Why Classify Wetlands?

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

Classification of Wetland and Deepwater Habitats of the United States


FWS/OBS-79/31
December 1979
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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—full)
- 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
Marine System

Open ocean overlying the continental shelf and its coastline, where salinities are >30 ppt except at the mouths of estuaries.

1) Extreme high water limit of spring tides
2) Wetland emergent vegetation

Subsystems:
- **Subtidal**: Substrate is continuously submerged (deepwater)
- **Intertidal**: Substrate is exposed and flooded by tides (wetland)

OR,
- **Estuarine system**: If #2 not present
- **Continental shelf**: (ocean extent)

Marine Subsystems

Subtidal

Intertidal

Subsystems:
- **Subtidal**: Substrate is continuously submerged (deepwater)
- **Intertidal**: Substrate is exposed and flooded by tides (wetland)

Estuarine System

Tidal deepwater systems and wetlands that are usually semi-enclosed by land but have open, partly-obstructed, or sporadic access to the open ocean.

1) Salinity >0.5 ppt
2) Imaginary line closes bay or river mouth
3) Wetland Vegetation (ocean extent)
4) Offshore Areas

Subsystems:
- **Subtidal**: Substrate is continuously submerged (deepwater)
- **Intertidal**: Substrate is exposed and flooded by tides (wetland)
Estuarine System

All deepwater systems and wetlands contained within a channel EXCEPT:

(1) Dominated by PERSISTENT emergent plants, trees, shrubs, mosses, or lichens
(2) Salinity >0.5 ppt.

Subsystems:
- Lower Perennial: Low Gradient/Flow, Substrate is mud or sand.
- Upper Perennial: High Gradient/Flow, Substrate is rock, gravel.
- Intermittent: Water flows only during part of the year.
- Tidal: Flow fluctuates with tide but freshwater.

Riverine System

Riverine Subsystems

Lower Perennial

Upper Perennial

Intermittent
<0.5 ppt  Lacustrine System

Freshwater deepwater habitats and wetlands with the following characteristics:

>8 ha in Surface Area: 1) Positioned in topographic depression or dammed river channel
and,

OR,

<8 ha in Surface Area: 2) Lacks >50% coverage of persistent emergent vegetation (non-persistent OK)
3) Deepest part of basin > 2 m depth

Subsystems:
- Limnetic: All deepwater zones
- Littoral: All wetlands zones

“Ponds, Lakes & Reservoirs” (extends from upland or Palustrine System to 2 m depth)

Lacustrine Subsystems

Size, Depth, Non-persistent

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 <0.5 ppt

No subsystem!!
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:
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.

• Dominant Plant Species (if class is vegetation)
• Dominant Animal Species (if class is substrate)

Sampling Methods

FWF 410
Types of Palustrine Classes, Subclasses, and Dominance Types

1) Rock Bottom:
- >75% HC of stones, bolders, or bedrock
- <30% HVC

Usually high-energy wetlands with well-aerated water.

A) Bedrock: >75% bedrock substrate
B) Rubble: <75% bedrock; >75% bedrock+bolders+stones

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

Not Common in Palustrine Systems!!

>25 cm dia.

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* (sezis), *Physa* (snail), *Tubifex*, and *Canthocamptus* (copepod)

Depends on F*
Unconsolidated Bottom

Most Common

Cobble/Gravel

Sand

Mud

Organic

25 cm – 2 mm

2.00 – 0.05 mm

Very Little or No Vegetation—
Flooded Soil or Detritus

Unconsolidated Bottom
Cobble and Sand Subclasses

Cobble

Sand

Flooded sandy bottom

Unconsolidated Bottom
Mud and Organic Subclasses

Mud

Organic

Unconsolidated Shore (mud)

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

B) Aquatic moss: >50% moss

C) Rooted Vascular: >50% RV

D) Floating Vascular: >50% FV

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

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Aquatic Bed

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Algal and Aquatic Moss Subclasses

<table>
<thead>
<tr>
<th>Algae</th>
<th>Aquatic Moss</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spicogyna, Cladophora</td>
<td>Fontinalis spp.</td>
</tr>
<tr>
<td>Common Water Moss (streams)</td>
<td></td>
</tr>
</tbody>
</table>
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% HVC and <75% HC of stone, boulders, or bedrock

- Shorelines lacking hydrophytes.

- A) Cobble-gravel: >50% c/g
- B) Sand: >50% sand
- C) Mud: >50% silt & clay
- D) Organic: >50% dead or live organic matter
- E) Vegetated: >50% non-hydrophytic, pioneer plants that die if flooded.

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

Unconsolidated Shore

Not Common in Palustrine Systems!!

Sand Subclass
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)
Moss-lichen Wetlands

Northern Wetlands

Moss-Lichen Wetland

Moss and Lichen Subclasses

Moss

Lichen

Sphagnum spp.

Reindeer moss

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**
  - *Scirpus* spp.
  - No standing vegetation after winter

- **Non-persistent**
  - *Echinochloa*
  - No standing vegetation after winter

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

<table>
<thead>
<tr>
<th>Dominance Types:</th>
<th>Salix, mangrove, tamarack, black spruce</th>
</tr>
</thead>
<tbody>
<tr>
<td>A) Broad-leaved Deciduous:</td>
<td>&gt;50% BLD shrubs</td>
</tr>
<tr>
<td>B) Broad-leaved Evergreen:</td>
<td>&gt;50% BLE shrubs</td>
</tr>
<tr>
<td>C) Needle-leaved Deciduous:</td>
<td>&gt;50% NLD shrubs</td>
</tr>
<tr>
<td>D) Needle-leaved Evergreen:</td>
<td>&gt;50% NLE shrubs</td>
</tr>
<tr>
<td>E) Dead:</td>
<td>&gt;50% dead shrubs</td>
</tr>
</tbody>
</table>
Scrub-Shrub Wetlands

Willows: Broad-leaved Deciduous

Thermal & Protective Cover

Broad-leaved Deciduous and Evergreen

BL Deciduous  BL Evergreen

Buttonbush  Magnolia

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: Low energy wooded wetlands (swamps, bottoms, hammocks)

Note: Scrub-shrub wetlands can become forested wetlands

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

<table>
<thead>
<tr>
<th>Dominance Types</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red maple, green ash, overcup oak, mangroves, baldcypress, tamaracks, white cedar</td>
<td></td>
</tr>
</tbody>
</table>

A) Broad-leaved Deciduous: >50% BLD trees
B) Broad-leaved Evergreen: >50% BLE trees
C) Needle-leaved Deciduous: >50% NLD 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

**Note:** Scrub-shrub wetlands can become forested wetlands.
**Needle-leaved Deciduous and Evergreen**

- NL Deciduous
- NL Evergreen

**Dead Subclass**

- Scrub-Shrub
- Forested

**Water Regime Modifiers**

*(8 Nontidal)*

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.

Criteria not as quantitative as USACE zones.
Water Regime Modifiers

(8 Nontidal)

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) Euthaline 30.0-40
3) Mixohaline 0.5-30
4) Fresh <0.5

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:
   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:
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**
- **PAB03-ic04co**
- **PF01-t04cm**

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

**More Practice**

- **PUB02-pb04alo**
- **PEM01-sp04alo**
- **PSS02-ie04alo**

- 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