Botkin & Keller: *Environmental Science: Earth as a Living Planet-* **8th Ed.** APES- Chapter #19- *Water Pollution and Treatment-* Guided Reading

Name: ______

Learning Objectives: Degradation of our surface-water and groundwater resources

is a serious problem. After reading this chapter, you should understand the following:

- * What constitutes water pollution and what the major categories of pollution are
- * Why the lack of disease-free drinking water is the primary water-pollution problem in many locations around the world
- * How point and non-point sources of water pollution differ
- * What biochemical oxygen demand is, and why it is important
- * What eutrophication is, why it is an ecosystem effect, and how human activity causes it
- * Why sediment pollution is a serious problem
- * What acid mine drainage is, and why it is a problem
- * How urban processes can cause shallow-aquifer pollution
- * What the various methods of wastewater treatment are, and why some are environmentally preferable to others
- * Which environmental laws protect water resources and ecosystems

Read: Case Study: America's "First River": A Success Story

Summarize the story of the Hudson River and PCB's:

Water Pollution

1: How is water pollution defined?

- 2: What are some of the *common water pollutants*?
- 3: What is the *primary water pollution* problem in the world today?
- 4: How many people are exposed to waterborne diseases worldwide?

5: Name **3** sources of Surface Water and **3** sources of Groundwater Pollution from the chart (19.1)

A Closer Look 19.1: What is the Value of Clean Water to New York City? What is the main idea of this story?

Biochemical Oxygen Demand (BOD)

1: What is **BOD** and what are some *sources of it*?

- 2: Where does approximately 33% of all BOD in streams come from?
- 3: What about in **urban areas (BOD)**?

4: What is the *relationship between BOD and dissolved oxygen levels*? (What happens when BOD is high?)

- 5: Explain the **3 zones of BOD**:
- * Pollution Zone:
- * Active Decomposition Zone:

* Recovery Zone:

Waterborne Disease

1: What is Fecal Coliform Bacteria and where does it come from?

<u>Nutrients</u>

1: How do urban streams get high concentrations of Nitrogen and Phosphorus?

Eutrophication

1: Define Eutrophication:

2: What is the solution to *artificial or cultural eutrophication*?

A Closer Look 19.2: Cultural Eutrophication in the Gulf of Mexico *What is a dead zone and how is it created?*

<u>Oil</u>

1: Which Environmental Act was created after the Exxon Valdez disaster?

Sediment

1: Why is *sediment pollution* considered to be a two-fold problem?

2: What are some of the techniques employed by a sediment control program?

Acid Mine Drainage

1: Define Acid Mine Drainage and explain how it occurs:

2: What is the general equation for acid mine drainage?

3: What site was once designated by the U.S. Environmental Protection Agency as the *nation's worst hazardous waste site?*

Surface Water Pollution

1: What are some **point sources** of surface water pollution?

2: What are some **non-point sources** of surface water pollution?

3: What are the 2 approaches to dealing with surface water pollution?

Groundwater Pollution

1: _____% of the 175,000 known waste disposal sites in the United States may be producing plumes of hazardous chemicals that are migrating into groundwater resources.

- 2: What is **bioremediation**?
- 3: What are the 5 important points about groundwater pollution?
- 4: What is saltwater intrusion of well water?

Wastewater Treatment

1: Summarize how Septic Tank Sewage Disposal Systems work.

2: What happens during primary treatment of sewage?

3: What happens during secondary treatment of sewage?

4: When is advanced wastewater treatment used?

5: What are some of the risks associated with **Chlorine** treatment of wastewater that is later discharged?

Land Application of Wastewater

1: Explain the process of wastewater renovation and conservation cycle.

Wastewater and Wetlands

1: How can applying treated sewage to wetlands be helpful to the wetland ecosystem?

Water Reuse

1: What is the difference between indirect and direct water reuse?

Environmental Laws

- Make sure to *memorize the following laws*:
- Clean Water Act
- Federal Safe Drinking Water Act
- Water Quality Act

How safe do you believe the drinking water is in your home? How did you reach your conclusion? Are you worried about low-level contamination by toxins in your water? What could the sources of contamination be?

Read, "Is Water Pollution from Pig Farms Unavoidable" and answer the following:

1: Why was pig farming such a controversy in North Carolina during this time?

2: What did pig farmers do with the pig waste? Why was this allowed?

3: What is the lesson learned from North Carolina's "Bay of Pigs"?

4: What legislation has been created as a result of this catastrophe?

Study Questions:

1: Do you think outbreaks of waterborne diseases will be more common or less common in the future? *Why? Where are outbreaks most likely to occur?*

2: How does water that drains from coal mines become contaminated with sulfuric acid? *Why is this an important environmental problem?*

3: Do you think our water supply is vulnerable to terrorist attacks? *Why? Why not? How could potential threats be minimized?*

4: How would you design a system to capture runoff where you live before it enters a storm drain?