

CHAPTER 17

During this new unit you will be studying, I want you to remember a sentence that you should remember from earlier chapters:



What do you think it means? No, everything in the world is not glued together! But whatever you do today can affect everything else in the world in the future! Cool, huh?

Think about all of the kingdoms you have explored:

Animals

Plants

Protists

Fungi

Archaeobacteria

Eubacteria

All of these kingdoms are connected to each other! They all must work together in order to survive!

Do you remember the biomes you studied?

Tundra

Coniferous Forest

Deciduous Forest

Tropical Rain Forest

Grassland

Aquatic

Desert

In each of these biomes you may find organisms from each kingdom! And... each of these organisms must work together in order to survive!

So every biome has kingdoms of organisms that work together to survive! This means that every biome and every kingdom is connected to each other!

The easiest way to explore the fact that everything in the world is connected is to look at a...

Food chain!



No, not a chain of fast-food restaurants... like where you get your favorite hamburger!

A **food chain** is a way to show how species use each other for food. It is called a "chain" because nutrients are passed from one organism to another...

But, why?

Because every living organism is food for another organism!

Let's look at a very simple food chain:



In this food chain...

The grasshopper eats the grass... the snake eats the grasshopper... and the bird eats the snake!

Simple, right? You bet!

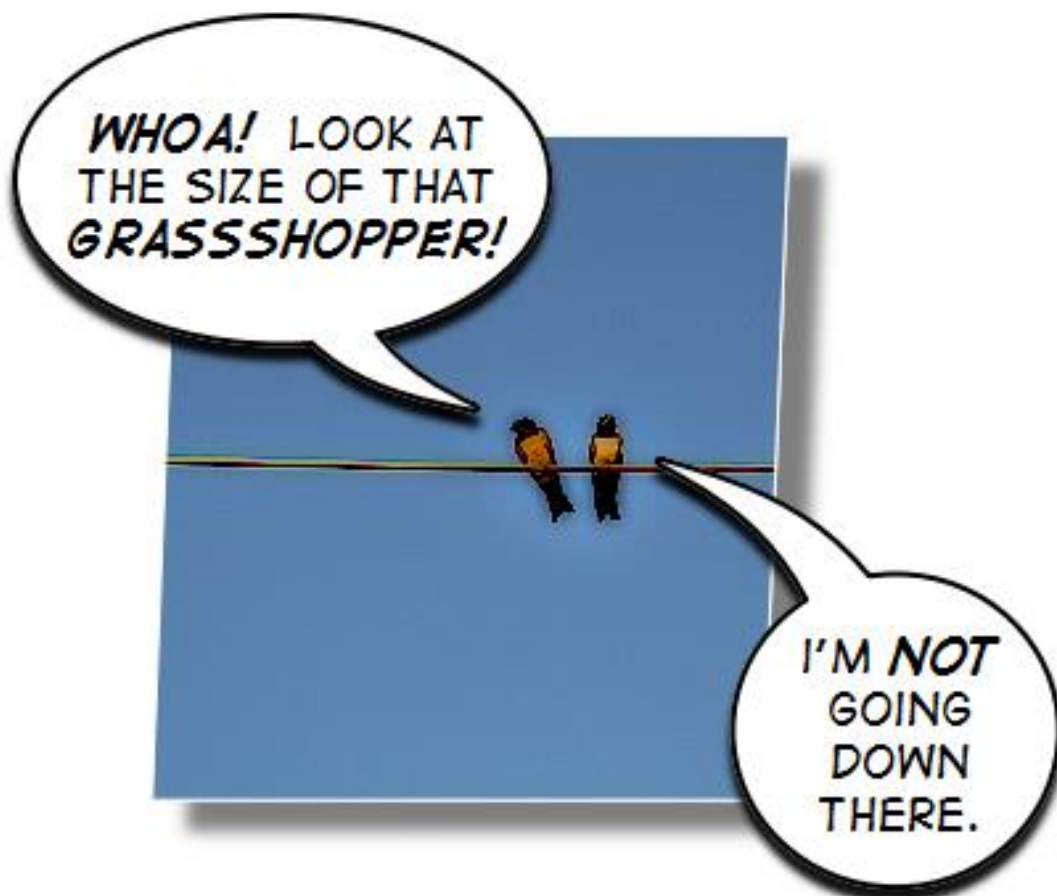
Food chains show how nutrients are passed from one organism to another! Whenever you look at a food chain, please remember that the "chain" only works in one direction.

You wouldn't say:

The **grass** ate the grasshopper.

Then the **grasshopper** jumped on the bird and ate it!

And then the **bird** flew down and swallowed up the snake...



Before you start thinking that this chapter doesn't have any definitions...

Scientists call plants in all food chains by another name – **producers!**

Plants are known as producers because they are **autotrophic** (Remember that autotrophs are organisms that make their own food!) All other organisms are known as **consumers**. Consumers are **heterotrophic**. They get all of their nutrients by eating (or consuming) other organisms!

There are three different consumers that you should know about:

Herbivores – (“her-bih-vorz”) these animals only eat plants to get their nutrients.

Carnivores – (“car-nih-vorz”) these are the animals that eat other animals (like the herbivores) for food.

Omnivores – (“ahm-nih-vorz”) Omnivores are not picky about what they eat. They will eat plants or animals!

But what about the organisms out there like fungi and bacteria that eat the dead stuff in the environment? If you remember, these organisms are known as **decomposers**.

These organisms are very important to all food chains as well! The nutrients that decomposers make from breaking down all of the dead stuff are used by the producers. And every food chain has at least one producer in it!



Let's look at the food chain we talked about earlier!



In this food chain:

- The Grass would be the **producer** because it is a plant and it makes its own food.
- The grasshopper is a **consumer** because it is eating something else to get its nutrients. It is also a **herbivore** because it is eating a plant (producers)!
- The bird would be another **consumer**, because it is also eating something else to get its nutrients. The bird is also a **carnivore** because it is eating another animal.
- The snake, like the bird, is also a **consumer** and a **carnivore**.



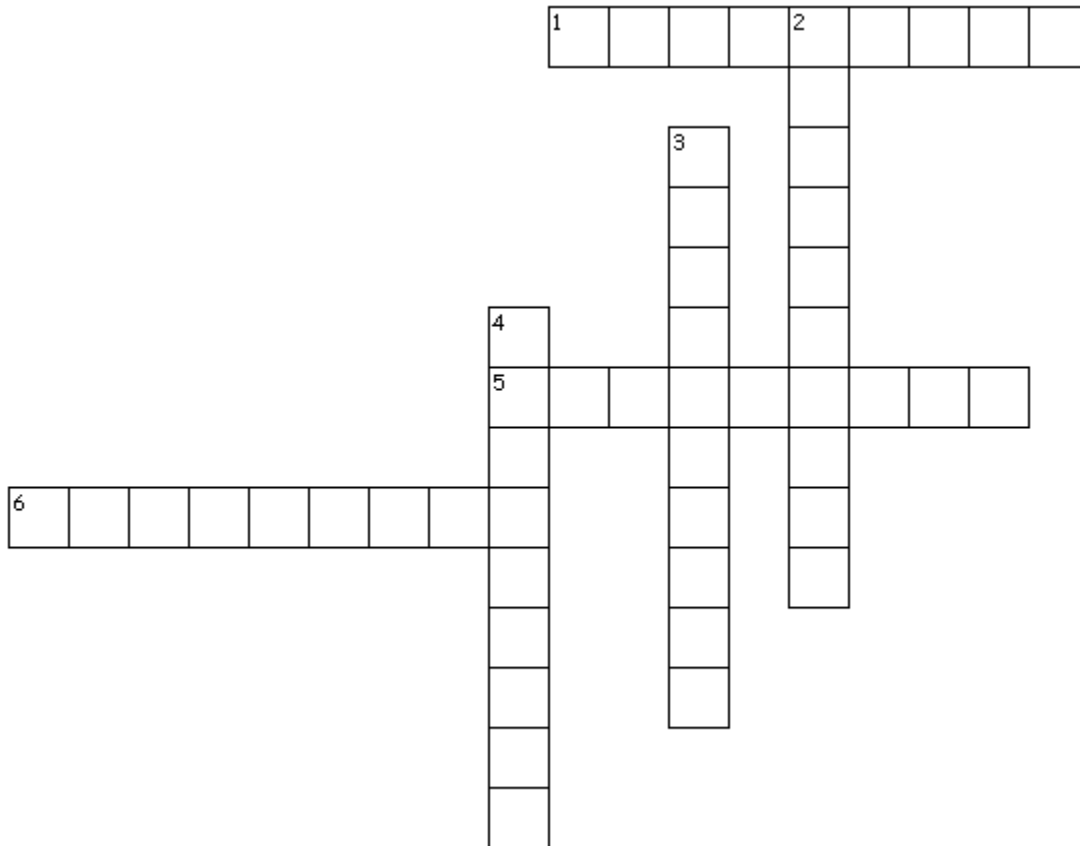
I know that birds eat things other than just grasshoppers! I've seen them eat seeds and fruits! So how can they be a carnivore? Wouldn't they be an omnivore?

If you didn't think of this before, you probably are right now!

You would be very correct in stating that the bird is an omnivore in real life! However, the food chain you have looked at today only shows that a bird eats grasshoppers. It does not show you everything that a bird can eat!

This is a big problem with looking at food chains! They can never show you exactly what it is like in real life! You are going to look at something much more realistic in the next chapter...

Place the answers to the following clues in the boxes below. Each box should contain one letter.



Across

- a relationship between species that use each other for food; nutrients are passed from one organism to another in this relationship
- these organisms will eat plants or animals
- autotrophic organisms that produce their own food; plants

Down

- these are the animals that eat other animals (like the herbivores) for food
- these animals only eat plants to get their nutrients
- animals that get all of their nutrients by eating (or consuming) other organism

Match the words in the first column to the best available answer in the second column.

- | | |
|------------------|--|
| _____ Food chain | 1) these animals only eat plants to get their nutrients |
| _____ Producers | 2) autotrophic organisms that produce their own food; plants |
| _____ Consumers | 3) these organisms will eat plants or animals |
| _____ Herbivores | 4) a relationship between species that use each other for food; nutrients are passed from one organism to another in this relationship |
| _____ Carnivores | 5) animals that get all of their nutrients by eating (or consuming) other organisms |
| _____ Omnivores | 6) these are the animals that eat other animals (like the herbivores) for food |

Draw a picture of a food chain. Label your drawing with the following types of organisms:

Producer

Herbivore

and

Carnivore

CHAPTER 18

In the last chapter you learned that a food chain is a relationship between species that use each other for food. Each organism is linked together into a "chain" because nutrients are passed from one organism to another...

Remember the sentence...



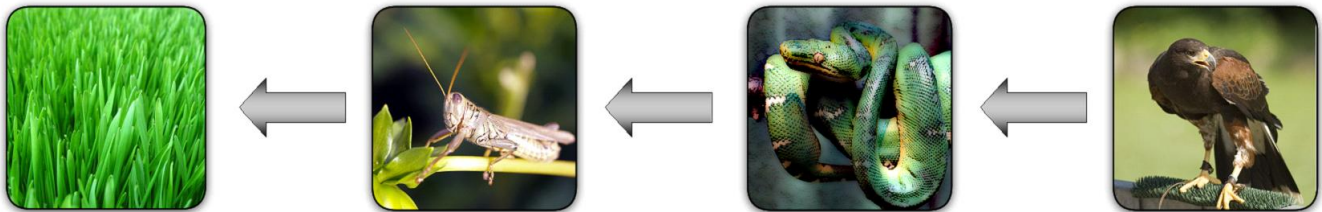
Everything in the world is connected together because:

Every living organism is food for another organism!

You also discovered that food chains have a very large problem...

Food chains don't show everything an organism can eat!

Let's look back at the food chain from last chapter:



As you learned in the last chapter, the animals in this food chain eat many, many, many more things in their life than what is in this picture!



So...this food chain does not show you what a snake, a bird, or a grasshopper can eat!

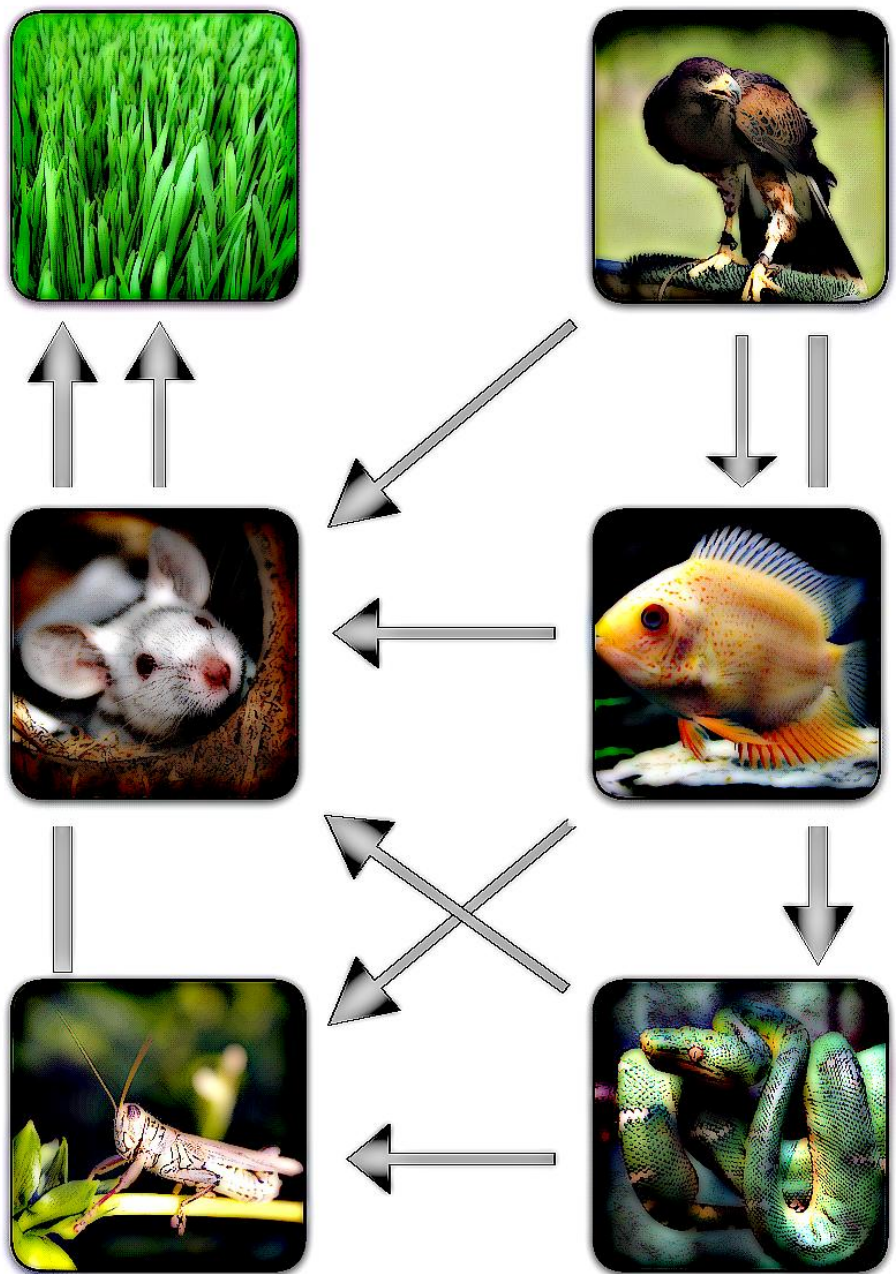
**Food chains
can never
show you
everything an organism can eat!**

Therefore, I give you:

THE FOOD WEB

Think of a food web as a lot of food chains grouped together!

Let's take a look at this food web from a grassland biome and see what we can find...



Within a habitat, each species within a food web may be inside several different food chains! This supports the fact that...



Now here's a chance to review a lot of what you have learned in the past several weeks...

In all food webs, plants provide most of the food to the organisms! But a lot of different kinds of organisms can eat plants. Fungi, archaeobacteria, eubacteria, protists and animals can **all** eat plants.

Do any of these organisms sound familiar to you? They should, since they are all different kingdoms of life! That means that in every food web, you could find different kinds of animals from all of the kingdoms!

Now for some more review...

Food webs exist wherever you can find living organisms.
So if you look in...

Tundras
Coniferous Forests
Deciduous Forests
Tropical Rain Forests

Grasslands
Aquatic areas
or Deserts

...you would find very large food webs that connect all of the different species in that area! That's right - all of the biomes have large food webs inside them!

Don't forget that every living organism is food for another organism!

Scientists sometimes call carnivores (animals that eat other animals for food) **predators** ("pread-ah-torz"). Predators get

their nutrients by eating other animals. The animal being eaten by a predator is known as their **prey**.

WHAT DID DTHE 20 POUND
RAT SAY TO THE CAT?



HERE KITTY KITTY...

Most predators are larger than their prey. They have body parts that may help them see far distances, run fast or smell their prey from far away!



In addition, most prey have body parts that help them defend themselves from predators. Some have very good senses which help them notice a predator before it

attacks. Others are very fast, which is helpful when you are trying to outrun a predator. Some animals have special traits that help them survive. Skunks, for example, have a powerful odor they can spray on predators to keep them away!

You might be thinking that without predators, the prey could live a long and happy life, right?

Nope!

Without predators, the number of prey would increase very quickly... and what are all of these organisms going to eat? That's right - everything! There would be no food left so they would all starve!

But what if there are too many predators? Well, in this case the large number of predators would eat all of the prey! They may be happy for a short while, that is... until they run out of food! Oops!

You cannot have too many predators or prey in one habitat. This is because too many of one kind of species in a habitat will use up the resources in that habitat! So, there must be a balance in the numbers of predators and prey. This balance is known as the **carrying capacity** ("kuh-pass-ih-tee").

WHAT DO YOU MEAN,



"WE'RE OUT OF PREY?"

True or false:

A food chain is a collection of many food webs joined together.

If this sentence is false, fix it to make it true!

Match the words in the first column to the best available answer in the second column.

- | | |
|-------------------------|---|
| _____ Food web | 1) animals that eat other animals for food; also known as a carnivore |
| _____ Predators | 2) animals that are eaten by predators |
| _____ Prey | 3) a balance of predators and prey in a habitat |
| _____ Carrying capacity | 4) a group of food chains linked together |

Draw a picture of a food web. Label your drawing with the following types of organisms:

Producer

Herbivore

and

Carnivore

CHAPTER 19

In the past two chapters, you have explored food chains and food webs. But, have you seen any pictures of humans in these drawings? Nope.

Should they be in there? Of course they should!

Humans are omnivores, just like bears, bald eagles and foxes! We can get our nutrients from plants or animals! Humans also live in each biome (except for the aquatic biome!) Because of these things, almost all food webs can contain humans. **We are everywhere!**



The **population density** of humans is different in each biome. Population density is a scientific way of saying "the number of individuals of a species in a certain area." You would not find as many humans living in the desert as you would in a grassland or forest. So, the population density of humans living in the grassland or forest would be bigger than in the desert. The biomes that contain the highest population density of humans must have the most natural resources in order for us to survive.

In fact, out of all the species in the world, humans change the environment the most! These changes can cause good and bad things to happen to everyone in the food web.

In this chapter, you are going to look at some of these “bad things.”

First of all, there are a lot of humans on the planet...over six billion to be exact.

6,000,000,000 people! That is a lot of zeros!

By the year 2050, some scientists think this number will increase to around nine billion!

With such a high population density, humans use up a huge amount of resources from the environment! In many cases, these resources are being used up faster than they can be renewed! This is a large problem!



Six billion people eat a lot of food, drink a lot of water and breathe a lot of air.

Many scientists think that the number of humans and other organisms in our food web may not be balanced very well! This means that the carrying capacity of the world is not balanced!

Let's look at one example of how our environment may be unbalanced through our soil, water and air...

We will start this journey by looking at plants...

That's right, plants!



DIDN'T THINK
OF THAT, DID
YOU?

**Most of the
nutrients we
eat come from
plants!**

You may think that the hamburger you ate for dinner is not a plant...and you are correct! But the cow that gave you that hamburger survived by eating nothing but plants! So...the nutrients from the plant were used to grow a cow, and they now help you to grow as well!

What do plants need to survive?

They need nutrients from the soil, water, sunlight and air!

But as more people fill up the earth, more space is needed for them to live. **So what happens to the soil?** It has to be covered up with new homes, buildings, parking lots. If the soil is covered up, it cannot be used to grow food for all of these new people. This can be a big problem!

Now what about the water? Well, most of the world is covered in water. The aquatic biome is **huge!** But, most of this water we cannot drink!

What do you mean? There is water we cannot drink?

Most of the aquatic biome is covered in saltwater. This salty water is found in all of the oceans in the world!

Only a very, very small amount of water exists in the world that you and I can drink! Don't get me wrong, there is still a lot of freshwater out there! However, the more people there are, the faster this resource will be used before it can be renewed.



How about the air? The more people there are, the more air we need to survive! That makes sense...doesn't it? And here is the really cool part – it's the plants that make the air we need to breathe!

So what does this mean to us?

You know that plants need soil, right? Well, if we cover up too much soil to make new homes and buildings, we are not going to have very much room for new plants! Without plants, we cannot get the air that we need to breathe. This is a huge problem! Also, our carrying capacity would be unbalanced without plants because they are in every food web.

So what have we learned here?



The more people there are, the more water we use. And, more soil is covered up. Without soil, we have no plants! Without plants, we have no air! And, without plants, we have no food!

The more humans that are born into the world, the more unbalanced our food web becomes.

Don't give up hope yet!

The population density of all animals, including humans, can increase or decrease! In nature, the population density for all animals will increase until something slows it down.

But what can slow down a population that is growing so large?

The two factors that can affect a large population are:

Famine and Disease

Famine is a time when many consumers go hungry and don't have enough food to eat. If this happens for too long, many organisms can die. Famine happens when the consumers eat

up most of their resources within their habitat.



Another problem that happens when too many organisms live in one habitat is **disease**. When an organism is said to have a disease, it means it is sick! There are all kinds of disease that can affect a population.

Sometimes, these diseases come from harmful eubacteria or **viruses** that get into their bodies.

A **virus** is a small organism that can cause disease.

Viruses are smaller than any eubacteria, but they can do just as much harm! Unlike eubacteria, viruses cannot live on their own! They have to live within another

organism! There are ways of keeping viruses out of your bodies. You'll learn about this in the next chapter...



You will also explore how people work everyday to keep our carrying capacity balanced in the next chapter!

Unscramble the words below:

1. feamni _____
2. iolepaspyunnotidt _____
3. aseeds _____
4. suevris _____

Write the definitions for each word:

1. _____

2. _____

3. _____

4. _____

Match the words in the first column to the best available answer in the second column.

_____ Population
_____ density

1) a collection of chemicals
that can spread disease

_____ Famine

2) a scientific way of saying
"the number of individuals
of a species in a certain
area"

_____ Disease

3) A time when lots of people
go hungry and don't have
enough food to eat

_____ Viruses

4) a sickness

Which one is right? Circle the correct answer.

1. The population density of humans would be the largest in which of these biomes?
 - a. grassland
 - b. desert
 - c. aquatic

2. Most of the nutrients that humans need come from:
 - a. animals
 - b. plants
 - c. the ocean

3. Freshwater is an important resource because _____.
 - a. the aquatic biome is mostly freshwater
 - b. very few organisms need freshwater to survive
 - c. the amount of freshwater is very small

4. Famine and disease can cause population density to _____.
 - a. increase
 - b. decrease
 - c. stay the same

5. The best way to protect you from disease is by _____.
 - a. reduction, reusing and recycling
 - b. covering your mouth when you sneeze
 - c. washing your hands

6. The number of humans in the world is over _____ billion.
 - a. six
 - b. nine
 - c. ten

CHAPTER 20

Ok... I hope I didn't scare you in the last chapter?
Remember...

Don't give up hope yet!

Six billion people are a lot of mouths to feed, but there are things that you and I can do to help out! In fact, there are all kinds of people out there who try to balance all of the food webs that are in our world! In this chapter, you are going to learn what you and others can do to help out!

Since it is true that...



...we are all
responsible for
our food web
and our
environment!

But what can be done to help out?

You can use the three R's...

Reduce - using less resources

Reuse - using resources again **without** changing them

Recycle - using resources again **after** changing them

I would guess that some of you have been told not to leave the water running or to waste food!

It is important that you do not overuse the resources you need to survive - like water and food!

By running water only when you need it you are reducing the waste of our freshwater! This is very good!

Our food is another resource that can be reduced as well!



At dinnertime, it would be best to take only what you know you are going to eat! All that good food is not going to help anyone if it is thrown in the trash!

Here is one more for you.....and it is very simple!

Did you know that by washing your hands you can keep yourself (or others!) from getting sick?

From the last chapter you learned about disease, remember? A lot of disease is spread between humans through their hands! If you keep yourself clean, there's a good chance that you will not spread any diseases to yourself or to others!

These are really simple things to do! Just try to think before you act! You can make a difference!



Many of you may be thinking that you would like to do more than these simple things to help the environment.

Good for you!

With more and more humans changing the earth, it takes a lot of work to keep our carrying capacity balanced. If you remember, carrying capacity is a balance in the numbers of predators and prey in a habitat. This has been mentioned a lot lately, hasn't it? Well here it comes again...

Carrying capacity is studied by people who work in **Conservation**. Conservation is the protection and careful use of resources and the environment. Conservation agents work throughout the United States of America to protect our natural wildlife!

These people work very hard to protect and manage our natural resources. All of the states in the U.S.A. have groups of conservation **agents!** There are several ways these agents work to conserve our natural resources. Some of them include:

- Hunting/fishing programs
- Restoring damaged habitats
- Educating people about good use of their land
- Releasing organisms into the habitat

Let's take a closer look into each one of these jobs...



Hunting/fishing programs

Some of you may be wondering how hunting and fishing can be helpful! Don't ever forget...

Every living organism is food for another organism!

In order to balance our food web, some organisms must be killed in order to keep other organisms alive!

Conservation agents make certain that only a certain number of living organisms (like deer, birds and fish) are killed every year! The amount of organisms killed every year should never be greater than the number of new organisms being created! So, these agents have to study the environment very closely to make certain that our carrying capacity is balanced at all times! That's a hard job to do!

Fixing damaged habitats

You learned in the past chapter that humans change their environment a lot! These changes affect everyone in the food web!

Sometimes these changes can destroy a habitat for other organisms.

Conservation agents work

to fix habitats for organisms to live there again. Fixing a damaged habitat could include:

- Planting food for animals
- Cleaning up a stream for fish
- Building homes for animals to use

Educating people about good use of their land

Conservation agents work with people to improve their land so that other organisms can live there too. Sometimes, agents work with landowners to teach them how to plant food or build homes to attract animals onto their land. For example, building a birdhouse can attract certain birds onto their land.

MOM!!!

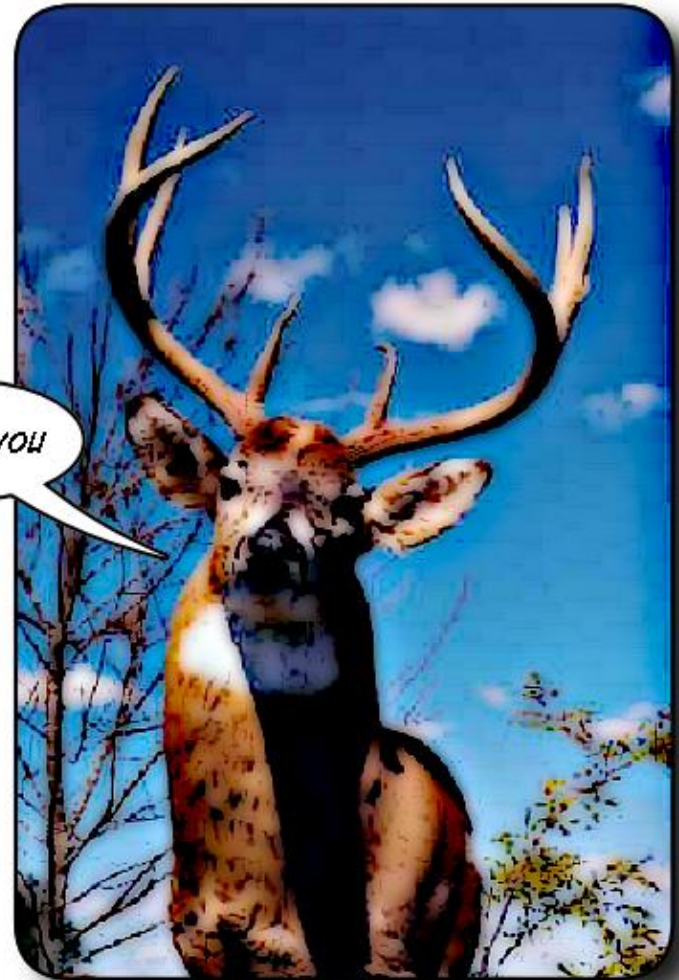


**What's for dinner?!?!
We are hungry!**

Releasing organisms into the habitat

Sometimes, certain species disappear from an area. This can be caused by many things:

- Their habitat could be destroyed
- There could be too many killed by hunters,
- They were all consumed by other predators



BEFORE SETTLERS ARRIVED IN MISSOURI, THERE WERE AROUND 500,000 DEER LIVING IN THIS AREA. BY 1925, HUNTERS HAD KILLED NEARLY ALL DEER IN MISSOURI WITH ONLY 400 FOUND IN THE STATE. BECAUSE OF THE MISSOURI DEPARTMENT OF CONSERVATION AND THEIR REINTRODUCTION OF DEER, OVER 1,000,000 CURRENTLY LIVE IN THE STATE!

Remember, if too many organisms are removed from the

habitat, the food web may become unbalanced! If the conservation agents can find the species that has disappeared somewhere else in the world, they may be able to put this organism back into the habitat! This process is called **reintroduction** ("ree-in-tro-duck-shun") and it has been very successful with many different organisms!

Fill in the blanks with the correct words from the bank at the bottom of the page.

Reintroduction _____
organisms _____ their
habitats.

Word Bank:

into
relocating
back
means

Which one is right? Circle the correct answer.

1. Which of the following is not a job for a person who works in conservation?

- a. hunting and fishing programs
- b. fighting fires in a forest
- c. restoring damaged habitats

2. If too many organisms are taken from a habitat...

- a. the food web may become unbalanced
- b. all of the food chains will get larger
- c. the amount of resources in a habitat will increase

3. Species may become extinct because:

- a. they move to a different habitat
- b. their habitat becomes destroyed
- c. their populations get too large

4. "Every living organism is..."

- a. ...either a herbivore or a carnivore."
- b. ...heterotrophic."
- c. ...food for another organism."

5. The number of animals that are hunted...

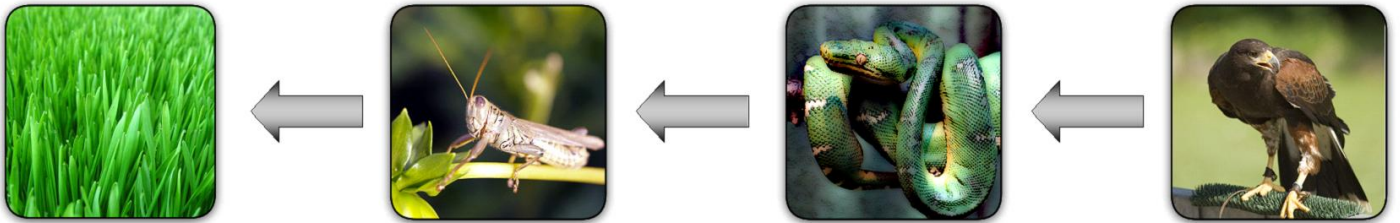
- a. ...should be greater than the number being created.
- b. ...should be less than the number being created.
- c. ...should be the same as the number being created.

6. Which of the following is a good reason for reintroduction?

- a. too many of the organisms were killed by predators
- b. hunters want new organisms to kill
- c. other organisms need more prey to eat

Unit Five review

Find the producers, herbivores, carnivores, prey and consumers in the picture. List them below.



Producers	Herbivores	Carnivores	Prey	Consumers

Is this picture showing you a food chain or a food web?

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

Be certain to go over your definitions for the test!