60% HVC of Shrubs would be a Forested not Scrub-shrub Wetland)

If Horizontal Vegetative Cover is **<30%**:

Class is distinguished based on the texture and composition of the **substrate**

Classes: How many classes?

HVC >30% (tallest strata)



Subclasses and Dominance Type

Subclass:

Describe *finer* differences in **vegetative** life forms (often related to life history) or **substrate** characteristics (i.e., size [gravel vs. sand] or composition [sand vs. organic])

Dominance Type:

The taxonomic category subordinate to subclass.

Use
50/20
Rule

- Dominant Plant Species *(if class is vegetation)*
- Dominant Animal Species *(if class is substrate)*

Subclasses and Dominance Type

Sampling Methods

FWF 410



Types of Palustrine Classes, Subclasses, and Dominance Types

1) Rock Bottom:

• >75% HC of stones, boulders, or bedrock

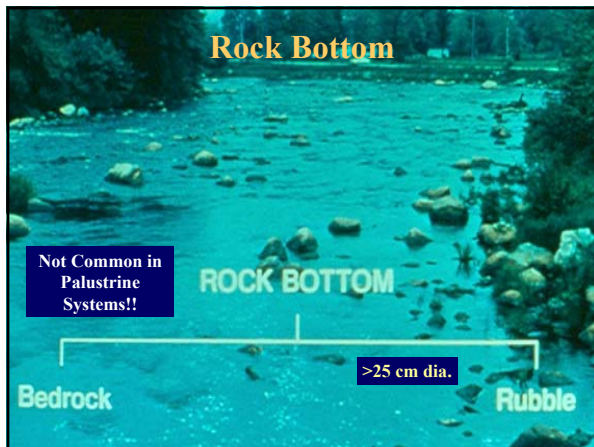
• <30% HVC

Usually high-energy wetlands with well-aerated water.

A) Bedrock: >75% bedrock substrate

B) Rubble: <75% bedrock; >75% bedrock+boulders+stones

Dominance Types: *Ephemera*, *Procambarus*, *Spongilla*, and *Lymnaea* (pond snail)



Types of Palustrine Classes, Subclasses, and Dominance Types

2) Unconsolidated Bottom:

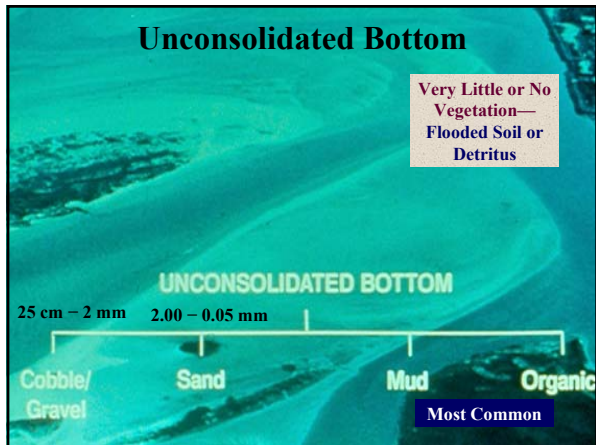
- >25% HC of soil particles smaller than stones
- <30% HVC

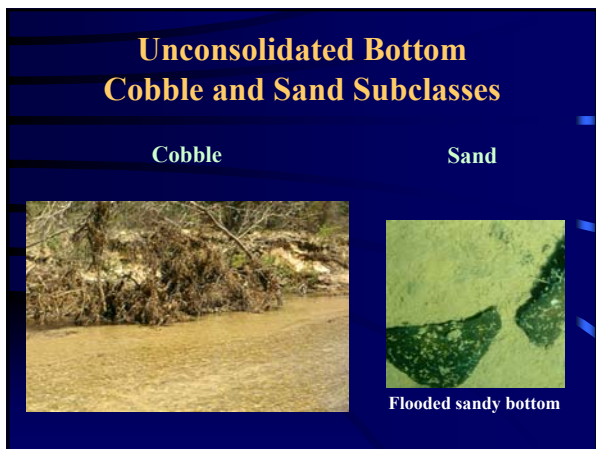
Usually low-energy wetlands that are flooded more permanently.

- A) Cobble-gravel: >50% c/g
- B) Sand: >50% sand
- *C) Mud: >50% silt & clay
- *D) Organic: >50% dead or live organic matter

Dominance Types: *Gammarus* (scuds), *Physa* (snail), *Tubifex*, and *Canthocamptus* (copepod)


Depends on V^*





Unconsolidated Bottom Mud and Organic Subclasses


Mud



UCB (mud)

Unconsolidated Shore (mud)

Organic



Submersed Detritus & Benthic Organisms

Types of Palustrine Classes, Subclasses, and Dominance Types

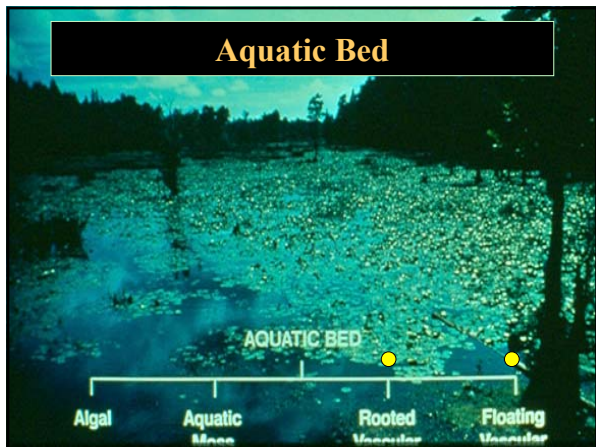
3) Aquatic Bed:
 >30% HVC of plants that grow on or below the surface of the water; <30% HVC "taller" plants.

Usually low-energy habitats that are flooded permanently.

A) Algal: >50% algae *C) Rooted Vascular: >50% RV
 B) Aquatic moss: >50% moss *D) Floating Vascular: >50% FV

Dominance Types: *Chara, Fontinalis, Vallisneria, Ruppia, Nuphar, Lemna, and Eichhornia*

Aquatic Bed

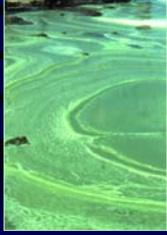


AQUATIC BED

Algal Aquatic Moss Rooted Vascular Floating Vascular

Algal and Aquatic Moss Subclasses

Algae



Spirogyra, Cladophora



Aquatic Moss



Frontinalis spp.

Common Water Moss
(streams)

Rooted and Floating Vascular Subclasses

Rooted



Parrotfeather



Pondweeds

Floating Vascular



Duckweed



Water
Hyacinth

Types of Palustrine Classes, Subclasses, and Dominance Types

4) Unconsolidated Shore:

Shoreline areas with <30% HVC¹ and <75% HC of stone, boulders, or bedrock

Shorelines lacking hydrophytes.

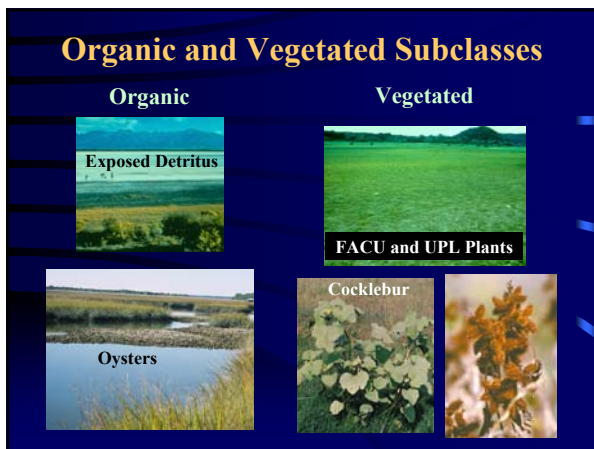
- A) Cobble-gravel: >50% c/g * C) Mud: >50% silt & clay
- B) Sand: >50% sand D) Organic: >50% dead or live organic matter

¹E) Vegetated: >50% non-hydrophytic, pioneer plants that die if flooded.

Dominance Types: Snails, worms, clams, *Xanthium* (cocklebur)







Types of Palustrine Classes, Subclasses, and Dominance Types

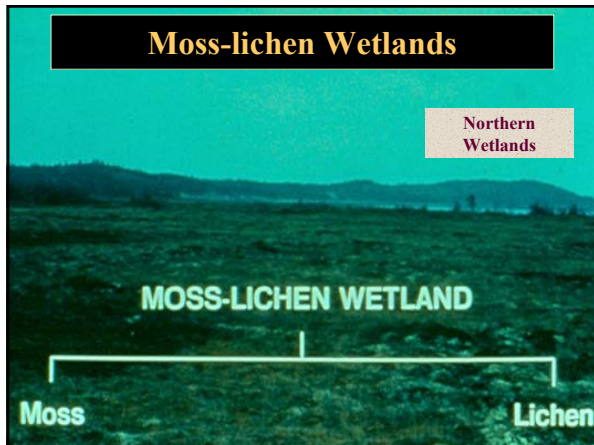
5) Moss-lichen Wetland:

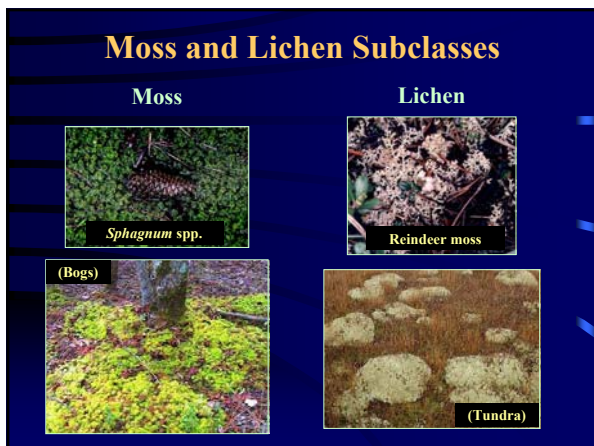
>30% HVC of moss and lichens;
<30% HVC "taller" plants.

Wetlands (bogs and lichen swamps) of northern latitude.

A) Moss: >50% moss B) Lichen: >50% lichen

Dominance Types: Peat moss (*Sphagnum*), liverwort (*Chiloscyphus fragilis*), reindeer moss (*Cladina rangiferina*)





Types of Palustrine Classes, Subclasses, and Dominance Types

6) Emergent Wetland:

>30% HVC of erect, rooted hydrophytes, excluding mosses and lichens; <30% HVC "taller" plants.

Low energy wetlands (marshes, playas, prairie potholes)

A) Persistent: >50% HC of plants that remain standing at least until the beginning of the next growing season.

B) Nonpersistent: >50% HC of plants which fall to the surface of the substrate or water at the end of the growing season.

Dominance Types: **Cattail** (*Typha*), **bulrush** (*Scirpus*), **wild millet** (*Echinochloa*), **wild rice** (*Zizania*), **Panicums**

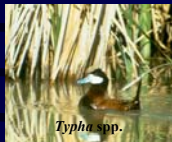


Emergent Wetlands

Very Common—
Used Extensively
by Waterfowl

Persistent and Non-Persistent Subclasses

Persistent



Non-persistent



Types of Palustrine Classes, Subclasses, and Dominance Types

7) Scrub-shrub Wetland:

>30% HVC of shrubs (<6m [20 ft.] in height);
<30% HVC of trees

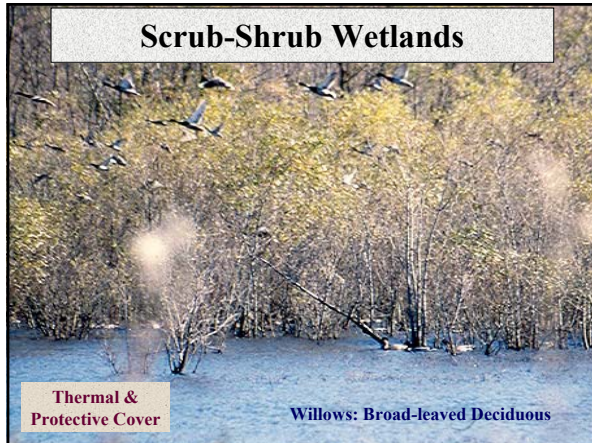
Low energy wooded wetlands (shrub swamps, pocosin)

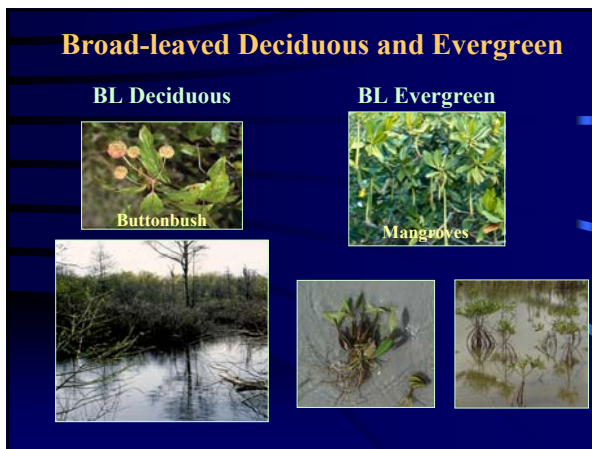
*A) Broad-leaved Deciduous: >50% BLD shrubs *C) Needle-leaved Deciduous: >50% NLD shrubs

B) Broad-leaved Evergreen: >50% BLE shrubs D) Needle-leaved Evergreen: >50% NLE shrubs

E) Dead: >50% dead shrubs

Dominance Types: *Salix*, mangrove, tamarack, black spruce





Needle-leaved Deciduous and Evergreen

NL Deciduous



NL Evergreen

Balsam
Fir



White
Cedar

Tamarack Bogs



Black Spruce Bog



Types of Palustrine Classes, Subclasses, and Dominance Types

8) Forested Wetland:

Note: Scrub-shrub wetlands
can become forested wetlands

>30% HVC of trees (>6m [20 ft.] in height)

Low energy wooded wetlands (swamps, bottoms, hammocks)

- *A) Broad-leaved Deciduous:
>50% BLD trees
- *C) Needle-leaved Deciduous:
>50% NLD trees
- B) Broad-leaved Evergreen:
>50% BLE trees
- D) Needle-leaved Evergreen:
>50% NLE trees
- E) Dead: >50% dead trees

Dominance Types: Red maple, green ash, overcup oak, mangroves, baldcypress, tamaracks, white cedar



Broad-leaved Deciduous and Evergreen

BL Deciduous



Hardwood Bottomlands

BL Evergreen



Mangrove Forest

Needle-leaved Deciduous and Evergreen

NL Deciduous



Cypress Sloughs

NL Evergreen



Cedar Swamps



Dead Subclass

Scrub-Shrub



Forested



Water Regime Modifiers

(8 Nontidal)

Criteria not as quantitative as USACE zones.

- 1) **Permanently Flooded**
Water covers substrate in all years.
- 2) **Intermittently Exposed**
Water covers substrate in all years, except during drought.
- 3) **Semi-permanently Flooded**
Water covers substrate throughout the growing season in most years.
- 4) **Seasonally Flooded**
Water covers substrate for extended periods, especially early in the growing season, but it is absent by the end of the growing season.

Water Regime Modifiers

(8 Nontidal)

Indirect Indicators
drift & inundation lines, vegetation, etc.

- 5) **Saturated**
Substrate is saturated, but surface water is seldom present.
- 6) **Temporarily Flooded**
Surface water is present for brief periods during the growing season, but water table is far below the surface for most of the year.
- 7) **Intermittently Flooded**
Substrate is usually exposed, but surface water can be present for variable durations but w/o predictable seasonal periodicity.
- 8) **Artificially Flooded**
Hydroperiod is controlled by pumps, water control structures, and/or levees.

Water Chemistry Modifiers

Salinity:

	PPT
1) Hyperhaline	>40
2) Euhaline	30.0-40
3) Mixohaline	0.5-30
*4) Fresh	<0.5

pH:

	pH
1) Acid	<5.5
2) Circumneutral	5.5-7.4
3) Alkaline	>7.4

Soil Modifiers

Soil Core Depth = 40 cm [16 in] COE

1) Mineral: Criteria same as before.

A) Saturated Infrequently:

- <20% dry-weight organic carbon

B) Saturated Frequently/Long Durations:

- <18% dry-weight organic carbon if >60% of mineral portion is clay
- <12% dry-weight organic carbon if no clay
- 12-20% dry-weight organic carbon if 0-59% clay

2) Organic: <0.002 mm dia.

All substrates that have more organic carbon than above percentages.


Special Modifiers

- 1) **Excavated** Excavated basin or channel.
- 2) **Impounded** Structure (dam) prevents outflow.
- 3) **Diked** Structure (levee) prevents inflow.
- 4) **Partly Drained** Water level has been artificially lowered, but hydrophytes and/or hydric soils present.
- 5) **Farmed** Soil is mechanically disturbed, but hydrophytes will reestablish if farming ceases.
- 6) **Artificial** Non-natural substrate.
 e.g., dredge spoil, automobiles, concrete

Alphanumeric Code

(Handout)

PSS01-sf04co



Ω


PEM01-sp04co

PF01-t04cm

PAB03-ie04co

• 1.5 m deep (Sept.)
• <0.5 ppt; pH = 6.0
• 50% Organic C; 10% Carbon C [trees]

More Practice



PUB02-p04alo

PSS02-ie04alo

PEM01-sf04alo

PEM02-t04alo

- 0.1-1.9 m deep
- <0.5 ppt; pH = 8.5
- Shortly after spring rains
- 0.1 mm; 30% organic carbon
- Annuals, perennials, mangrove
