

COLUMBUS STATE COMMUNITY COLLEGE

ESSH 1101 - Introduction to Environmental Science, Safety & Health

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Homework 5 – Water Resources and Water Pollution

Environmental Science, 16th Ed. by Tyler and Spoolman – Chapter 11

1. If water is one of our most abundant resources, why are shortages occurring and why are we concerned about its availability in the future?
 - Water is an abundant resource covering 70%+ of the Earth's surface. However, the bulk of this water is saltwater. **Shortages are occurring due to poor resource management, drought, overuse, aquifer depletion, and pollution.**
 - **Future availability of freshwater is a major global concern due to national economic reliance whereby freshwater drives agriculture** (crops and cattle) which allows nations to feed their population.
 - **Access to freshwater also allows arid areas to be populated.** Without this resource, these cities and towns would be reclaimed by the environment (deserts). This would create additional economic strains on states and nations.
 - Additionally, **access to freshwater elevates the socio-economic factors and aids in removing people from poverty.**

2. Explain the concept of a *water footprint*. Identify two of your direct uses of water and two of your indirect (or virtual) uses of water.
 - **A water footprint is the amount of water a person uses directly and indirectly.** Direct use is **water used to drink, bathe, do dishes and laundry, cooking, and indoor plumbing.**
 - **Indirect use of water is considered virtual water use.** This is **water necessary to grow crops and cattle, energy used, and make products.**

3. What are some important environmental problems related to groundwater use?
 - Environmental problems associated with groundwater use are
 - **Dry wells become nonrenewable**
 - **Lack of access to fresh water**
 - **Depleted aquifers**
 - **Polluted aquifers**
 - **Land subsidence**

4. Identify two advantages of building dams. What are two different environmental impacts associated with the construction of dams?
- **Advantages realized through dam construction are:**
 - **Abundant drinking water**
 - **Inexpensive electricity generated by hydropower**
 - Provide irrigation water above and below the dam
 - Recreation and fishing in the resulting reservoir
 - Reduce flooding hazards downstream
 - **Environmental impacts from dam construction are:**
 - Resulting reservoir floods forests and croplands and displaces people
 - **Large water loss in the reservoir via evaporation**
 - **Deprives downstream areas of nutrient rich silt**
 - Risk of dam failure resulting in catastrophic devastation and loss of life (low risk)
 - Disrupts migrating fish and spawning (mitigated by fish ladders)
5. Identify four ways that you can conserve or reduce your use of water.
- Consumers can reduce their water footprint by:
 - **Use water more efficiently** (recycle and reuse water as gray water)
 - **Use rain barrels and build rain gardens (bioretention)** in urban areas
 - **Stop growing water intense crops in arid areas**
 - **Use permeable materials (concrete and asphalt) to allow greater groundwater recharge** instead of generating more stormwater runoff
6. Define and distinguish between *point* and *nonpoint sources* of water pollution. Which is easier to treat and control, and why?
- **Point sources discharge pollution into bodies of water at specific locations** through drainpipes, ditches, and sewer lines.
 - **Nonpoint sources are dispersed over a large area** and are generally associated with rainfall and snowmelt.
 - In the grand scheme of things, **nonpoint sources would be faster, cheaper, and easier to address because the causes are more readily known** and can be more easily remedied.
7. Explain why the dissolved oxygen in a body of water will decline when biodegradable wastes are discharged into it.
- Dissolved oxygen will decline at biodegradable pollution points because organisms and bacteria within the water flow are required to clean the biodegradable waste. This area is called the Decomposition zone. Dissolved oxygen levels will return to normal as the biodegradable material is filtered and cleaned by the water flow.

8. What is *cultural eutrophication*, and how does it affect aquatic ecosystems?
- **Cultural eutrophication is an accelerated form of eutrophication** where the introduction of nutrients like nitrates and phosphates is sped up **due to human interference**.
 - **Ponds and lakes will show signs on cultural eutrophication during times of hot weather and drought by producing dense growths (blooms) of organisms such as algae and cyanobacteria.**
 - **When the algae die, oxygen-consuming bacteria decompose them.**
 - **As a result, the bacteria will deplete dissolved oxygen in the water near the shore and at the bottom of the body of water.**
9. Describe the basic differences between the goals of the *Clean Water Act* and the *Safe Drinking Water Act*.
- **The Safe Drinking Water Act was designed to set strict limits (maximum containment levels) for pollutants in drinking water.** Currently there are limits on 91 potential contaminants in U.S. tap water.
 - **The Clean Water Act was designed to address pollution discharges into U.S. surface water** (creeks, lakes, streams, rivers, deltas, floodplains, wetlands, and oceans).
10. Is the treatment of wastewater during *secondary sewage treatment* primarily a physical, chemical or biological process? (Select only one.) Explain your answer.
- **Secondary sewage treatment is a biological process** whereby aerobic **bacteria** are utilized to **remove 90% of the dissolved and biodegradable oxygen demanding organic wastes.**