

APES Chapter 20-21 Supplemental Notes

Water Pollution & Solid Waste

- *STB-3.A. Identify differences between point and nonpoint sources of pollution.*
 - A point source refers to a single, identifiable source of a pollutant, such as a smokestack or waste discharge pipe.
 - Nonpoint sources of pollution are diffused and can therefore be difficult to identify, such as pesticide spraying or urban runoff.
- *STB-3.B. Describe the impacts of human activities on aquatic ecosystems.*
 - Oil spills in marine waters cause organisms to die from the hydrocarbons in oil. Oil that floats on the surface of water can coat the feathers of birds and fur of marine mammals. Some components of oil sink to the ocean floor, killing some bottom-dwelling organisms.
 - Oil that washes up on the beach can have economic consequences on the fishing and tourism industries.
 - Oceanic dead zones are areas of low oxygen in the world's oceans caused by increased nutrient pollution.
 - An oxygen sag curve is a plot of dissolved oxygen levels versus the distance from a source of pollution, usually excess nutrients and biological refuse.
 - Heavy metals used for industry, especially mining and burning of fossil fuels, can reach the groundwater, impacting the drinking water supply.
 - Litter that reaches aquatic ecosystems, besides being unsightly, can create intestinal blockage and choking hazards for wildlife and introduce toxic substances to the food chain.
 - Increased sediment in waterways can reduce light infiltration, which can affect primary producers and visual predators. Sediment can also settle, disrupting habitats
- *STB-3.C. Describe endocrine disruptors.*
 - Endocrine disruptors are chemicals that can interfere with the endocrine system of animals.
- *STB-3.D. Describe the effects of endocrine disruptors on ecosystems.*
 - Endocrine disruptors can lead to birth defects, developmental disorders, and gender imbalances in fish and other species.
- *STB-3.F. Explain the environmental effects of excessive use of fertilizers and detergents on aquatic ecosystems.*
 - Eutrophication occurs when a body of water is enriched in nutrients.
 - The increase in nutrients in eutrophic aquatic environments causes an algal bloom. When the algal bloom dies, microbes digest the algae, along with the oxygen in the water, leading to a decrease in the dissolved oxygen levels in the water. The lack of dissolved oxygen can result in large die-offs of fish and other aquatic organisms.
 - Hypoxic waterways are those bodies of water that are low in dissolved oxygen.
 - Compared to eutrophic waterways, oligotrophic waterways have very low amounts of nutrients, stable algae populations, and high dissolved oxygen.
 - Anthropogenic causes of eutrophication are agricultural runoff and wastewater release.
- *STB-3.G. Describe the effects of thermal pollution on aquatic ecosystems.*
 - Thermal pollution occurs when heat released into the water produces negative effects to the organisms in that ecosystem.
 - Variations in water temperature affect the concentration of dissolved oxygen because warm water does not contain as much oxygen as cold water.
- *STB-3.K. Describe solid waste disposal methods.*
 - Solid waste is any discarded material that is not a liquid or gas. It is generated in domestic, industrial, business, and agricultural sectors.
 - Solid waste is most often disposed of in landfills. Landfills can contaminate groundwater and release harmful gases.
 - Electronic waste, or e-waste, is composed of discarded electronic devices including televisions, cell phones, and computers.
 - A sanitary municipal landfill consists of a bottom liner (plastic or clay), a storm water collection system, a leachate collection system, a cap, and a methane collection system.

- *STB-3.L. Describe the effects of solid waste disposal methods.*
 - Factors in landfill decomposition include the composition of the trash and conditions needed for microbial decomposition of the waste.
 - Solid waste can also be disposed of through incineration, where waste is burned at high temperatures. This method significantly reduces the volume of solid waste but releases air pollutants.
 - Some items are not accepted in sanitary landfills and may be disposed of illegally, leading to environmental problems. One example is used rubber tires, which when left in piles can become breeding grounds for mosquitoes that can spread disease.
 - Some countries dispose of their waste by dumping it in the ocean. This practice, along with other sources of plastic, has led to large floating islands of trash in the oceans. Additionally, wildlife can become entangled in the waste, as well as ingest it.

- *STB-3.M. Describe changes to current practices that could reduce the amount of generated waste and their associated benefits and drawbacks.*
 - Recycling is a process by which certain solid waste materials are processed and converted into new products.
 - Recycling is one way to reduce the current global demand on minerals, but this process is energy-intensive and can be costly.
 - Composting is the process of organic matter such as food scraps, paper, and yard waste decomposing. The product of this decomposition can be used as fertilizer. Drawbacks to composting include odor and rodents.
 - E-waste can be reduced by recycling and reuse. E-wastes may contain hazardous chemicals, including heavy metals such as lead and mercury, which can leach from landfills into groundwater if they are not disposed of properly.
 - Landfill mitigation strategies range from burning waste for energy to restoring habitat on former landfills for use as parks.
 - The combustion of gases produced from decomposition of organic material in landfills can be used to turn turbines and generate electricity. This process reduces landfill volume.

- *STB-3.N. Describe best practices in sewage treatment.*
 - Primary treatment of sewage is the physical removal of large objects, often through the use of screens and grates, followed by the settling of solid waste in the bottom of a tank.
 - Secondary treatment is a biological process in which bacteria break down organic matter into carbon dioxide and inorganic sludge, which settles in the bottom of a tank. The tank is aerated to increase the rate at which the bacteria break down the organic matter.
 - Tertiary treatment is the use of ecological or chemical processes to remove any pollutants left in the water after primary and secondary treatment.
 - Prior to discharge, the treated water is exposed to one or more disinfectants (usually, chlorine, ozone, or UV light) to kill bacteria.