Engineering Hydrology
Class 5: Rainfall Abstractions
Evaporation
Objectives

Be able to:

- Define “abstractions”
- Distinguish between different types of abstractions
- Use a mass-balance approach to quantify an abstraction
What are “abstractions”?

Diagram showing the water balance and energy balance processes, including precipitation, evaporation, transpiration, interception, wind, runoff, infiltration, percolation, surface zone, root zone, and transmission zone.
• **Interception**: Rainfall which is intercepted by and evaporated from plant canopies or plant residue

• **Depression Storage**

• **Evaporation**

• **Transpiration**
ET Types

- Free water
- Lake
- Bare Soil
- Transpiration
- Interception Loss
- Potential ET --- This is one of our major goals!
- Actual ET

Estimating ET from Lakes

- Water Balance
- Mass Transfer (covered in textbook nicely)
- Direct Measurement (Pan, Eddy Correlation)
- Energy Balance (covered in textbook nicely)
- Combination – Energy and Mass Transfer (Penman)
Example Problem: Mass Balance Approach

Given a watershed with area = 3000 mi$^2$ with average annual precipitation (P) = 44 in and average annual discharge = 2000 ft$^3$/s, what is the annual evaporation?

Hint: consider all mass fluxes in and out, including evaporation (E), inflow (I), precipitation (P), outflow (O), seepage to groundwater (GW), and change in water stored in the watershed (storage, or $\Delta S$). Now, simply balance these components: $E = I + P - O - GW - \Delta S$. Given what information is provided, what assumptions must you make?
Rainfall Abstractions

- Interception
- Depression Storage
- Infiltration
- Evaporation
- Transpiration

**Interception**

- Portion of precipitation that wets above-ground objects
- Function of: storm size, species age and density, season

**Depression Storage**

- Portion of precipitation that is captured in surface depressions
- Function of: surface slope and other characteristics