

Announcements

- Exam on Sept. 14
- Lecture on Thursday, September 7, will be held at Confluence Park (confluence of Cherry Creek and S. Platte River, Across from the REI megastore).
- Meet at the Park at 2:30 pm, and I will try to let you leave at 3:35 to get to your next class.
- Bring waders/boots/towel if you plan on getting wet

Hydrology and Physiography of Groundwater and Wetland Habitats

- Habitats and the hydrologic cycle
- Movement through soil and groundwater
- Wetlands

Case Study: Ogallala Aquifer

- From Nebraska to Texas
- Amount pumped is greater than the flow of the Colorado River
- Supplies 30% of irrigation water used in U.S.
- Being used 10 times as fast as being replenished
- Arkansas River below aquifer is mostly dry, above almost always flows
- Eventually it will cost too much to pump irrigation water up

What are wetlands?

- Ecotone between terrestrial and aquatic habitats
- are flooded at least part of the year (hydrology)
- hydric soils
- support hydrophytes (aquatic/wetland plants)

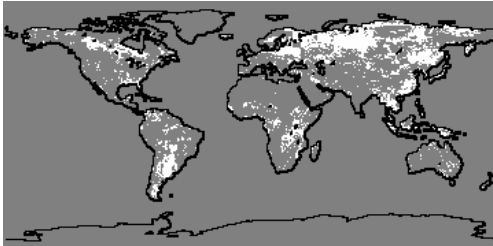
Wetlands

- Crucial to waterfowl, wildlife and plant life
- Provide vital ecosystem services such as waste purification and flood control
- Most endangered aquatic habitat

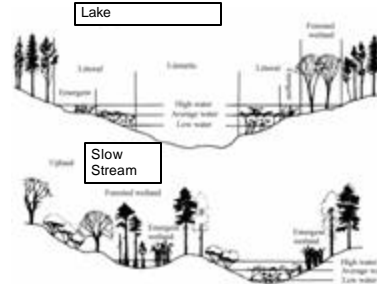
Wetland Losses

- 70% of U.S. riparian wetlands lost
- 50% of prairie potholes gone
- Half of Everglades drained
- 22 states have lost more than half of their wetlands in the last 200 years
- Wetlands lost in other countries: Cameroon (80%), New Zealand (90%), Australia (95%), Thailand (96%), Vietnam (>99%)

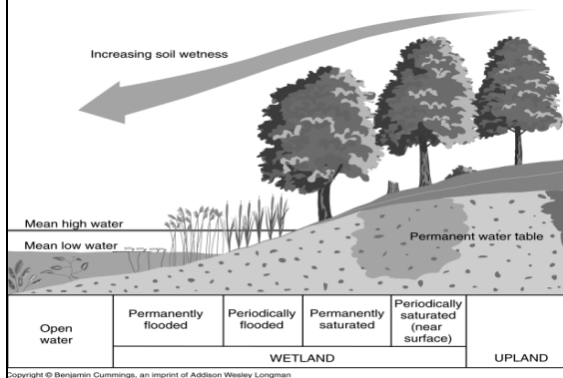
Distribution of Wetlands Around the World



Classification of Subhabitats in Two Wetland Types

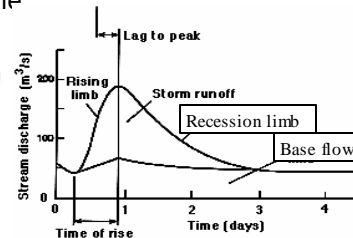


Terrestrial-aquatic ecotone

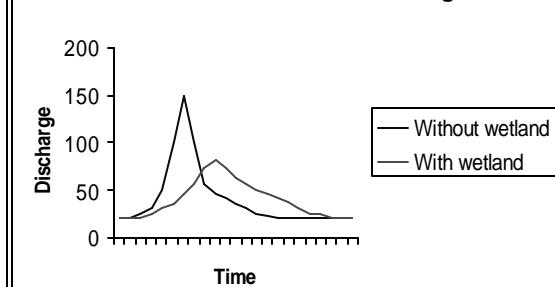


Wetlands are not worthless

- water filtering: nature's kidneys
- accumulation of organic material for food or farming
- habitat for wildlife
- nutrient cycling
- flood regulation
- water storage



Effects of wetland on flooding



Types of wetlands

- Salty
 - mangroves: coastal marine wetland with woody vegetation
 - marsh: emergent herbaceous vegetation; *Spartina*
 - seagrass: submersed herbaceous vegetation; seagrass; turtle grass
 - mud flats/sand flats
- Fresh
 - swamp: woody vegetation
 - marsh: herbaceous vegetation
 - bog: acidic; nutrient-poor, fed by precipitation, spongy covering of mosses, accumulation of peat
 - fen: more basic and nutrient-rich than bogs, fed by groundwater, accumulation of peat

There are many diverse animal communities associated with mangrove habitats. Those faunal groups associated with prop roots and sediment are marine assemblages, while animals in the canopy are terrestrial. Here oysters colonize the prop roots of red mangroves.

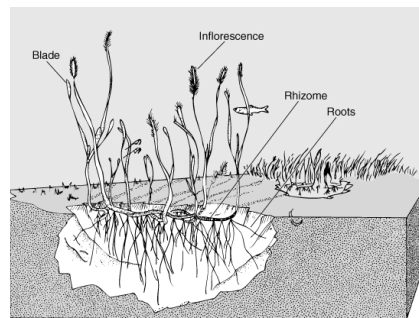
Salt marshes: very productive coastal habitats that provide food and shelter for several marine/estuarine organisms.

Many juvenile fishes and other animals use these habitats as nursery grounds

Seagrasses

All seagrasses have a similar appearance, with thin straplike blades arising from a creeping rhizome that stabilizes the sediment.

Seagrass beds are most strongly influenced by water currents and wave action, which shape how the beds form. Seagrass beds are depositional environments, often with high organic content that can make the sediment under the bed anaerobic.



Swamps: woody freshwater wetlands

- A swamp is any freshwater wetland dominated by woody plants.
- There are many different kinds of swamps, ranging from the forested red maple swamps of the Northeast, to the extensive bottomland hardwood forests found along the sluggish rivers of the Southeast.
- Swamps are characterized by saturated soils during the growing season, and standing water during certain times of the year. The highly organic soils of swamps form a thick, black, nutrient-rich environment for the growth of water-tolerant trees.
- Plants, birds, fish, and invertebrates such as freshwater shrimp, crayfish, and clams require the habitats provided by swamps.
- Many rare species, such as the endangered American crocodile depend on these ecosystems as well.

Freshwater Marshes

- Marshes are defined as wetlands frequently or continually inundated with water, characterized by emergent soft-stemmed vegetation adapted to saturated soil conditions.
- There are many different kinds of marshes, ranging from the prairie potholes to the Everglades, coastal to inland, freshwater to saltwater.
- All types receive most of their water from surface water, and many marshes are also fed by groundwater.
- Nutrients are plentiful and the pH is usually neutral leading to an abundance of plant and animal life.

Freshwater habitats:wet meadow

Wet meadows are a type of marsh that commonly occurs in poorly drained areas such as shallow lake basins, low-lying farmland, and the land between shallow marshes and upland areas. Some wet meadows are found high in the mountains on poorly drained soil. These wetlands, which often resemble grasslands, are typically drier than other marshes except during periods of seasonal high water. For most of the year wet meadows are without standing water, though the high water table allows the soil to remain saturated. A variety of water-loving grasses, sedges, rushes, and wetland wildflowers proliferate in the highly fertile soil of wet meadows.

Freshwater habitats:prairie pothole

Prairie potholes are depressional wetlands (primarily freshwater marshes) found most often in the Upper Midwest, especially North Dakota, South Dakota, Wisconsin, and Minnesota. This formerly glaciated landscape is pockmarked with an immense number of potholes, which fill with snowmelt and rain in the spring. Some prairie pothole marshes are temporary, while others may be essentially permanent. Submerged and floating aquatic plants take over the deeper water in the middle of the pothole while bulrushes and cattails grow closer to shore. Wet, sedgy marshes lie next to the upland.

Freshwater habitats:vernal pools

The unique environment of vernal pools provides habitat for numerous rare plants and animals that are able to survive and thrive in these harsh conditions. Many of these plants and animals spend the dry season as seeds, eggs, or cysts, and then grow and reproduce when the ponds are again filled with water. In addition, birds such as egrets, ducks, and hawks use vernal pools as a seasonal source of food and water.

Status

Vernal pools are a valuable and increasingly threatened ecosystem, often smaller than the bulldozer that threatens to destroy them. More than 90% of California's vernal pools have already been lost. Great efforts are being made to protect the remaining vernal pools, as their disappearance marks the loss of rare and important habitat and some of the associated plant and animal species as well.

Freshwater habitats: Bogs

- Bogs are characterized by spongy peat deposits, acidic waters, and a floor covered by a thick carpet of sphagnum moss.
- Bogs receive all or most of their water from precipitation rather than from runoff, groundwater or streams. As a result, bogs are low in the nutrients needed for plant growth, a condition that is enhanced by acid forming peat mosses.
- There are two primary ways that a bog can develop: bogs can form as sphagnum moss grows over a lake or pond and slowly fills it (terrestrialization), or bogs can form as sphagnum moss blankets dry land and prevents water from leaving the surface (paludification).
- The unique and demanding physical and chemical characteristics of bogs result in the presence of plant and animal communities that demonstrate many special adaptations to low nutrient levels, waterlogged conditions, and acidic waters, such as carnivorous plants.

Freshwater habitats: Fens

Fens, are peat-forming wetlands that receive nutrients from sources other than precipitation: usually from upslope sources through drainage from surrounding mineral soils and from groundwater movement. Fens differ from bogs because they are less acidic and have higher nutrient levels. They are therefore able to support a much more diverse plant and animal community. These systems are often covered by grasses, sedges, rushes, and wildflowers. Over time, peat may build up and separate the fen from its groundwater supply. When this happens, the fen receives fewer nutrients and may become a bog.

Managing Hydrology of Everglades

- Everglades once had a sheet of water that flowed across the lower 1/4th of Florida
- Was drained for agriculture and development
- Billions of dollars being spent on restoring more natural flows
- 700 km of canals, 9 large pump stations, 18 gated culverts, and 16 spillways make controlling hydrology difficult
- Additional problems include nutrient pollution, mercury pollution, and endangered species