

Botkin & Keller: Environmental Science: Earth as a Living Planet- 8th Ed.
Chapter #5- Ecosystems: Concepts and Fundamentals Guided Reading Assignment

Name: _____

Case Study: Sea Otters, Sea Urchins, and Kelp: Indirect Effects of Species on One Another

1: Define: **Community Effect**

2: Explain WHY the Sea Otter is considered the Keystone Species in this ecosystem. (*Hint: Explain the food chain*)

3: **Why** were Sea Otters endangered and how did their numbers rebound?

5.1- The Ecosystem: Sustaining Life on Earth

1: Define **Ecosystem Structure**

2: What two main processes must occur to maintain an ecosystem?

5.2- Ecological Communities and Food Chains

1: What is the difference between a food chain and a food web?

2: Define: **Trophic Level**

3: Define: **Autotrophs, Heterotrophs, Carnivores, Herbivores, Decomposers**

4: Explain the food web of Yellowstone Hot Springs. Explain each trophic level (*include a photo*).

5: Explain a pelagic ecosystem. Explain each trophic level (include photos).

A Closer Look- Land and Marine Food Webs

1: Look at the terrestrial food web. Should we include people within this ecosystem's food web? That would place us within nature. OR should we place people outside of the ecosystem, thus separate from nature?

5.3- Ecosystems as Systems

1: Why are ecosystems considered to be **OPEN systems**?

2: Define: **Watershed**

5.4- Biological Production and Ecosystem Energy Flow

1: Define: **Energy**

2: Explain: **Ecosystem Energy Flow**- *What two ways does energy enter an ecosystem?*

The Laws of Thermodynamics and the Ultimate Limit on the Abundance of Life

1: **The First Law of Thermodynamics** is *also known as what?* **Define it.**

2: What is the **Second Law of Thermodynamics** say?

3: Define **Entropy** (*give an example*).

4: What is an intermediate system?

5.5- Biological Production and Biomass

1: What is **biomass**?

2: *Define the following:*

* **Biological Production**

* **Gross Production**

* **Net Production**

3: What are the **3 measures** that are used for biomass and biological production?

4: What is **primary production**- *who carries this out?*

5: What is **secondary production**- *who is involved?*

6: Who are **chemoautotrophs**? Explain- *where are they usually found?*

5.6- Energy Efficiency and Transfer Efficiency

- 1: What is *energy efficiency*?
- 2: How would energy efficiency look with a wolf and moose population? **Explain.**
- 3: What is *food-chain or trophic level efficiency*?
- 4: **Generally**, how much energy is lost to heat when being transferred between trophic levels?

5.7- Ecological Stability and Succession

- 1: What is **ecological succession**?
- 2: **Compare and contrast primary and secondary succession**- give an example of each.
- 3: Explain how succession would look in a **Dune**.
- 4: Explain how succession would look in a **Bog**.
- 5: Explain how succession would look in an **old-field**.
- 6: Explain how succession would look in a **coral reef**.

5.9- How Species Change Succession

- 1: Explain **facilitation** in succession and where is it most common?
- 2: Explain **interference** in succession and what it can lead to.
- 3: What is **chronic patchiness**? When does this occur?

Critical Thinking Issue: Should People Eat Lower on the Food Chain?

- 1: Why does the energy content decrease at each higher level of a food chain? What happens to the energy lost at each level?
- 2: Why it is appropriate to use mass to represent energy content?

3: Using the average of 21 kilojoules of energy to equal 1g of completely dried vegetation and assuming that wheat is 80% water, what is the energy content of the 333,000 kg of wheat shown in the pyramid? (show your work).

4: Make a list of environmental arguments for and against an entirely vegetarian diet for people. What might be the consequences for the United States agriculture if everyone in the country began to eat lower on the food chain?

5: How low do you eat on the food chain? Would you be willing to eat lower? Explain.

Study Questions:

1: Farming has been described as managing land to keep it in an early stage of succession. What does this mean, and how is it achieved?

2: Keep track of the food you eat during one day and make a food chain linking yourself with the sources of those foods.

Determine the biomass (grams) and energy (kilocalories) you have eaten.

Using an average of 5Kcal/g, then using the information on food packaging or assuming that your net production is 10% efficient in terms of energy intake, how much additional energy might you have stored during the day? (What is your weight gain from the food you have eaten?)