

# TODAY'S GOALS

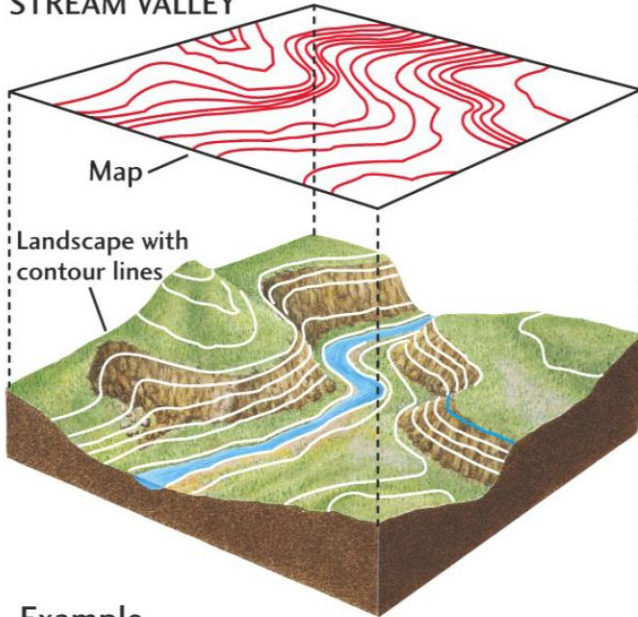
- Watershed Basics
  - Delineation
  - Structure
  - Function
  - Quantity
- At the end of the lecture, we should be able to understand the basic properties of a watershed.

# INTRODUCTION

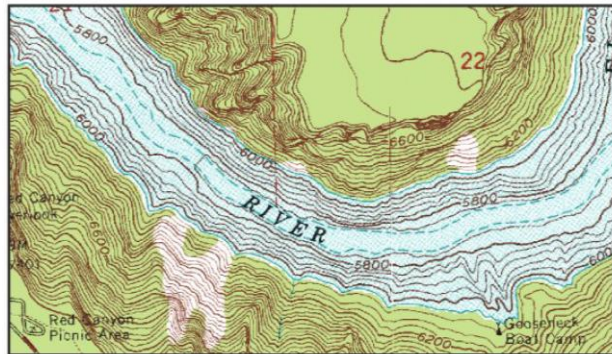
- Watershed – the land that drains into a body of water
  - Size can vary from a few acres to thousands of square miles
  - Open watershed – drains into an ocean
  - Closed watershed – empties into an inland body of water (lake or pond)

# WATERSHED DELINEATION

STREAM VALLEY

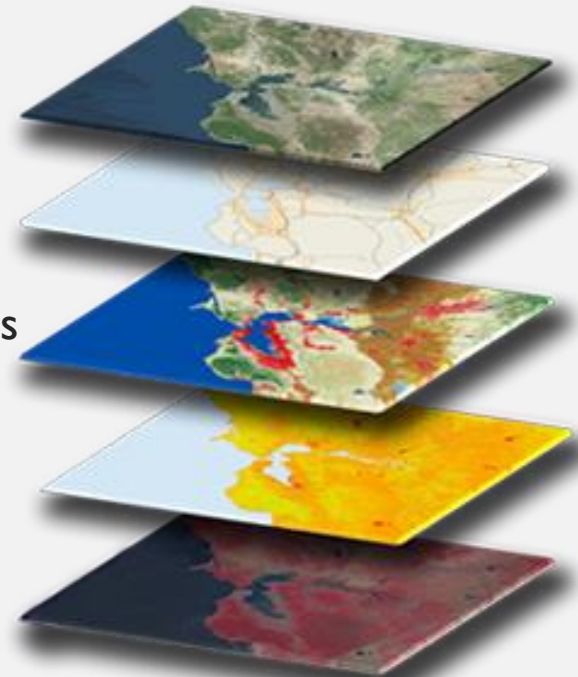


Example

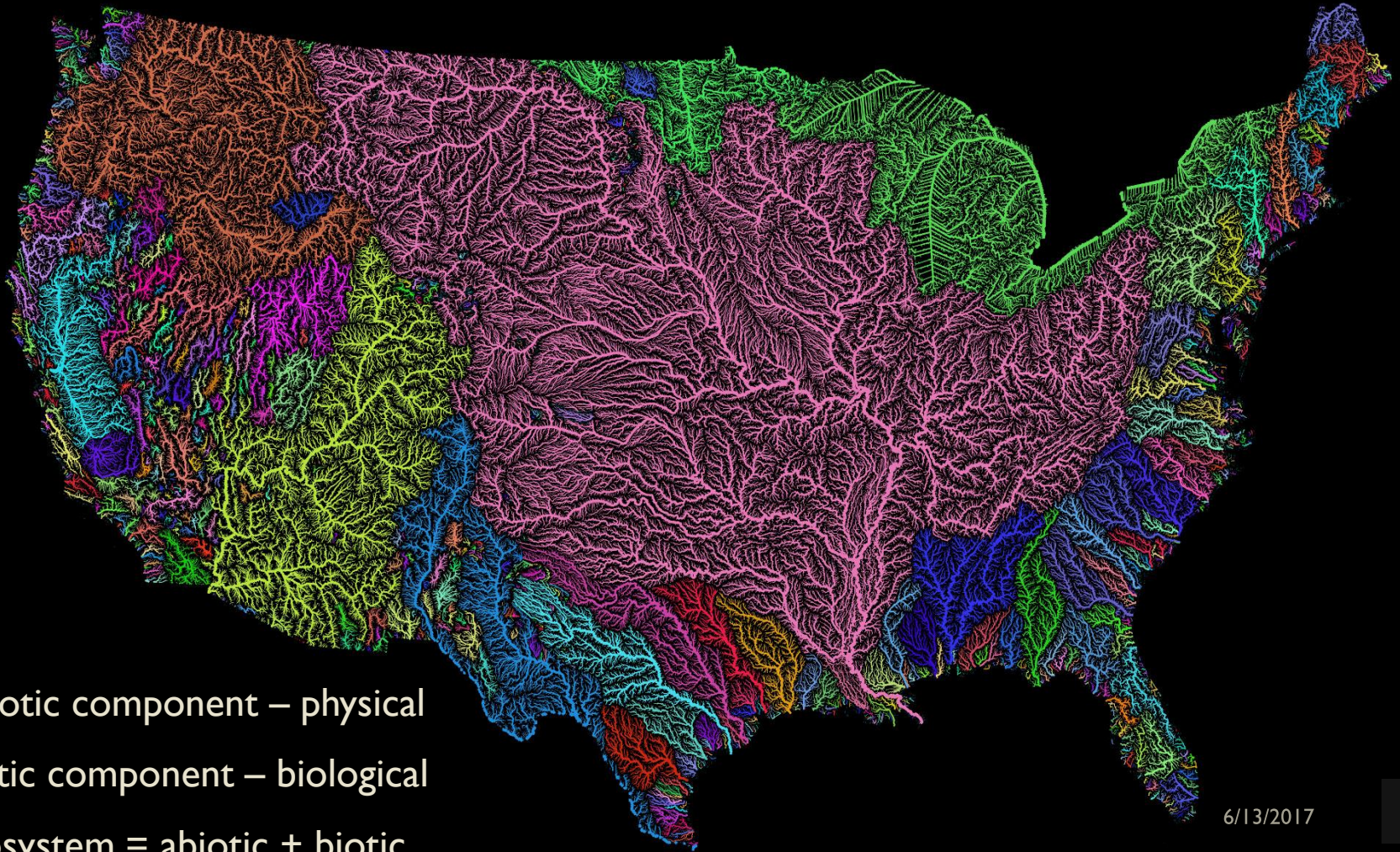


Flaming Gorge, Wyoming

- Watersheds are usually delineated using topographical maps to determine ridges or other high points (breakpoints) separating the different watersheds.
- Topographical maps – show surface relief as contours
- Satellite technology (Geographical Information Systems) with spatial analysis software can be used to do this quickly and accurately



# WATERSHED STRUCTURE



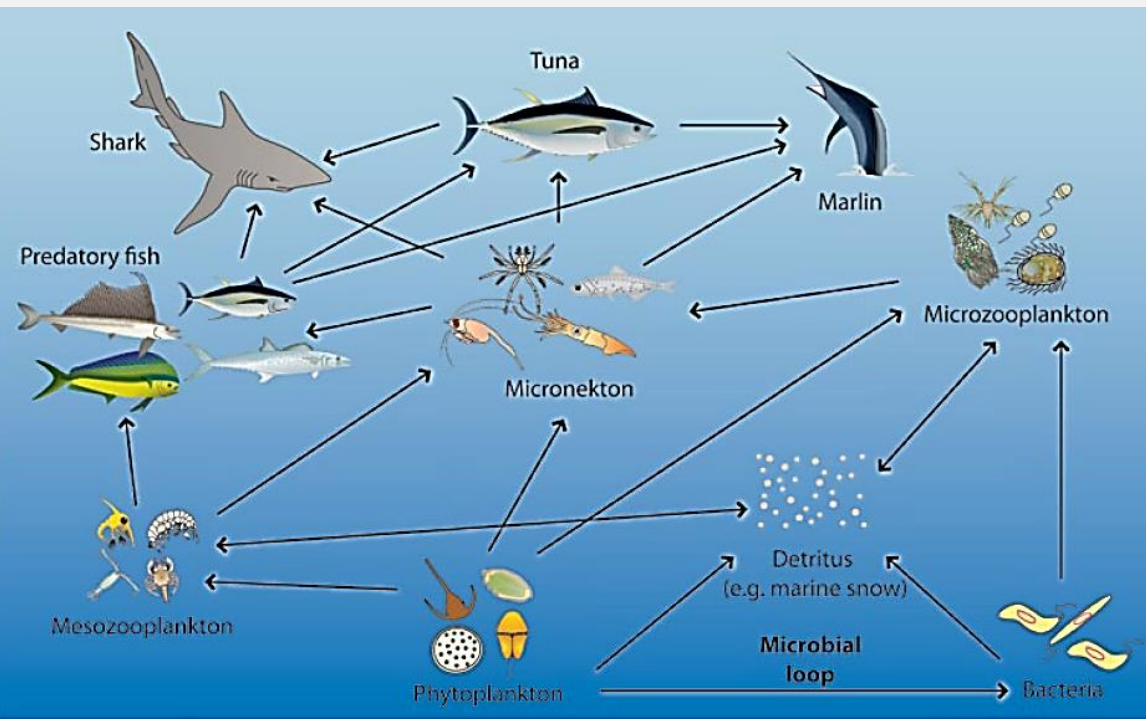
- Abiotic component – physical
- Biotic component – biological
- Ecosystem = abiotic + biotic

# WATERSHED STRUCTURE

- Abiotic environment
  - Climate
    - Measured over an extended time period (different from weather)
    - Includes average and extreme temperatures, humidity, precipitation type and amount, winds, cloud cover
  - Geomorphology – the study of geological structure of an area and its development
    - Geological structures – mountains, valleys, flats, and depressions
    - Depends on the type of geological materials present
    - Weathering – the breakdown of materials from wind, water, freezing, thawing
    - Hydrogeomorphology – source and flow of water within and through the landscape

# WATERSHED STRUCTURE

- Biotic environment
  - Soils – a living system full of microbes, fungi, insects, worms, gophers, snakes, rodents
    - Typically 45% mineral (sand, silt, clay), 5% organic, 50% space (filled with water or air)
    - Elaborate classification of soils – we will not cover this, just FYI



- Food webs – transfer and balance of energy among organisms in an ecosystem
  - Keystone species – a species that has a larger impact than its numbers would suggest
  - Indicator species – a species whose presence or absence can indicate an environmental change

# WATERSHED FUNCTION

3 major functions

1. Movement and storage of water, nutrients, and energy
2. Cycling and transformations of nutrients and energy
3. Providing an opportunity for ecological change: succession

# WATERSHED FUNCTION

## I. Movement and storage of water, nutrients, and energy

- Five components:
  - Availability – the substance must be available for transport
    - Perhaps the nutrient is not in a usable form for the organism to use
  - Detachment – a substance cannot have anything holding it in place
    - A leaf must first fall from a tree before it can be transported
  - Transport – the actual movement of the substance
  - Deposition – where the movement stops
  - Integration – usually refers to the nutrient being used or consumed by the organism
- Alluvial – sediment transported by water
- Eolian – sediment transported by wind



# WATERSHED FUNCTION

## 2. Cycling and transformations of nutrients and energy

- Largely due to microbial life consuming the nutrients
- Cycle refers to the transport, adsorption, transformations, or chemical reactions, loss, and gain of the element studied
- Exchange between land, water and living organism
- Life is based on carbon, oxygen, and nitrogen, all of which move from organism to organism
- Nitrification – taking nitrogen from unusable forms and making the usable

# WATERSHED FUNCTION

## 3. Providing an opportunity for ecological change: succession

- Succession – many people or things sharing a characteristic and following one after another
  - Example: the King's crown being passed down to his son
  - In our case, many people sharing the same space, nutrients, and water, one after another