

ECOLOGY

Periods: 8-9

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Lesson – Food Chains and Webs --- “What’s for dinner?”

Every organism needs to **obtain energy** in order to live. For example, **plants get energy from the sun**, some animals eat plants, and some animals eat other animals.

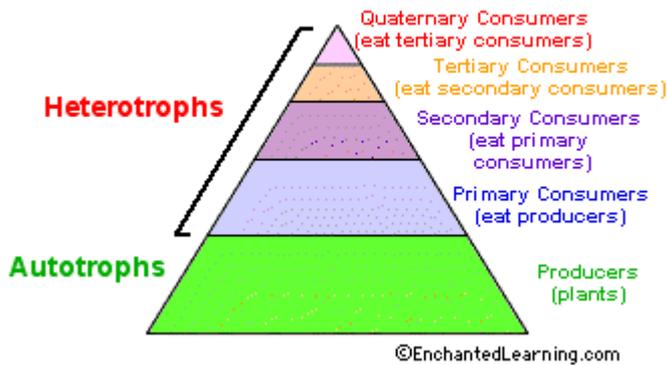
A **food chain** is the sequence of **who eats whom** in a biological community (an ecosystem) to obtain nutrition. A food chain starts with the **primary energy source**, usually the **sun** or boiling-hot deep sea vents. The next link in the chain is an **organism that make its own food** from the primary energy source – an example is **photosynthetic plants** that make their own food from sunlight (using a process called **photosynthesis**) and **chemosynthetic bacteria** that make their food energy from chemicals in hydrothermal vents. These are called **autotrophs** or **primary producers**.

Sample Food Chains

| Trophic Level | Grassland Biome | Pond Biome | Ocean Biome |
|---------------------|------------------|----------------------|--------------------|
| Primary Producer | grass ↓ | algae ↓ | phytoplankton ↓ |
| Primary Consumer | grasshopper ↓ | mosquito larva ↓ | zooplankton ↓ |
| Secondary Consumer | rat ↓ | dragonfly larva ↓ | fish ↓ |
| Tertiary Consumer | snake ↓ | fish ↓ | seal ↓ |
| Quaternary Consumer | hawk ↓ | raccoon ↓ | white shark ↓ |

Next come organisms that eat the autotrophs; these organisms are called **herbivores** or **primary consumers** – an example is a rabbit that eats grass. The next link in the chain is animals that eat herbivores – these are called **secondary consumers** – an example is a snake that eat rabbits. In turn, these animals are eaten by larger **predators** – an example is an owl that eats snakes. The **tertiary consumers** are eaten by **quaternary consumers** – an example is a hawk that eats owls. Each food chain end with a **top predator**, and animal with **no natural enemies** (like an alligator, hawk, or polar bear).

The Food Web



The arrows in a food chain show the flow of **energy**, from the sun or hydrothermal vent to a top predator. As the energy flows from organism to organism, energy is lost at each step. A network of many **food chains** is called a **food web**.

Trophic Levels:

The trophic level of an organism is the position it holds in a food chain.

1. **Primary producers** (organisms that make their own food from sunlight and/or chemical energy from deep sea vents) are the base of every food chain – these organisms are called **autotrophs**.
2. **Primary consumers** are animals that eat primary producers; they are also called **herbivores** (plant-eaters).
3. **Secondary consumers** eat primary consumers. They are **carnivores** (meat-eaters) and **omnivores** (animals that eat both animals and plants).
4. **Tertiary consumers** eat secondary consumers.
5. **Quaternary consumers** eat tertiary consumers.
6. Food chains “end” with top predators, animals that have little or no natural enemies.

When any organism dies, it is eventually eaten by **detritivores** (like vultures, worms and crabs) and broken down by **decomposers** (mostly bacteria and fungi), and the exchange of energy continues.

Some organisms' position in the food chain **can vary as their diet differs**. For example, when a bear eats berries, the bear is functioning as a **primary consumer**. When a bear eats a plant-eating rodent, the bear is functioning as a **secondary consumer**. When the bear eats salmon, the bear is functioning as a **tertiary consumer** (this is because salmon is a secondary consumer, since salmon eat herring that eat zooplankton that eat phytoplankton, that make their own energy from sunlight). Think about how **people's place in the food chain varies – often within a single meal!**

Numbers of Organisms:

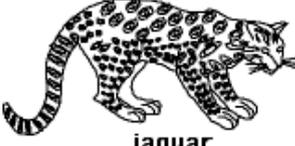
In any **food web**, **energy is lost each time one organism eats another**. Because of this, there have to be many **more plants than there are plant-eaters**. There are **more autotrophs than heterotrophs**, and more plant-eaters than meat-eaters. Each level has about **10% less energy** available to it because **some of the energy is lost as heat** at each level. Although there is **intense competition** between animals, there is also **interdependence**. When one **species goes extinct**, it can affect an entire chain of other species and have unpredictable consequences.

Equilibrium

As the number of **carnivores in a community increases**, they eat more and more of the herbivores, decreasing the herbivore population. It then becomes harder and harder for the carnivores to find herbivores to eat, and the population of carnivores decreases. In this way, the carnivores and herbivores stay in a **relatively stable equilibrium**, each limiting the other's population. A similar equilibrium exists between plants and plant-eaters.

Complete the Food Chains Worksheet

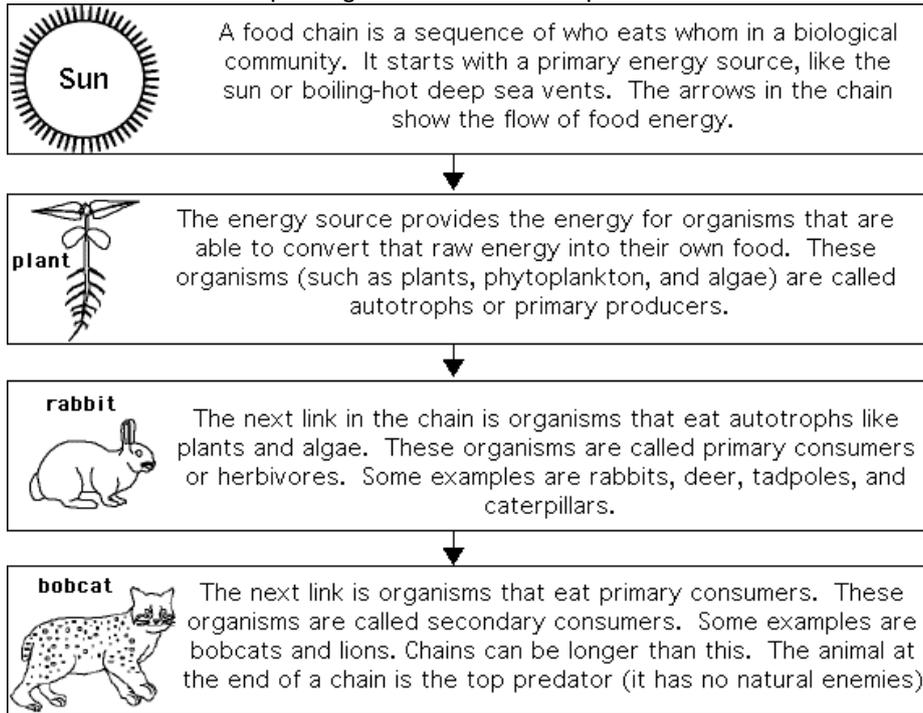
Circle the organisms that complete the food chains below.

| | | | | |
|--|--|--|---|---|
|  <p>Sun</p> | <p>a. plankton b. alligator c. fish d. grass e. chicken</p> |  <p>zebra</p> | <p>a. spider b. guppy c. lion d. wheat e. human</p> | |
|  <p>Sun</p> |  <p>algae</p> | <p>a. moth b. snail c. whale d. caterpillar e. snail</p> | <p>a. lion b. starfish c. fish d. grass e. crow</p> |  <p>raccoon</p> |
|  <p>Sun</p> |  <p>plants</p> | <p>a. javelina b. anaconda c. falcon d. grass e. spider</p> |  <p>jaguar</p> | |
|  <p>Sun</p> |  <p>grass</p> | <p>a. weasel b. spider c. seaweed d. wolverine e. cricket</p> |  <p>snake</p> | <p>a. sheep b. goat c. ant d. owl e. moose</p> |
|  <p>Sun</p> |  <p>phytoplankton</p> | <p>a. zooplankton b. algae c. seal d. walrus e. moss</p> | <p>a. jellyfish b. spider c. krill d. starfish e. clam</p> |  <p>humpback whale</p> |

1. Sun -> Grass -> Zebra-> Lion
2. Sun -> snail -> fish -> raccoon
3. Sun -> plants -> javelin -> jaguar
4. Sun -> grass -> weasel -> snake -> owl
5. Sun -> phytoplankton ->zooplankton -> krill -> humpback whale

Food Chain Worksheet

Read the passage then answer the questions below.



Questions

1. What do the arrows in a food chain represent? _____

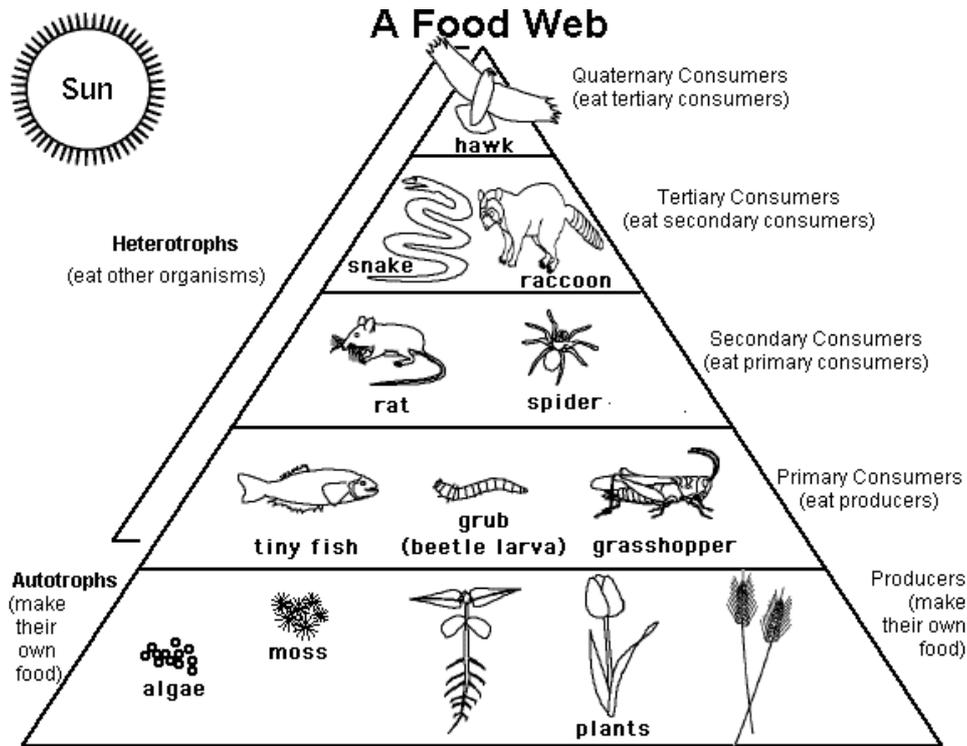
2. A food chain starts with an _____ source.
3. Organisms that make their own food are called _____
or _____.
4. Organisms that eat plants are called _____
or _____.
5. An animal with no natural enemies is a _____.

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1. The arrows in a food chain represent the flow of food energy.
2. A food chain starts with a primary source (Ex: sun).
3. Organisms that make their own food are called autotrophs or primary producers.
4. Organisms that eat plants are called primary consumers or herbivores.
5. An animal with no natural enemies is a top predator.

Food Web Worksheet

Read the passage then answer the questions below.



Questions

1. There are many more _____
than there are primary consumers.
2. Organisms that eat other organisms are called _____.
3. Organisms that make their own food are called _____
or _____.
4. Grass is _____.
5. Zebras (grass-eaters) are _____.
6. Lions (zebra-eaters) are _____.

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1. There are many more autotrophs/ producers than there are primary consumers.
2. Organisms that eat other organisms are called secondary consumers.
3. Organisms that make their own food are called autotrophs or producers.
4. Grass is autotrophs.
5. Zebra (grass-eaters) are primary consumers.
6. Lions (zebra-eaters) are secondary consumers.

Food Chain Quiz - Multiple choice comprehension questions
Color the circle by each correct answer.

| | |
|---|---|
| <p>1. A plant is ...</p> <ul style="list-style-type: none"> <input type="radio"/> A. an autotroph <input type="radio"/> B. a heterotroph <input type="radio"/> C. a primary producer <input type="radio"/> D. A and C | <p>6. A person who eats a chicken that ate grain is a ...</p> <ul style="list-style-type: none"> <input type="radio"/> A. primary producer <input type="radio"/> B. primary consumer <input type="radio"/> C. secondary consumer <input type="radio"/> D. quaternary consumer |
| <p>2. A cow is ...</p> <ul style="list-style-type: none"> <input type="radio"/> A. a primary consumer <input type="radio"/> B. a heterotroph <input type="radio"/> C. an herbivore <input type="radio"/> D. all of the above | <p>7. Primary consumers eat ...</p> <ul style="list-style-type: none"> <input type="radio"/> A. primary producers <input type="radio"/> B. primary consumers <input type="radio"/> C. secondary consumers <input type="radio"/> D. quaternary consumers |
| <p>3. Autotrophs ...</p> <ul style="list-style-type: none"> <input type="radio"/> A. make their own food <input type="radio"/> B. are the base of the food chain <input type="radio"/> C. are primary producers <input type="radio"/> D. all of the above | <p>8. Secondary consumers eat ...</p> <ul style="list-style-type: none"> <input type="radio"/> A. primary producers <input type="radio"/> B. primary consumers <input type="radio"/> C. tertiary consumers <input type="radio"/> D. quaternary consumers |
| <p>4. A lion that eats a zebra that ate grass is a ...</p> <ul style="list-style-type: none"> <input type="radio"/> A. primary producer <input type="radio"/> B. primary consumer <input type="radio"/> C. secondary consumer <input type="radio"/> D. quaternary consumer | <p>9. Tertiary consumers eat ...</p> <ul style="list-style-type: none"> <input type="radio"/> A. primary producers <input type="radio"/> B. primary consumers <input type="radio"/> C. secondary consumers <input type="radio"/> D. quaternary consumers |
| <p>5. A bear that eats a fish that ate bugs that ate algae is a ...</p> <ul style="list-style-type: none"> <input type="radio"/> A. primary producer <input type="radio"/> B. primary consumer <input type="radio"/> C. secondary consumer <input type="radio"/> D. tertiary consumer | <p>10. Quaternary consumers eat ...</p> <ul style="list-style-type: none"> <input type="radio"/> A. primary producers <input type="radio"/> B. primary consumers <input type="radio"/> C. secondary consumers <input type="radio"/> D. tertiary consumers |

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- 1. D.
- 2. D.
- 3. D.
- 4. C.
- 5. D.
- 6. C.
- 7. A.
- 8. B.
- 9. C.
- 10. D.

Food Chain Quiz #2 - Multiple choice comprehension questions
Color the circle by each correct answer.

| | |
|---|---|
| <p>1. A heterotroph ...</p> <ul style="list-style-type: none"> <input type="radio"/> A. is an autotroph <input type="radio"/> B. eats other organisms <input type="radio"/> C. is a primary producer <input type="radio"/> D. A and C <input type="radio"/> E. none of the above | <p>6. A top predator...</p> <ul style="list-style-type: none"> <input type="radio"/> A. has no natural enemies <input type="radio"/> B. is a meat eater <input type="radio"/> C. is a heterotroph <input type="radio"/> D. all of the above <input type="radio"/> E. none of the above |
| <p>2. A cow (that eats plants) is ...</p> <ul style="list-style-type: none"> <input type="radio"/> A. a primary consumer <input type="radio"/> B. a heterotroph <input type="radio"/> C. an herbivore <input type="radio"/> D. all of the above <input type="radio"/> E. none of the above | <p>7. A detritivore ...</p> <ul style="list-style-type: none"> <input type="radio"/> A. is an autotroph <input type="radio"/> B. eats decomposing matter <input type="radio"/> C. kills animals <input type="radio"/> D. all of the above <input type="radio"/> E. none of the above |
| <p>3. If a person eats a vegetable, the person is acting as ...</p> <ul style="list-style-type: none"> <input type="radio"/> A. a primary producer <input type="radio"/> B. a primary consumer <input type="radio"/> C. a secondary consumer <input type="radio"/> D. a tertiary consumer <input type="radio"/> E. a quaternary consumer | <p>8. As nutritional energy passes through the food chain, energy ...</p> <ul style="list-style-type: none"> <input type="radio"/> A. is lost <input type="radio"/> B. is gained <input type="radio"/> C. remains constant <input type="radio"/> D. increases, then decreases <input type="radio"/> E. decreases, then increases |
| <p>4. If a person eats a steak (from a cow), the person is acting as ...</p> <ul style="list-style-type: none"> <input type="radio"/> A. a primary producer <input type="radio"/> B. a primary consumer <input type="radio"/> C. a secondary consumer <input type="radio"/> D. a tertiary consumer <input type="radio"/> E. a quaternary consumer | <p>9. There are more primary producers than there are ...</p> <ul style="list-style-type: none"> <input type="radio"/> A. primary consumers <input type="radio"/> B. secondary consumers <input type="radio"/> C. tertiary consumers <input type="radio"/> D. quaternary consumers <input type="radio"/> E. all of the above |
| <p>5. If a person eats a salmon (that ate smaller fish that ate algae), the person is acting as ...</p> <ul style="list-style-type: none"> <input type="radio"/> A. a primary producer <input type="radio"/> B. a primary consumer <input type="radio"/> C. a secondary consumer <input type="radio"/> D. a tertiary consumer <input type="radio"/> E. a quaternary consumer | <p>10. There are more tertiary consumers than there are ...</p> <ul style="list-style-type: none"> <input type="radio"/> A. primary consumers <input type="radio"/> B. secondary consumers <input type="radio"/> C. tertiary consumers <input type="radio"/> D. quaternary consumers <input type="radio"/> E. all of the above |

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1. E.
2. D.
3. B.
4. C.
5. D.
6. D.
7. B.
8. A.
9. E.
10. D.

Match each Food Chain Word to its Definition.

Draw a line from each word on the left to its definition.

food chain The network of all the inter-related food chains in a biological community.

food web The sequence of who eats whom in a biological community.

autotroph An organism that gets its energy by eating other organisms.

heterotroph An organism that makes its food from light or chemical energy without eating.

carnivore An organism that eats plants.

herbivore An organism that eats meat.

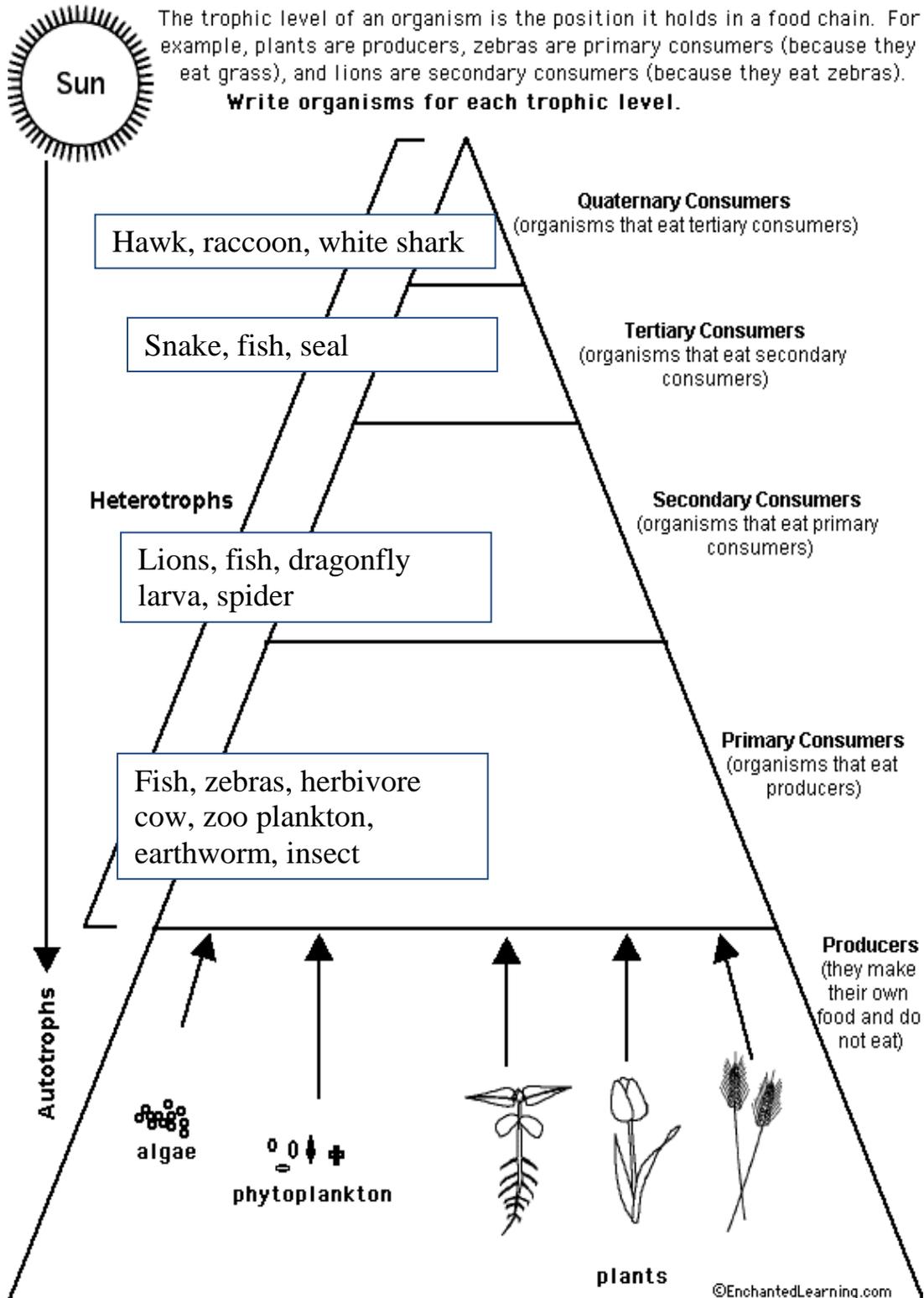
primary consumer A meat-eater that eats primary consumers.

secondary consumer A meat-eater that eats tertiary consumers.

tertiary consumer A meat-eater that eats autotrophs.

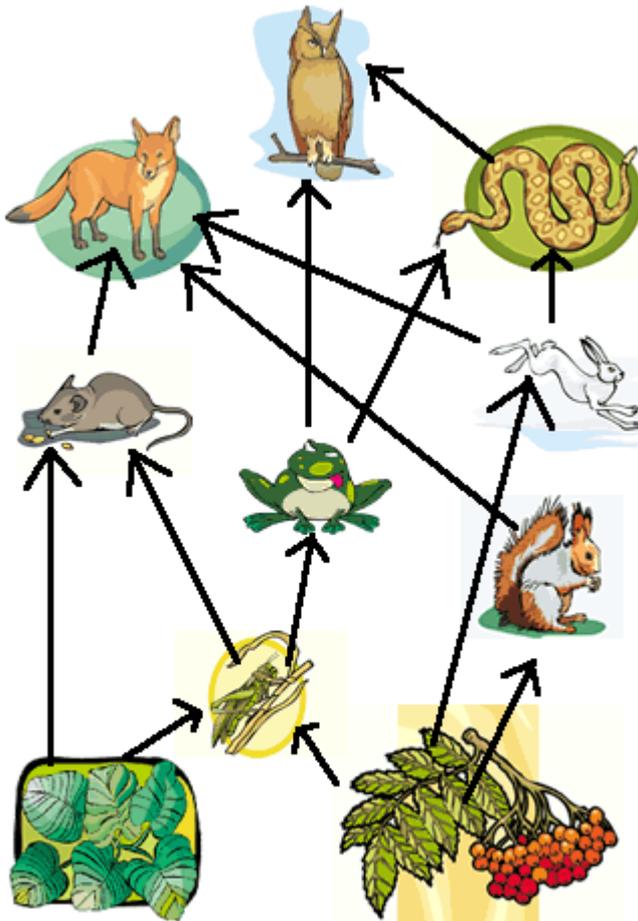
quaternary consumer A meat-eater that eats secondary consumers.

Food Chain Trophic Levels - Worksheet



Worksheet – Introduction to Food Webs

Food Web Worksheet



Identify the:

1. Producers
Plants, leaves, shrubs, any type of vegetation in this chart.

2. Primary Consumers
Squirrel, grasshopper, rat, rabbit

3. Secondary Consumers
fox, rat, frog

4. Herbivores
squirrel, grasshopper, rabbit, rat

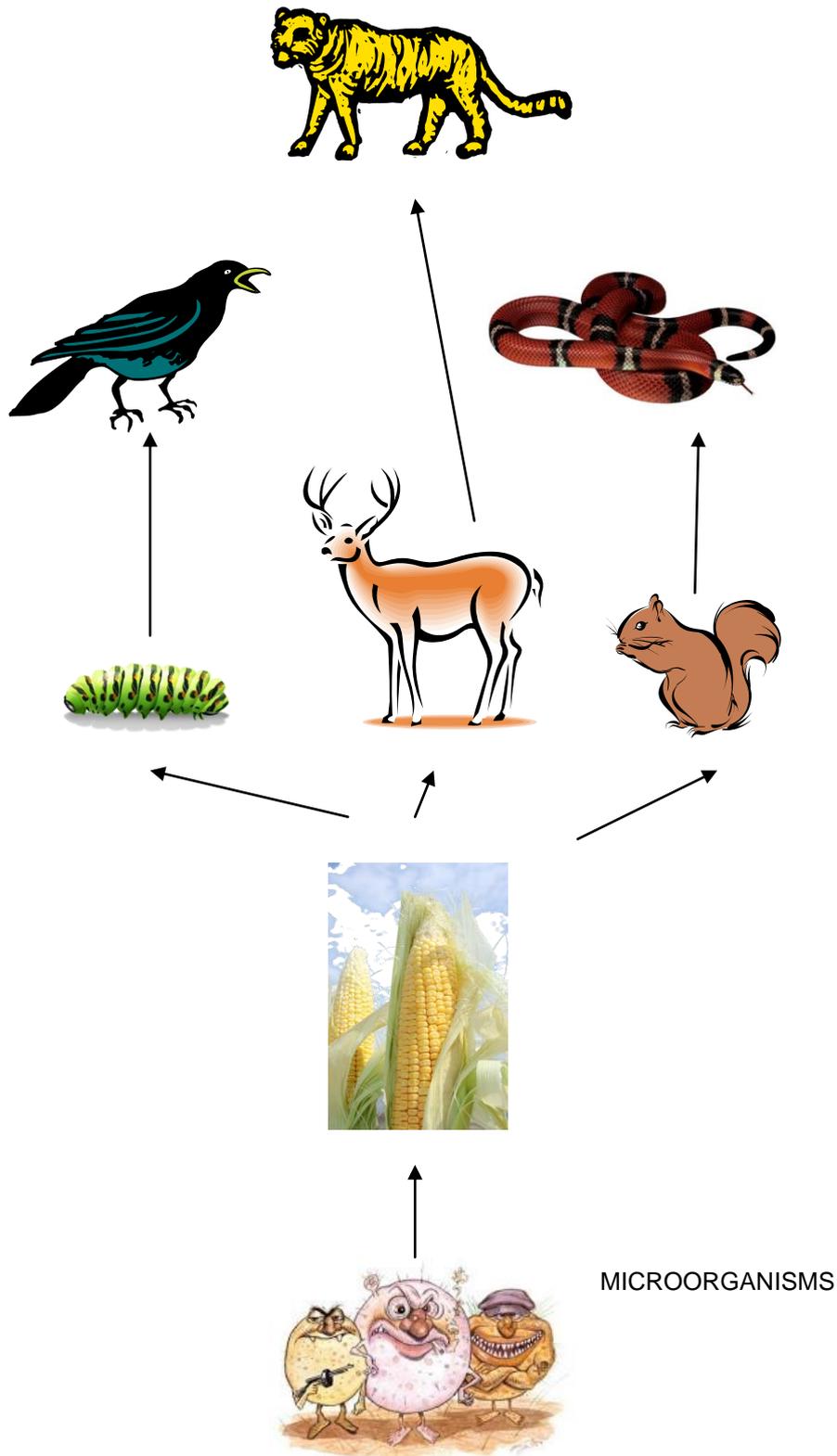
5. Carnivores
snake, fox, owl, frog

6. Omnivores
rat

7. What elements are missing from this food web?
The elements that are missing from the food web are detritivores, decomposers, and quaternary consumers.

On the back, **construct a Food web** using the following animals. This ecosystem represents a farm area. The corn is the main source of food for many of the herbivores in the area. You do not have to draw pictures; you can just use the animal names and draw arrows between them.

SNAKE, CORN, CATERPILLAR, DEER, CROW, MOUSE, COUGAR, SQUIRREL, MICROORGANISMS (decomposers)



Worksheet – Food Webs

1. Define and provide examples for each of the following groups of heterotrophs.

a) Herbivores – Organisms that eat only producers. (Usually an animal that feeds on plants.) (Ex: caterpillars, grasshoppers, zooplankton, etc.)

b) Carnivores – Organisms that eat consumers. (Usually an animal that eat meat.) (Ex: cougars, raccoon, white shark, etc.)

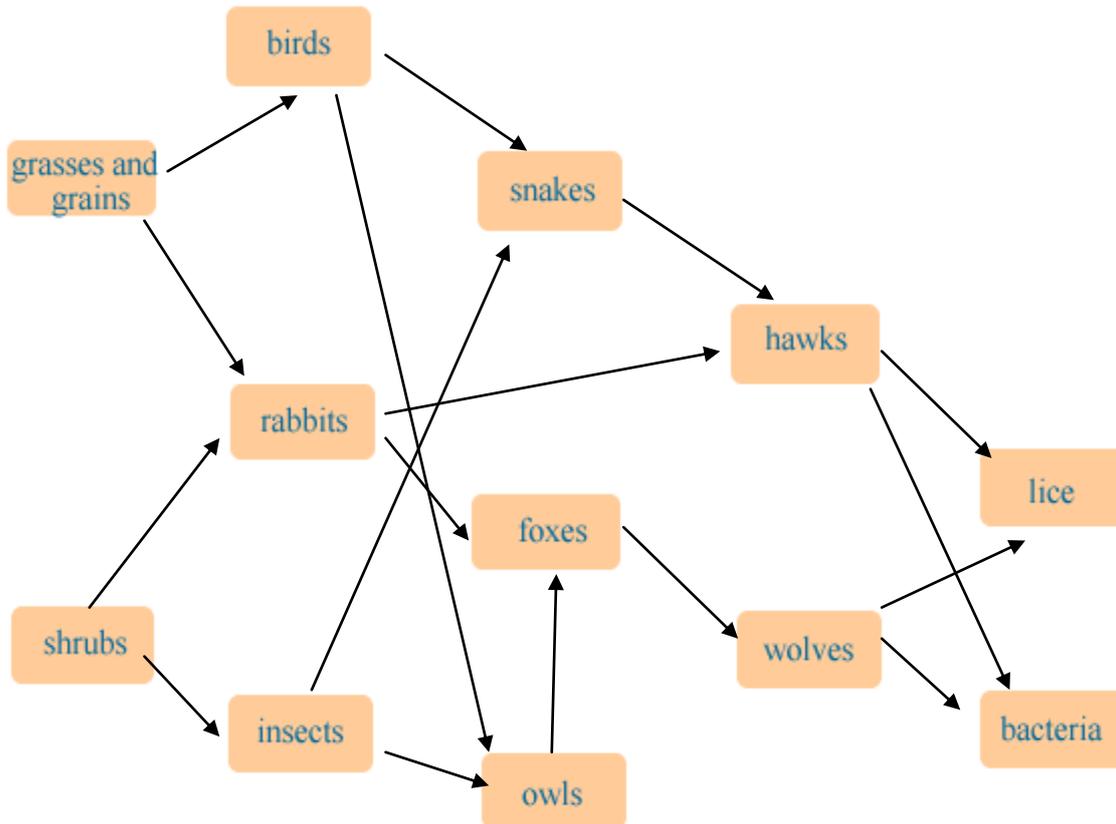
c) Omnivores – Organisms that eat producers or consumers. (Ex: Humans, Grizzly bear, skunk, raccoon, crow)

d) Saprophytes – A plant, fungus, or microorganism that lives on dead or decaying organic matter. (Ex: Rhizopus (bread mould), mucor (pin mould), Yeast, and Agaricus (a mushroom).

e) Decomposers- An organism, esp. a soil bacterium, fungus, or invertebrate that decomposes organic material. (Ex: Fungi, Bacteria, and Actinomycetes)

2. Using the organisms named below create a food web which represents the flow of energy between organisms by using arrows to connect the organisms.

(Note: You should have more than one arrow pointing towards and pointing away from any given organism.)



Lab Exercise 1 - From Land to Mouth

A field of corn contains a certain amount of food energy. If cattle eat the corn, they will gain some of the food energy. How does the amount of energy in the corn compare with the amount of energy in the cattle? Is it more efficient to feed on corn or beef? In this activity, you will compare the energy content of some familiar human foods.

You will need: graph paper, calculator, and colored pencils/markers

What to do:

1. The table below lists the average amount of energy (in kilojoules per square meter of land per year) in different organisms that people use for food.

| Organism | Energy (KJ/m ² /year) | Ranking |
|-------------------------|----------------------------------|---------|
| Wheat cereal | 3 400 | 6 |
| Oranges and grapefruits | 4 200 | 9 |
| Peanuts | 3 850 | 8 |
| Rice | 5 200 | 10 |
| Potatoes | 6 700 | 12 |
| Carrots | 3 400 | 6 |
| Other vegetables | 840 | 4 |
| Apples | 6 300 | 11 |
| Peaches | 3 800 | 7 |
| Beet sugar | 8 300 | 13 |
| Cane sugar | 14 650 | 14 |
| Corn | 6 700 | 12 |
| Milk (cow) | 1 800 | 5 |
| Eggs (chicken) | 840 | 4 |
| Chicken | 800 | 3 |
| Pork (pig) | 800 | 3 |
| Beef (cow) | 550 | 2 |
| Fish | 8 | 1 |

- a. Organize the data from LEAST energy to MOST energy. (Do this under the "Ranking" column in the table above)
- b. Make a bar graph to compare the relative amounts energy in each organism:
 - i. Include a LEGEND:
 - Use one color for producers and another color for consumers
 - ii. Label bottom with the names of each organism
 - iii. Label the left side with the energy

Assignment 1 - Create a concept map

Over the duration of this unit you will be responsible for collecting recent articles about 'Ecology' from newspaper and magazines. Each article you collect should be referenced with the source, date and page and stored in a folder. If the article can not be removed from its source, you must provide a summary of the article in point form. You must collect a *minimum* of **15 separate articles** throughout the unit.

Towards the end of the unit you will complete the following tasks using the articles that you have collected.

Task 1 - Prepare a concept web / map of the information contained in the articles that you have collected. If you need directions to create a concept map or concept web, see Creating a Concept Map, in Appendix A.

Task 2 - Write a one page summary that explains what you have learned using your concept web as a guide.

In this assignment, you are organizing a set of key concepts or ideas about ecology. The key concepts or ideas will come from the news articles you have collected.

The topic for this concept web is ecological news. Your original list of words or phrases must come from the recent news articles that you have collected. First, read through each of the 15 articles you have collected. As you read, highlight the key words or phrases in each of the articles. Generate a list of key concepts or ideas for your concept web using the words you have highlighted. After you have generated your list of words, follow steps 2 and 3 above to complete your concept web.

Evaluation:

1. Articles (minimum 15)

Current, properly referenced or summarized [15 marks]

2. Concept Web / Map

Complete, organized, neat [15 marks]

For Assignment 2, you have two options to choose from

OPTION 1: Build a food web

1. Choose a particular type of ecosystem (ex. freshwater, forest, prairie).
2. Research and create a list of the types of producers and consumers that live in the type of ecosystem you have chosen. (20 –25 organisms)
3. Do some further research to develop feeding relationship connections between the organisms you have listed?
4. Using a piece of plain white paper (min. size of 8 1/2 x 11) create a food web from the organisms you have listed
5. Examine your food web. Each individual food chain within your web should be complete and contain a producer, a top order consumer and all of the organisms in between. Your web should contain a minimum of 20 organisms. Be sure to include a decomposer or two.
6. Check your web one last time to be sure your arrows are pointing in the right direction and it is easy to follow. Add a title and few pictures or graphics for creativity.
7. Submit your web for evaluation.

Note: An assignment in a future lesson will require you to refer back to the food web that you have designed in this assignment. Be sure to keep your food web after it has been evaluated and returned to you.

Food Web Evaluation

1. Completeness [15 marks]
 - web contains a minimum of 20 organisms;
 - each food chain within the web contains a producer and top order consumer;
 - arrows properly indicate the direction of energy flow
2. Neatness and Creativity [5 marks]
 - web is easy to read and energy pathways are easy to follow
 - color and pictures have been used

Option 2: Biome Children's Book

Introduction: Children's Book

Students will choose one of the biomes found on the Earth to research and write a book designed for a third grade audience. The book will cover many aspects of a specific ecosystem within that biome. In order to write your book, you must have an excellent understanding of your biome and include all the items listed in the rubric. Also, remember that a 3rd grade audience would like pictures so include as many pictures as you can in your book. These pictures can be hand-drawn or computer-generated.

The requirements of the book are explained below.

Assignment:

| | |
|---|-------------------------------------|
| You are to choose one of the sixteen biomes found on our planet. These biomes are listed below. | |
| • Desert | • Savanna |
| • Chaparral | • Temperate Grassland |
| • Coniferous Forest | • Temperate Broadleaf Forest |
| • Tundra | • Lakes |
| • Wetlands | • Streams and Rivers |
| • Estuaries | • Intertidal Zones |
| • Ocean Pelagic | • Coral Reefs |
| • Marine Benthic Zone | • Tropical Rain Forest |

Within the biome you have chosen, try to focus on a particular ecosystem. For example -
Biome:

Tropical Rain ForestEcosystem: El Yunque Rainforest, Puerto Rico.

Within the context of your story, the following items must be included:

- A brief definition of the terms biome and ecosystem.
 - A geographic description of the biome/ecosystem chosen.
 - Abiotic factors: definition and how they affect the ecosystem.
 - Biotic factors: definition and how they affect the ecosystem.
 - Limiting factors (density-dependent and density-independent): definitions and at least two specific examples of each type of limiting factor.
 - Organisms found in this ecosystem: Producers (4 minimum) Consumers- primary, secondary, tertiary (6 minimum, 2 of each)
 - Description of a food web consisting of at least fifteen different organisms (names of organisms must be included).
 - Predator-prey relationships within the ecosystem (2 examples) – You must explain the relationship and indicate why the relationship is either beneficial or detrimental to the ecosystem.
 - An energy (productivity) pyramid or biomass pyramid.
 - A description of how the ecosystem has had (or could) rebuild after a natural disaster (secondary succession). Be sure to include the order in which new organisms would return to the ecosystem.
 - The impact of human activity on this ecosystem, including a prediction of what may happen to this ecosystem in the future.
- In addition to the required information above, your book must include a works cited page. This page should be located at the end of the book and must include a minimum of five sources.
- The story must be in story book format and must be handed in as a hard copy. An electronic copy will not be accepted.
 - There is no minimum length for the story book. The only requirement is that all required topics are presented in the book.

- The book will be graded on its biological accuracy, creativity, and the inclusion of the required topics.
- The book will be worth 100 points and is due on **December 19TH**. There will be a 5 pt. deduction per day for late assignments. I have included a rubric to assist you in the creation of your book.

Rubric for Biome Children's Book

| Criteria for Grading | Point Value | Points Earned |
|--|-------------|---------------|
| <ul style="list-style-type: none"> • Was the book written at a level a 3rd grader could understand or was the information copied directly from a biology text or Internet site? | 10 | |
| <ul style="list-style-type: none"> • Were pictures included to attract the interest of the reader? (Pictures can be hand-drawn or computer generated. Extra Points may be given for hand-drawn pictures.) | 10 | |
| Were each of the following required components included in the book? | | |
| <ul style="list-style-type: none"> • A brief definition of the terms biome and ecosystem. | 10 | |
| <ul style="list-style-type: none"> • A geographic description of the biome/ecosystem chosen. | 5 | |
| <ul style="list-style-type: none"> • Definition of abiotic factors and how they affect the ecosystem. | 5 | |
| <ul style="list-style-type: none"> • Definition of biotic factors and how they affect the ecosystem. | 10 | |
| <ul style="list-style-type: none"> • Definition of density-dependent limiting factors and density-independent limiting factors and at least two specific examples of each type of limiting factor. | 10 | |
| <ul style="list-style-type: none"> • Organisms found in this ecosystem: Minimum of 4 producers Minimum of 6 consumers- 2 primary, 2 secondary, and 3 tertiary | 10 | |
| <ul style="list-style-type: none"> • Description of a food web consisting of least fifteen different organisms (names of organisms must be included). This can be a diagram or picture. 2 examples of predator-prey relationships within the ecosystem. You must explain the relationship and indicate why the relationship is either beneficial or detrimental to the ecosystem. | 10 | |
| <ul style="list-style-type: none"> • An energy (productivity) pyramid or biomass pyramid. | 10 | |
| <ul style="list-style-type: none"> • Works Cited or Bibliography page with at least 5 sources. | 10 | |
| EXTRA CREDIT: A description of how the ecosystem has had to or could rebuild after a natural disaster (secondary succession). Be sure to include the order in which new organisms would return to the ecosystem | [5] | |

| | | |
|--|-----|---------------|
| EXTRA CREDIT: The impact of human activity on this ecosystem, including a prediction of what may happen to this ecosystem in the future. | [5] | |
| TOTAL POINTS: | 100 | POINTS EARNED |
| | | |
| COMMENTS: | | |

Assignment -3 Human Impact on food chains and webs

Humans have the ability to have a great impact on ecosystems. Living organisms are a significant portion of any ecosystem, therefore any activity that affects an ecosystem is also likely to affect the organisms within that ecosystem. If organisms are affected the food chains webs that the organisms are a part of will also feel the affects.

In the following assignment you will brainstorm to create a list of number of human activities that interfere with ecosystems. You will then research and present information on the affects one of these activities has on the organisms in a food chain or web.

Procedure:

With a partner create a list of human activities that may interfere with the organisms in an ecosystem. Keep in mind that organisms are anything living so you can include activities that affect plants either directly or indirectly.

The link below will provide you with a few activities that may help you get started.

<http://www.sturgeon.ab.ca/rw/Pyramids/interfere.html>

Using your list, choose **ONE** of the activities that you would like to research **AND PRESENT TO THE CLASS**. You will need to get your topic approved from me before starting the research.

Research this activity and record information about the following:

- 1. An explanation of the human activity.** (What is the activity? Why is it done? Is it necessary?)
- 2. How does this activity interfere with food chains and webs?** (Be sure to mention initial and long-term effects. Remember that if one organism in a food chain is affected others will likely be affected as well. If other organisms are not mentioned, you may need to do further research to find out what types of organisms feed on or are feed on by the initial organism affected.)
- 3. What can be done to reduce the impact of this activity?** Your answer to this question will include preventative measures and/or alternatives to the human activity.

You will need to present your information to the class on an assigned date.

Here are the presentation guidelines

- PPT, or posters, or pamphlets
- No more than 15 minutes
- Both of you should do the talking
- ABOVE ALL – MAKE THE PRESENTATION INFORMATIVE AND INTERESTING.

Your presentation date is on _____

Evaluation:

Information Presented:

[25 marks]

- An explanation of the human activity _____/5
- A description of how this activity interferes with food chains and webs _____/10
- Suggestions to reduce the impact of this activity _____/7
- Mechanics for information presented (ie. spelling, grammar, sentence structure) _____/3

Visual Product:

[10 marks]

- Is the information clear and easy to understand?
- Is it colorful?
- Have pictures or diagrams been produced and used?

TOTAL [35 MARKS]

Ecology Glossary

1. **Ecosystem:** *interactions between the **biotic** (living) organisms and the **abiotic** (non-living) materials and how *materials and energy* are transferred.*

 - a) **biotic** – *living or dead organisms; made up of cells.*
(examples: plants, animals)
 - b) **abiotic** – *non-living materials; basic unit is *elements* also includes *energy*.* (examples: plastic, oxygen, water, rocks, light, heat)

2. **Producers:** *turn the sun's *light energy* into *chemical (food) energy*.*
*They make their own food by the process called *Photosynthesis*.*
*Only find Producers on the *first trophic level*.*
(examples: plants, algae, bacteria)
3. **Consumers:** *can not make their own food (chemical energy)*
They use the chemical energy from other living organisms.
Consumers need to eat Producers or Consumers to get their food energy.
*Consumers are found on the *second or higher trophic levels*.*
 - a) **Primary Consumer** – *first consuming organism in a *food chain*.*
SECOND TROPHIC LEVEL
(examples: herbivores or omnivores)
 - b) **Secondary Consumer:** *second consuming organism in a *food chain*.*
THIRD TROPHIC LEVEL
(examples: carnivores or omnivores)
 - c) **Tertiary Consumer:** *third consuming organism in a *food chain*.*
FOURTH TROPHIC LEVEL
(examples: carnivores or omnivores)
4. **Trophic Level:** *feeding level*
5. **Types of Animal Consumers:**
 - a) **Herbivores:** *only eat *PRODUCERS* (such as plants)*
 - b) **Carnivores:** *eat *CONSUMERS* (herbivores or carnivore or omnivores)*
 - c) **Omnivores:** *eat *PRODUCERS* or *CONSUMERS**
6. a) **Food Chain:** *starts with a *producer* and *only connects* with *single links* (arrows) to the *consumers*.*
example: a typical food chain in a field ecosystem might be:
grass ---> grasshopper --> mouse ---> snake ---> hawk
 - b) **Food Web:** *multiple (many) food chains that *interconnect* showing *many feeding relationships*.*
7. a) **Scavengers** – *feed on the *bodies* of *larger dead animals*.*
(examples: vultures, eagles, ravens, hyenas, some ants, and beetles)
- b) **Detritivores** – *feed on *bodies* of *smaller dead animals* and *plants* and *dung*.*
(examples: crabs, earthworms, wood beetles, carpenter ants)
 - **Decomposers:** *feed on any remaining dead plant and animal matter; they break down the cells and get the last remaining energy.*
(examples: bacteria, fungi)

8. **Population** – *organisms that belong to the same species that live in the same ecosystem.* (ex: people-species in Halifax-ecosystem)
9. **Carrying Capacity** - *largest population of a species that an ecosystem can support.*
- a) **Competition:** demand for resources (ex: food, water, mates, space)
- **Intraspecific Competition:** competition within a species. (example: wolves vs. wolves)
 - **Interspecific Competition:** competition between species. (example: wolves vs. coyotes)
- b) **Population Density:** *the number of organisms within a given space.*
- **Density dependent factors:** *have a greater effect limiting population size when population number increases; especially play a role when the carrying capacity is reached* (example: food supply, predation, competition, disease)
 - **Density independent factors:** *limit population size no matter the size of the population (whether 10 or 1000 organisms)* (example: climate, oxygen level, natural disasters like hurricane, tornado, forest fire, earthquakes, floods)

10) Biological Magnification - the process whereby substances for example poisons collect in the bodies of organisms and progressively higher concentrations towards the top of the food chain example: DDT

Biological Magnification Activity in class: Each blade of grass gets DDT when they take in water. DDT gets stored in the plants along with stored energy. The grass gets eaten by the rabbits but rabbits eat many blades of grass and get all the DDT present. Now the fox eats many rabbits and the DDT from each rabbit goes to the fox. Therefore, the fox has more DDT than any organism below it on the Food Web.

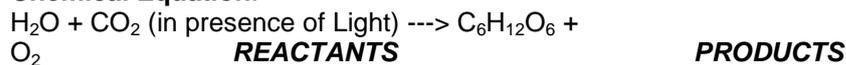
11) Nutrients - chemical elements used by organisms to build and operate their bodies.
example: carbon (C), oxygen (O), hydrogen (H), nitrogen (N)

12) Nutrient Cycles - movement of nutrients through the environment.
example: Carbon cycle; nitrogen cycle

13) Closed system - an environment in which substances do not enter or leave
example: Earth is often referred to as a closed system

14) **Photosynthesis** - the **change** of **light** energy to **chemical energy** (sugars) by **producers**.

Chemical Equation:



15) **Cellular Respiration** - the **change** of **chemical** energy (sugars) into **energy** that is **used** by organisms such **activities** as **metabolism** (maintaining body temperature, repairing cells, growth); **reproduction** and **movement**.



16) **Nitrogen Fixation** - the **changing** of **nitrogen gas** (N_2) in the atmosphere **into ammonium** (NH_4^+); nitrogen fixation is done by **bacteria** that **live** in the **soil** or on the **roots** of **legumes**.

17) **Nitrification** - the **changing** of **ammonium** (NH_4^+) in the **soil** into **nitrates** (NO_3^{-1}); nitrification is done by **bacteria** that **live** in the **soil**.

18) **Denitrification** - the **changing** of **nitrates** (NO_3^{-1}) into **nitrogen gas** (N_2) that **returns** to the **atmosphere**; denitrification is done by **bacteria** that **live** in the **soil**.

19) **Eutrophication** - a **water system** that has been **enriched** by **nutrients** (in particular nitrates) needed by plants; often nutrients from sewage and run-off over-enrich the water system **causing** an **increase** in **bacterial growth** and **oxygen depletion** that can **result** in the **loss** of **organisms** that live in the water system.

Appendix A

What is a concept web?

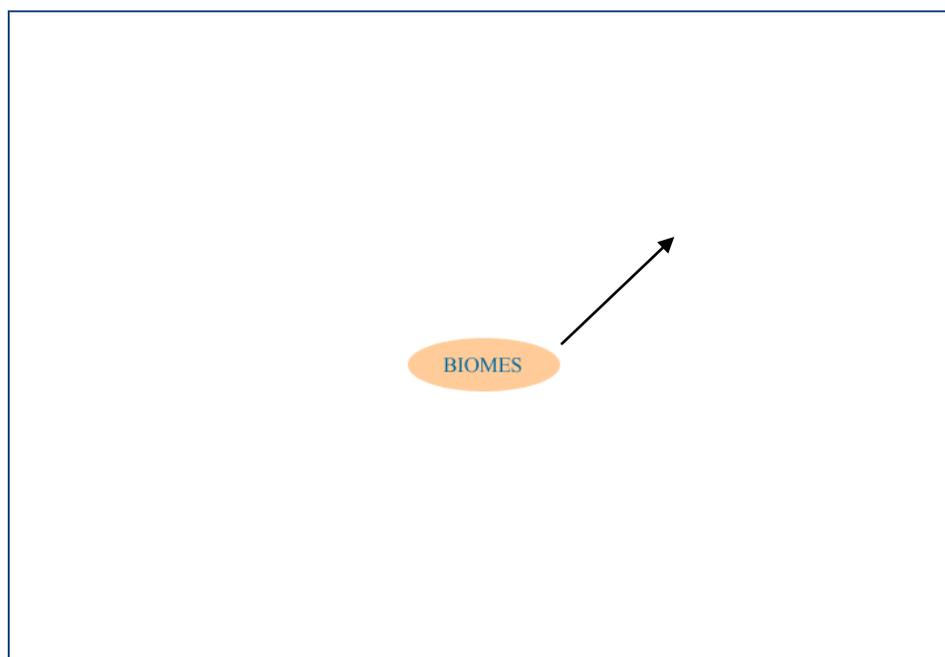
A concept web is a method of organizing ideas or concepts related to a key subject or topic. A concept web helps you to diagram the relationships between ideas or concepts.

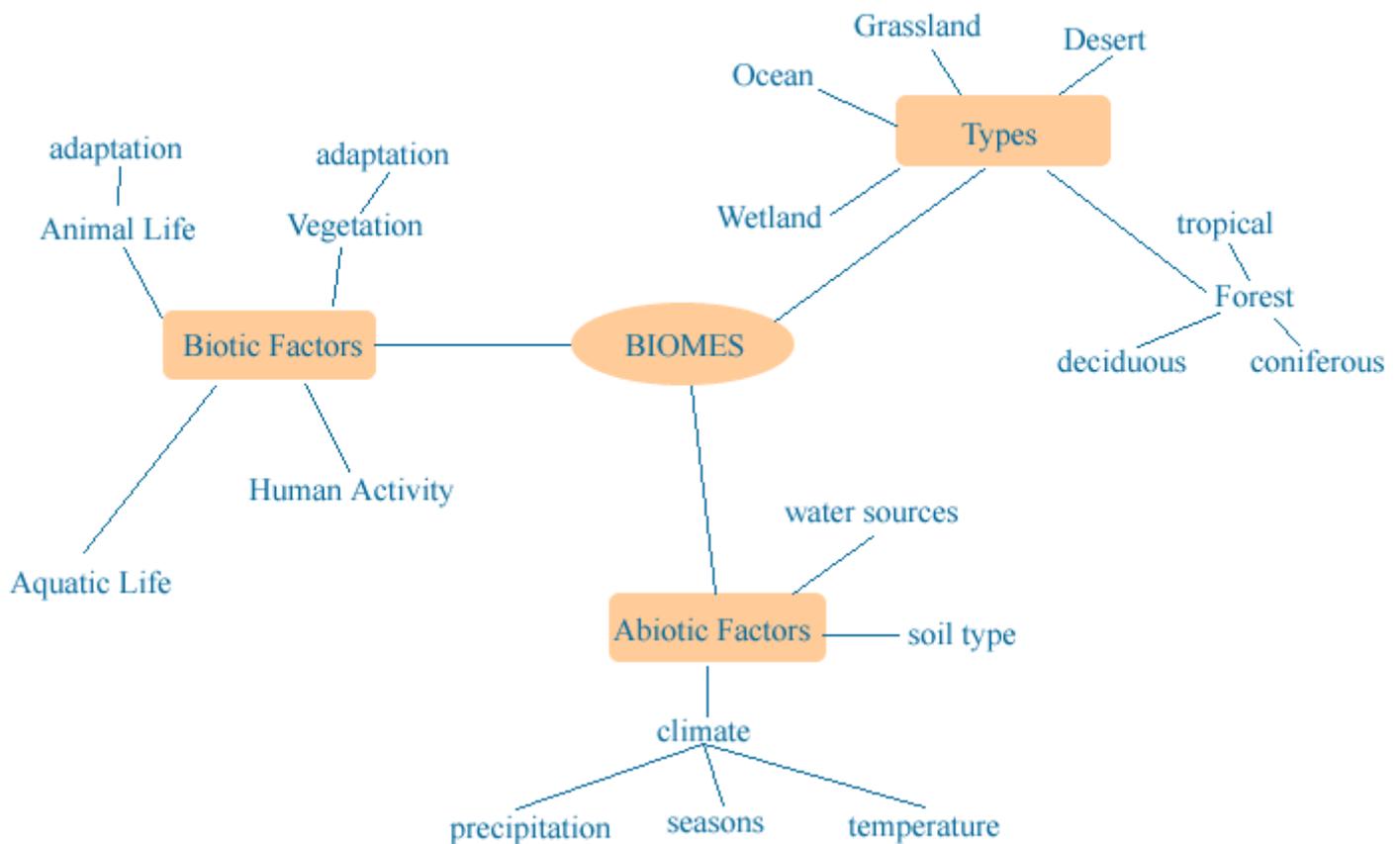
Steps to Creating a Concept Web:

1. Generate a list of words or phrases related to your key subject or topic.

For example: If you were to create a concept web on the topic of *biomes*, you could begin by brainstorming a list of words and phrases related to this topic:

3. Group related words or phrases, from your list, on web branches. Name each branch with a category heading that describes all of the words on that level. In order to complete the organization of your words, you may wish to create levels of branches for some of the key ideas. (See the *Types* branch in the example below.)





As you group the words and phrases from your list, new ideas may come to mind. Feel free to add these words to your web. If you think of new branches or category headings, add these as well. Also, do not feel that you have to use every single word or phrase from your original list.

Remember that a concept web is a method of organizing ideas using your frame of reference. Another person may organize the ideas in a different way. What is important is organizing your ideas so that they make sense to you.

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