

## *Unit 9 Notes: Hydrogeology*

### Real World Context:

Watersheds are the main organizing concept for elements and process of surface hydrology, ground water and land use.

Depletion of ground water can impact streams and biological viability. Landscapes can establish equilibrium inconsistent with emerging climatic patterns. Changes in climatic patterns or human diversions of water will shift equilibrium and produce changes in the characteristics of streams, ground water and landscapes.

Wetlands store water and recharge rivers during dry spells. They also absorb water during large storm events. A reduction of wetlands due to development or urbanization make flooding more likely as well as low stream discharge during drier months.

While water quality can be reduced by land use in many ways, the effects of agricultural practices are perhaps most profound.

Loss of soil not only diminishes the agricultural viability of land, but may greatly increase stream water turbidity which increases absorption of thermal energy and therefore water temperature. Dissolved oxygen levels drop as water temperature rises.

Organic and synthetic fertilizer from surface runoff adds nitrates to stream water which can cause algal blooms. Algae are eventually broken down by aerobic bacteria that consume great quantities of dissolved oxygen. Such occurrences can be inferred from a high biochemical oxygen demand (BOD) and lower percent saturation of dissolved oxygen.

The "dead zone" in the Gulf of Mexico is one of many off shore areas on Earth where coastal ecosystems suffer from extremely low amounts of dissolved oxygen. The depletion of oxygen begins in the spring, swells to a maximum size in summer and disappears in the fall. A major cause is excessive nutrients from agriculture in the Mississippi watershed.

Ground water systems are sustainable when input is equal to or exceeds output. Major sections of the Midwest are practicing unsustainable agriculture due to excessive down draw of the Ogallala aquifer. Some areas experience topographic subsidence due to excessive and continuous ground water withdrawal.

Ground water quality suffers from industrial chemicals and saline infiltration. The United States superfund sites are prioritized locations suffering from dangerous levels of ground water pollution.

Urbanization increases the proportion of impermeable surfaces that accelerate water runoff, reduce infiltration and recharge of wetlands and aquifers.

Water quality measured by physical, chemical and biological parameters reflect land use practices.