Wetland Hydrology

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What Makes a Wetland?

- Soils
- Vegetation
- Landscape Position
- Morphology (shape of the wetland basin)
- Hydrologic Factors

*Figure 1. The hydrologic cycle for part of a watershed.*
Morphology (shape of the wetland basin)

- Depth to water table
- Hydrologic Factors

Slopes and Depressions
Flats
Hydrologic Factors

- **Source** of Water (Precipitation, Surface Flow, Groundwater)
- **Flow Direction** of Water
- **Amount** of Water (magnitude)
- **Duration** (residence time)
- **Timing** (season, frequency)

Image courtesy of Richard Weber
Source of Water: Precipitation

(3 T’s):

- **Type**
  - Snow
  - Snowmelt
  - Ice
  - Rain
  - Condensation

- **Time of year (Season)**
  - Presence of vegetation
  - State of soil
  - Runoff/Erosion

- **Timing of recurrence**
  - Soil saturation
  - Water table levels
Source of Water: Surface Flow

The flow of water across the surface of the land, "Runoff"
Source of Water: Groundwater

Water held underground

- Maintains water table level fluctuations in wetland ecosystems

- Important source of water for human use and consumption
Flow Direction of Water

Water can leave the site through:

- Evaporation (temperature)
- Evapotranspiration (plants)
- Surface flow/Lateral Flow
- Infiltration (soil)
- Groundwater
Where is the groundwater going?

**Recharge vs. Discharge**

Water flows out of wetland down through the soil profile and **into the aquifer/groundwater**

Water flows out of the aquifer/groundwater **into the wetland**

Amount of Water (magnitude)

Dependent on:
- Source of water
- Size of catchment area (wetland basin)

Flow Accumulation:

(1^{st} order streams have a 1.25 acre catchment area)
Duration ("residence time")

How long does water stay in a wetland?

- Determines chemical and biotic properties of the wetland (nutrient status, plant species, etc.)
- Indicates how rapidly the water in the system is "replaced"
- Determined by:
  - Soils
  - Climate (precipitation events, temperature)
  - Flooding
  - Landscape position
  - Catchment size
  - Land Use
  - Wetland Quality (presence of vegetation)

Photo courtesy of Capel et. al, 2018
Timing

Time of Year

Frequency of Occurrence


https://skepticalscience.com/
Wetland Hydrology: Water Budgets

1. Balance between inflows and outflows of water
2. The surface contours of the landscape
3. Subsurface soil, geology, and groundwater conditions

\[ P + Qin = ET + \Delta S + Qout \] (A1)

where

- \( P \) is precipitation,
- \( Qin \) is water flow into the watershed,
- \( ET \) is evapotranspiration (the sum of evaporation from soils, surface-water bodies, and plants),
- \( \Delta S \) is change in water storage,
- and
- \( Qout \) is water flow out of the watershed.

(Healy et al. 2007)
References


