HANDOUT NO. 1 (For 10/1 & 10/4 2004):  INTRODUCTION

Wetlands and Wetland Ecology
Wetlands include swamps, bogs, fens, marshes and other wet ecosystems throughout the world. They occupy about 4-6% of the world's land surface.

History
Definitions & Classification

Wetland Functions and Values

Losses & Gains

Wetland Conservation

History of wetland ecology as a discipline
For a long time only individual ecosystems
- peatlands
- mangroves

1970’s - US: Clean Water Act, Wetland Inventory – need for definition

1980’s - SWS established; Journal Wetlands; www.sws.org

1st International Wetland conference India
Last ~ 20-30 years: exponential growth of scientific knowledge of wetlands and of research funding
Increase in conservation efforts
BUT !!!
Continuous loss and degradation

Wetland definition and classification
Most widely accepted definition in the US (Cowardin et al. 1979)

Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. They must have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes; (2) the substrate is predominantly undrained hydric soil; and (3) the substrate is non-soil and is saturated with water or covered by shallow water at some time during the growing season of each year.
Hierarchical classification: 5 systems (see Figs)

NRC 1995 definition:
A wetland is an ecosystem that depends on constant or recurrent, shallow inundation or saturation at or near the surface of the substrate. The minimum essential characteristics of a wetland are recurrent, sustained inundation or saturation at or near the surface and presence of physical, chemical, and biological features reflective of recurrent, sustained inundation or saturation. Common diagnostic features of wetlands are hydric soils and hydrophytic vegetation. These features will be present except where specific physicochemical, biotic or anthropogenic factors removed them or prevented their development.

Upper limit
- the boundary between land with predominantly hydrophytic cover and land with predominantly mesophytic or xerophytic cover

Lower limit
- tidal: elevation of the extreme low water of spring tide
- freshwater: 2 m below low water
**Prominent environmental and biological characteristics:**
1) Extrazonal character - wetlands can develop in all climatic zones and corresponding biomes on sites where soil saturation with water or water accumulation above soil surface is due to positive hydrological balance for a significantly long time within a year or growing season.
2) The unstable water table enables coexistence or alternating dominance of biota specifically adapted to fluctuating water levels as well as aquatic and terrestrial species.

Most wetlands act as a transitional zone or **ecotone** between land and water.

**Gradients:**
- Water level
- Salinity
- Nutrient level

**WETLAND FUNCTIONS x WETLAND VALUES**

**Functions** – ecological functions of a particular wetland ecosystem

**Values** – an estimate of importance of a particular ecosystem (anthropocentric focus)

<table>
<thead>
<tr>
<th>Key Functions</th>
<th>Corresponding Values</th>
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<tbody>
<tr>
<td>Water storage</td>
<td>Buffer zone against floods</td>
</tr>
<tr>
<td>Biogeochemical cycling (C, N, P)</td>
<td>Water quality improvement</td>
</tr>
<tr>
<td>Biological productivity</td>
<td>Wastewater treatment</td>
</tr>
<tr>
<td>Decomposition</td>
<td>Food products (rice)</td>
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<tr>
<td>Population/Community attributes</td>
<td>Timber harvest</td>
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<td></td>
<td>Global C storage</td>
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<td></td>
<td>Feeding and breeding grounds for waterfowl</td>
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<td></td>
<td>Recreation</td>
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<td>Educational/research value</td>
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</tbody>
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**Wetland losses and gains**

The U.S. today about 46% of original wetland resources; California >90% wetlands lost.

**Major losses:**
- Drainage for crop production
- Dredging, stream channelization
- Commercial and residence development
- Dams, levees
- Peat mining

**Natural threads:**
- Subsidence, rising seal levels
- Droughts
- Biotic (e.g., nutria)

**Gains:**
1) Natural (new deltas)
2) Man-made (lakes and dams, waterfowl habitat development - Ducks Unlimited)

**Wetland protection**

**Ramsar convention** - Convention sponsored by UNESCO on wetlands of international importance, especially as waterfowl habitat.

Ramsar, Iran 1971 (http://ramsar.org)

About 50 countries have signed the convention so far.

**World Heritage Sites**

Examples of Ramsar Sites that are also World Heritage Sites:

USA: Everglades, Florida
Australia: Kakadu National Park
Canada: Peace Athabasca Delta
France: Baie du Mont Saint-Michel
Spain: Donana
Romania: Danube Delta
Zaire: Parc National des Virungas

MAB (Man and Biosphere), WWF (World Wild Fund for Nature),
IUCN (International Union for Conservation of Nature),
IWRB (International Wildfowl Research Bureau)

Other definitions:
Swamp: wetland dominated by trees and shrubs (U.S.) xx permanently flooded wetland (British)
Marsh: wetland dominated by herbaceous vegetation (U.S.) non-peat forming, seasonally water-logged wetland (British)

Peatland = Mires (Moores, Muskags)
A) Bog: Ombrotrophic (rain fed), dominated by Sphagnum moss, species poor, acidic
B) Fen: Minerotrophic (water supply influenced by surrounding soil or rock), alkaline

Peat: the accumulated remnants of dead plants, less than 20% of inorganic particles
Bottomland: lowland wetlands along streams and rivers in alluvial floodplains
Pothole: shallow marsh-like pond (e.g., prairie potholes in Dakotas)
Playa: SW U.S. marsh-like ponds similar to potholes

Vernal pools: small pools in Mediterranean climate region of the Pacific coast, covered by shallow water for extended periods during the cool season and completely dry for most of the warm season

Reading: Mitsch and Gosselink, pp. 1-63. (2nd ed.); 3-104; 725-754 (3rd ed.)
Fig. 1. Classification hierarchy of wetlands and deepwater habitats, showing Systems, Subsystems, and Classes. The Palustrine System does not include deepwater habitats.
Fig. 5. Distinguishing features and examples of habitats in the Lacustrine System.

Fig. 6. Distinguishing features and examples of habitats in the Palustrine System.