

TODAY'S GOALS

- Intro to water and environmental issues
 - Ecosystems
 - Biomes
 - Watershed
 - Global water use and budgeting
- At the end of the class, we should be able to understand the complexity of water resources and how they are interconnected.

INTRODUCTION TO WATER RESOURCES

- Complex
- Many aspects
 - Physical – rivers, lakes, wetlands, groundwater, ecosystems
 - Historical – use past efforts to improve future activities
 - Social
 - Legal
 - ...

DISTRIBUTION OF WATER ON EARTH

- EVERYWHERE!
 - 1.39 billion km³ (331 million mi³)
 - 96% in the oceans
- Freshwater is abundant but unevenly distributed
 - Amazon rainforest – 15% of the world's fresh water but only 0.4% of the population
 - Asia – 36% of the world's fresh water and 69% of the population
- Need to store, transport – difficult and costly

TYPES OF NATURAL WATER RESOURCES

- Oceans
 - DEEP! – Mariana trench near Guam has a depth of 36,205 ft (Mt. Everest is only 29,035 ft)
 - Saline – 3.5% dissolved salt by weight (human tolerance is <2%)
 - Can't drink, can't farm, can't use in industry – difficult, expensive, or impossible to use 97% of Earth's water



TYPES OF NATURAL WATER RESOURCES

- Glaciers, permanent snow, sea ice, polar ice caps
 - Glaciers – dense ice sheets formed from tightly-packed snow
 - Cover 10% of land
 - So thick and heavy that gravity causes them to move
 - Cryosphere – cold or frozen sphere, parts of the Earth that are frozen
 - Glaciers exist everywhere, even near the equator – Mt. Kilimanjaro (Africa)
- Sea ice – ice chunks or sheets that float on the sea/ocean
- Polar ice caps – generate cold, dense water that creates deep ocean currents
 - Effects ocean temperatures, the atmosphere, and climate

TYPES OF NATURAL WATER RESOURCES

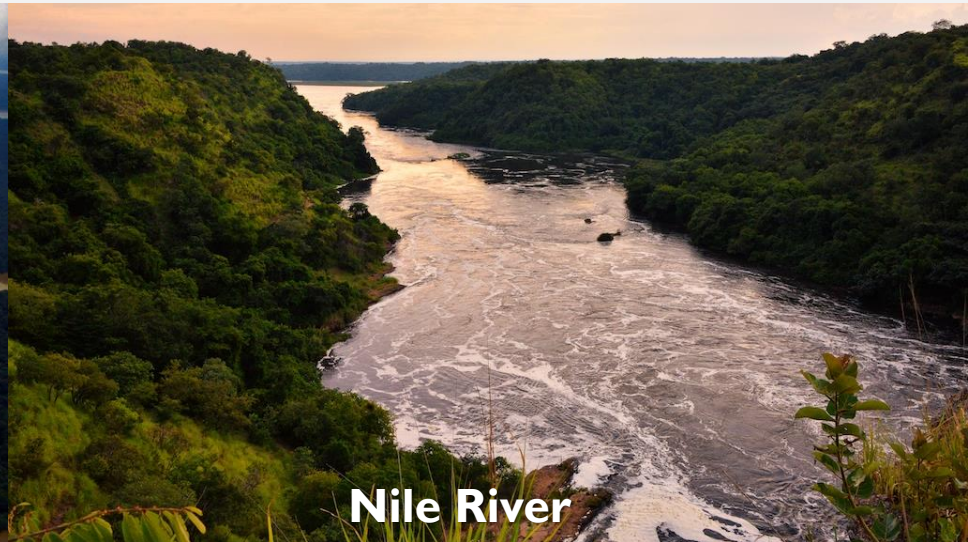
- Groundwater – water underground
 - Replenished by precipitation that seeps down through rock and soil into an aquifer
- Aquifer – a rock, sand, or gravel layer that can store significant amounts of water
 - Difficult to quantify the total amount
 - Around 30% of the total freshwater
 - Approximately 35 times greater than the volume of water in all the freshwater lakes and flowing rivers of the world
 - Vary in salinity, mineral content, and contaminants

TYPES OF NATURAL WATER RESOURCES

- Rivers, streams, creeks, and brooks – flowing water
 - Transport systems of the hydrological cycle
 - More the 3 million miles of river channels in the United States



Amazon River



Nile River

TYPES OF NATURAL WATER RESOURCES

Great Salt Lake, UT



- Lakes – inland body of water found in a topographical depression
 - Different from reservoirs
 - Canada contains nearly half of the world's lakes
 - Vary in amount plant and animal life
 - Great Salt Lake contains only small brine shrimp, fly grubs, and bacteria

TYPES OF NATURAL WATER RESOURCES

- Wetlands – areas saturated by surface or groundwater
 - Synonyms: swamp, marsh, bog, moor, estuary
 - Usually defined by the existence of wetland plants
 - Everywhere other than deserts and polar ice caps
 - Important function – providing habitat, food, breeding or nesting areas



TYPES OF NATURAL WATER RESOURCES

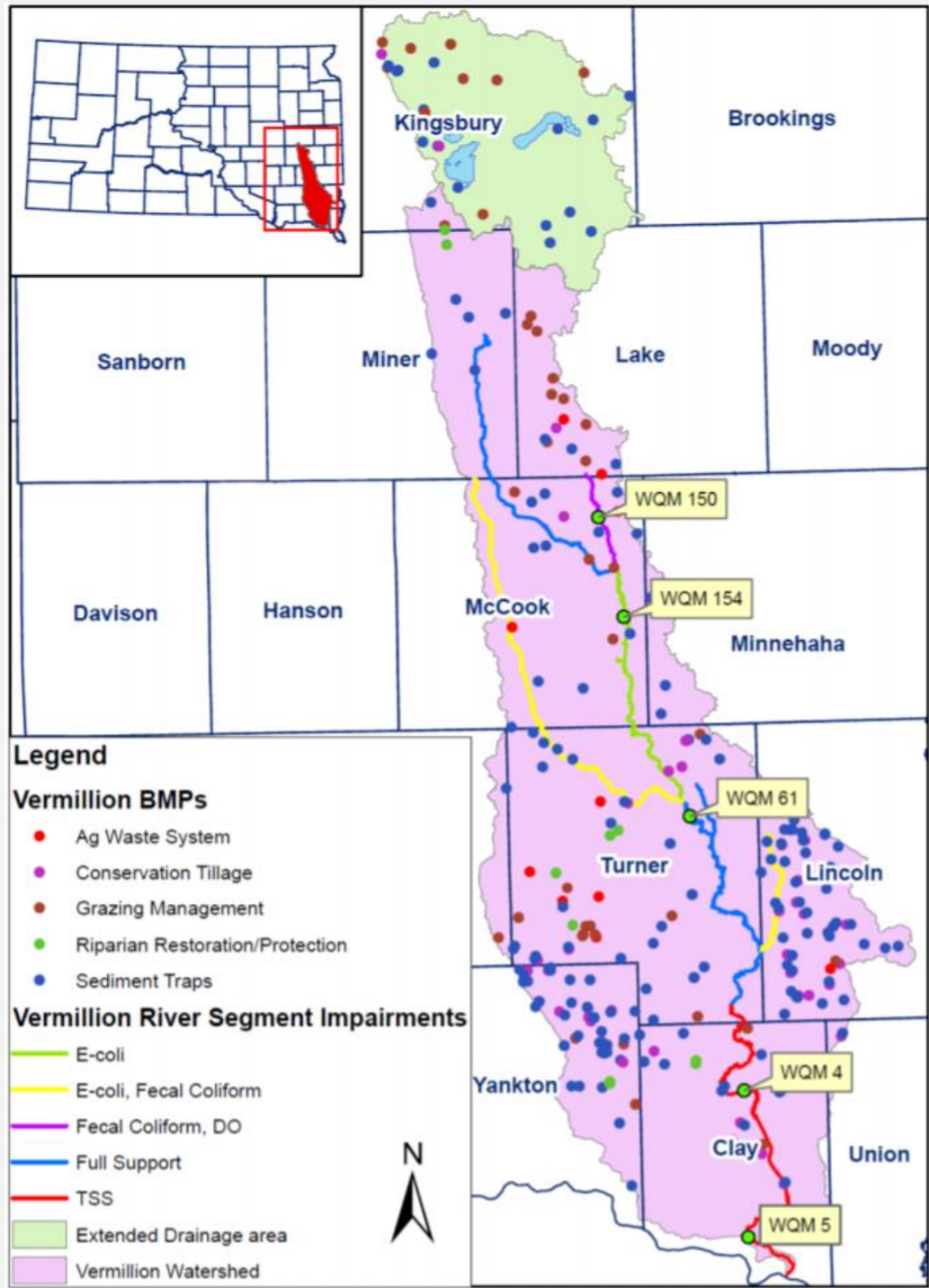
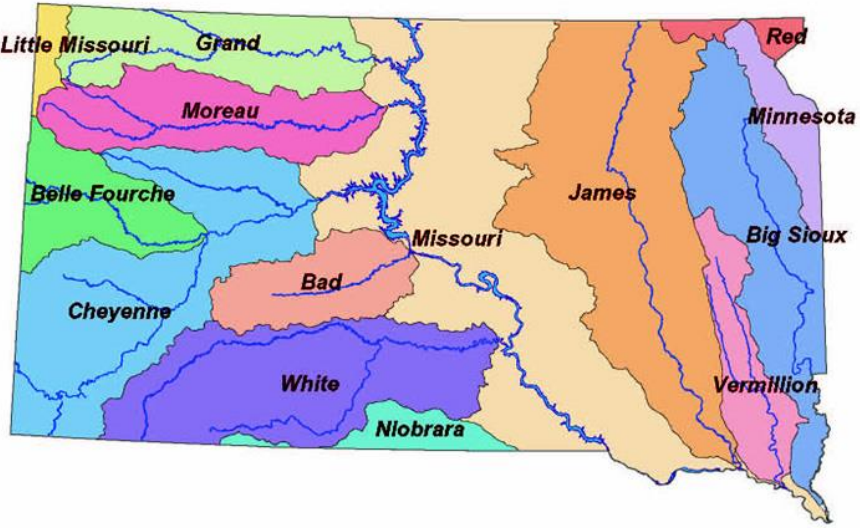
- Atmosphere – an “envelope” made of gas that surrounds a planet
 - Water evaporates from land and bodies of water
 - Atmospheric saturation occurs when air can hold no more water vapor
 - If saturation is exceeded and the temperature is cold enough, we get precipitation
 - Controversy and debate about how and why Earth has so much water
 - One of the most controversial theories is that water-rich comets and similar objects pass through the atmosphere and over time have deposited enough water to fill the oceans.



ECOSYSTEMS, BIOMES, AND WATERSHEDS

- Ecosystems – a dynamic complex of plant, animal, and microorganism communities and their non-living environment interacting as a functional unit
 - Range is size from a droplet of water to an entire continent
 - Do not have defined boundaries
 - Animals migrate and explore, plant seeds can be carried by wind or animals elsewhere
- Biomes – a significant ecosystem or community of plants and animals
 - Forest, grassland, desert, coral reef, etc.
- Watersheds – the entire land area that drains water into a particular body of water such as a river, pond, lake, or ocean
 - Synonym: river basin
 - We are currently in the Vermillion River Basin

SOUTH DAKOTA WATERSHEDS



VIDEO

- <https://www.youtube.com/watch?v=Fvkzjt3b-dU&t=5s>