Name Notes Filled In Period

UNIT 16

HUMANS IN THE BIOSPHERE.....CH 6

Objectives

_____1. I can list all of our natural resources and describe how they are valuable to me, and my planet.

_____2. I can describe how human activities have affected each class of natural resources.

_____3. I can identify ways to practice sustainable use for each natural resouce.

_____4. I can explain why biodiversity is an important natural resource.

_____5. I can describe many ways in which human activities have reduced, and are currently threatening, biodiversity around the world.

_____6. I can state the goals of conservation biology.

_____7. I can describe a number of ways to practice conservation and decrease levels of CO_2 emissions on a personal and a global level.

_____8. I can describe the two types of global change that are of concern to biologists.

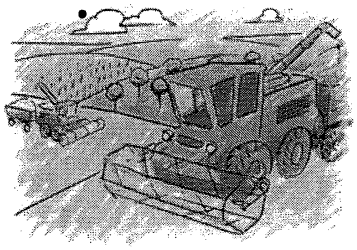
_____9. I can explain the function of the ozone layer, the negative effects that are a result of its depletion, and the steps that are being taken to restore it.

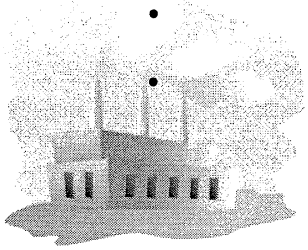
_____10. I can describe how humans have utilized the natural resources throughout history.

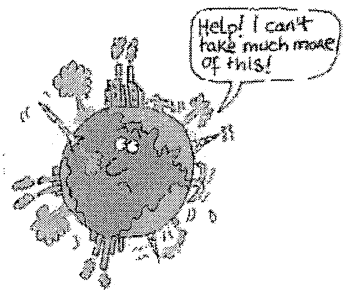
_____11. I can define invasive species and describe a number of invasive species that have harmed Michigan's ecosystems.

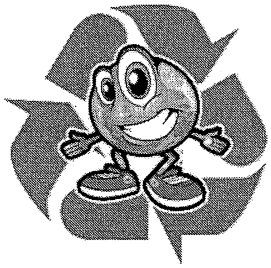
Vocabulary

- Acid rain
- Agriculture
- Aquaculture
- Biodiversity
- Biological magnification
- Conservation
- Deforestation
- Desertification
- Endangered species
- Green revolution
- Habitat fragmentation
- Invasive species
- Monoculture
- Nonrenewable resource
- Pollutant
- Renewable resource
- Smog
- Soil erosion
- Subsistence hunting
- Sustainable use









THE LORAX by: Dr. Suess

1. Who does the Once-ler represent in this story?

2. Who does the Lorax represent in this story?

3. In the story, the Once-ler's factory abused or polluted which types of resources (listed in your book)? For each resource, list the organism(s) that were affected.

4. The Once-ler gave his last Truffula seed to a child. What might this act symbolize?

HOW DO HUMANS AFFECT THE BIOSHPERE?

- When the Polynesians arrived on the Hawaiian islands, they had laws governing their natural resources.
  - Two examples are:
    - If you cut down a coconut tree; you 1st have to plant 2 trees.
    - No fishing during spawning season
  - Since they we not depleting the forest resources or decreasing the number of fish they were practicing Sustainable use.
- Hawaii today is much different. There is now industry and agriculture, which means cleared tracts of land, pavement and pollution. What is the result of this?
  - 2/3 of native bird species are extinct
  - Many species of land snails, plants, insects and much more have gone extinct.
  - Imported (non-native) plants and animals have crowded out native ones. These are called Invasive species
  - Basically there is a huge loss of biodiversity
- Human activities that have changed the flow of energy in an ecosystem are:
  - Hunting + gathering
  - Agriculture
  - Industry
  - Urban Development
- When human subsistence hunters arrived in North America 12,000 years ago they caused one of the major mass extinctions of large animals including the wooly mammoth, giant ground sloth,

and the Saber toothed cats. (Cast of Ice Age) It also decimated our populations of yak, zebra, and cheetah.

- What did humans begin doing 11,000 years ago that really began to change ecosystems? Agriculture
- Now humans had a dependable food supply. How did this change human culture forever?
  We were able to gather in larger settlements and began civilizations (government, laws, writing)
- Now that humans were settling in one place they began to domesticate animals.
  We started keeping herds of:

  Sheep, goats, cows, pigs, horses, dogs
- How did these herds affect the land?
  Land became overgrazed + turned into scrubland; the water supply was strained.
- Modern Agriculture: What modern advances in science and technology improved agriculture?

  Irrigation systems and Farm machines
- By the 1950's humans were straining the world's food supply. So scientists introduced even better farming practices:
  - "Miracle Strains" of crops that had higher yields (more produced)
  - Monoculture
  - Irrigation Systems
  - Chemical Fertilizers
  - Pesticides

- The Industrial Revolution of the 1800's was an explosion of new technology. Unfortunately it also lead to huge amounts of pollutants being dumped into the air, water, and soil.
- Suburban Sprawl: The suburbs just keep growing. What are some problems associated with this?
  Crowding, loss of land resources

- Tragedy of the Commons –
  When everyone is permitted to use a resource, such as air or oceans, but no one is responsible for preserving that resource, the resource is destroyed.
- What are some problems that humans have caused through the tragedy of the commons?

  Animal + Plant Extinctions
  Loss of biodiversity
  Depleted resources

NATURAL RESOURCES TABLE Use book pgs 144 - 149

Renewable resource – Resource that can be replenished within our lifetime. (wood, fish, crops etc)

Non-renewable resource – Resource that cannot be replenished within our lifetime (fossil fuels, old growth forest, aluminum)

Sustainable use - A way of using resources at a rate that does not deplete them.

FOREST RESOURCES pg 146

Why is this resource valuable?

-
-
-
-

Why is a temperate forest considered renewable, but the old-growth forests of the NW considered non-renewable?

Problems:	Sustainable Use Practices:
1. Deforestation -	1.
2. What are the effects of deforestation?	2.
	3.

LAND RESOURCES pg 145	
Why is this resource valuable? • • •	
Problems:	Sustainable Use Practices:
1. Soil Erosion - 2. Desertification -	1. 2.

Ocean Resources pg 147	
Why is this resource valuable? •	
Problems:	Sustainable Use Practices:
1. Overfishing -	1. 2.

AIR RESOURCES Pg 148

Why is this resource valuable?

-

Problems:	Sustainable Use Practices:
1. Smog -	1.
2. How do pollutants get in the air?	2.
3. Acid Rain –	

WATER RESOURCES Pg 149

Why is this resource valuable?

- List of common uses:

Problems:	Sustainable Use Practices:
1. In what ways can pollutants enter the water supply?	1.
	2.
2. Microorganisms	3.
	4.

BIODIVERSITY Pg 150

Why is this resource valuable?

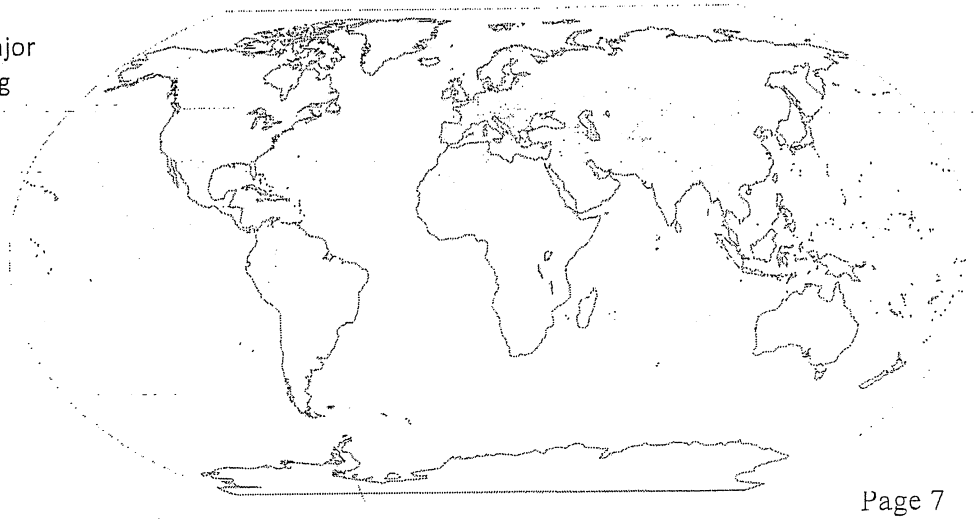
Crocodile example: *Crocodiles are one of Earth's longest surviving species. Scientists wondered why. It turns out that crocs have amazing immune systems. Scientists are now studying croc immune systems as part of AIDS research. If crocs go extinct, they'll take this valuable genetic information with them.*

How are we threatening biodiversity?	How are we trying to conserve biodiversity?
1.	1.
2.	2.
3.	3.
4.	4.

What is the single greatest threat to biodiversity on land? Destroying Rainforest

Why aren't we outlawing the destruction of that habitat immediately?

On the map to the right, color in the major "hot spots" of human activity destroying habitats and driving species to extinction.



INVASIVE SPECIES NOTES

Nonnative species – A species that has been taken from its native habitat and transported to a new environment.

Invasive species – A non-native species whose introduction causes economic or environmental harm, or harm to human health.

What are they?

- Invasive species can be plants, animals, or other organisms (microbes)

* Do not have limiting factors in the new environment

Characteristics of Invasive Species:

- Tolerates a wide variety of conditions.
- Has a long growing season or short generation time.
- Has few natural controls such as predators, diseases, or pests.
- Disperses easily
- Produces lots of seeds or eggs.
- Enjoys climate and environmental conditions similar to the natural range of the new environment.
- Invasive species can often grow exponentially because they don't have limited resources, natural predators, or disease to limit their growth.

INVASIVE SPECIES ARE A THREAT!!!

- Scientists believe invasive species are among the MOST SIGNIFICANT THREAT TO BIODIVERSITY! making many other organisms endangered or extinct.

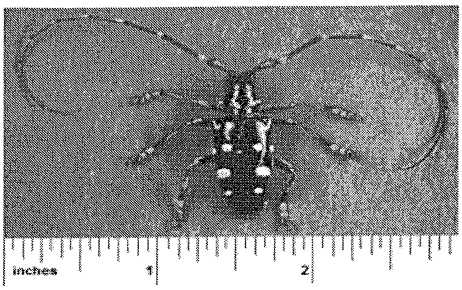
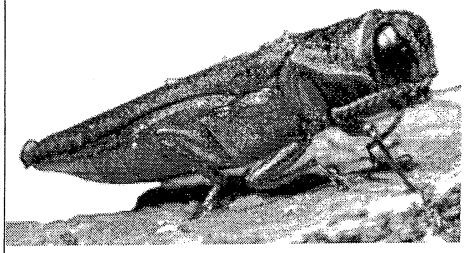
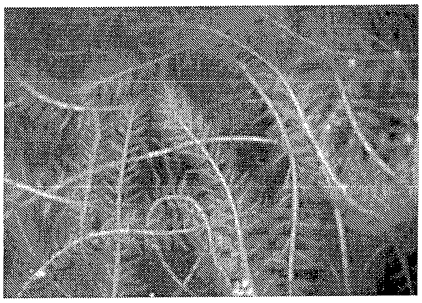
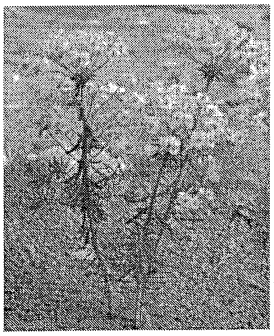
How can we keep invasive species out of our ecosystems?

- Increased customs checks from other countries
- Physically removing invasive species from areas.

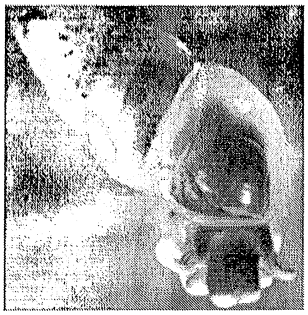
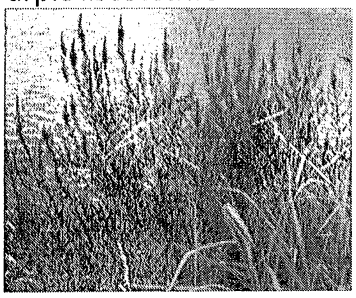
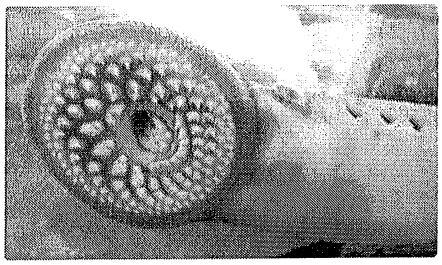
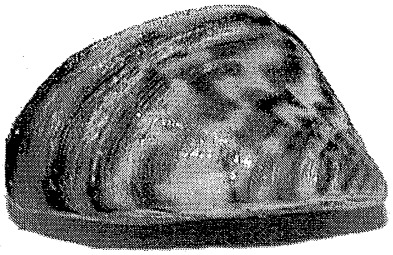
How can I help?

- Prevention
- Become educated
- Don't release pets into unnatural places
- Volunteer to help remove invasive species.

Invasive Species Affecting/Threatening Michigan

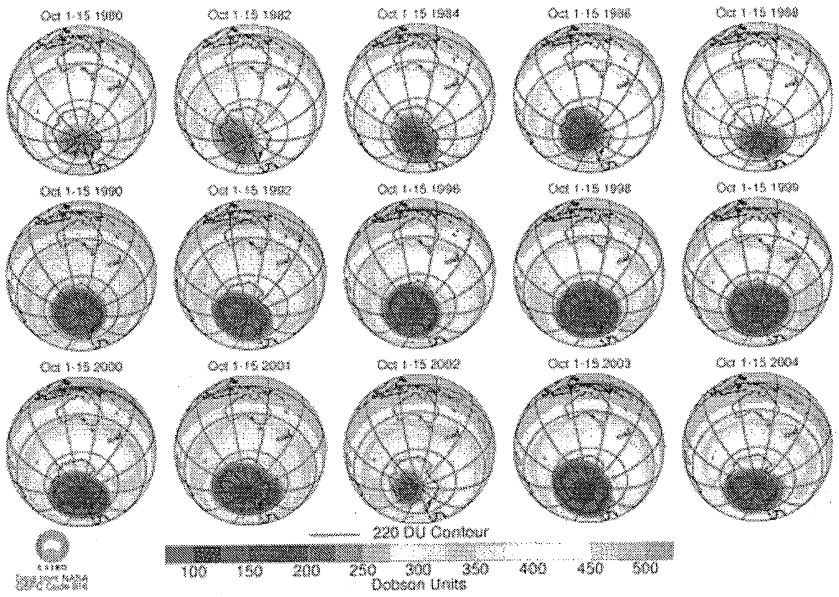
Asian Carp 	Description: Mode of transport: Harm caused:
Asian (or Citrus) Longhorned Beetle 	Description: Mode of transport: Harm caused:
Emerald Ash Borer 	Description: Mode of transport: Harm caused:
Eurasian Watermilfoil 	Description: Mode of transport: Harm caused:
Leafy Spurge 	Description: Mode of transport: Harm caused:

See pages at end of packet in STC

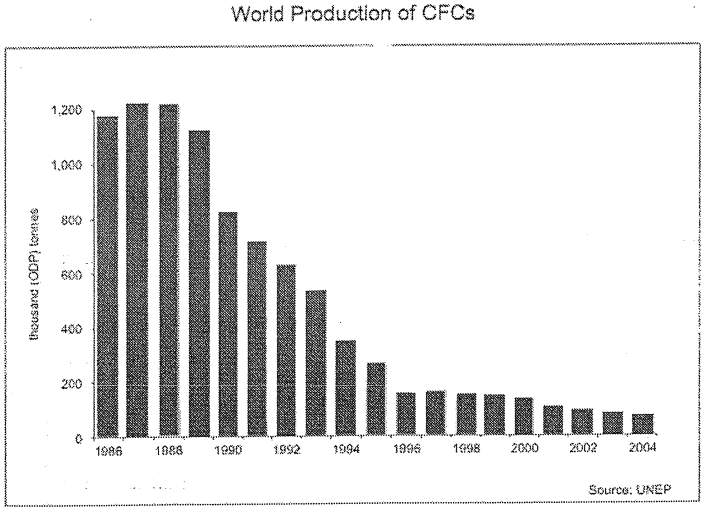
New Zealand Mud Snail 	Description: Mode of transport: Harm caused:
Purple Loosestrife 	Description: Mode of transport: Harm caused:
Round Goby 	Description: Mode of transport: Harm caused:
Sea Lamprey 	Description: Mode of transport: Harm caused:
Zebra Mussel 	Description: Mode of transport: Harm caused:

The Ozone Layer

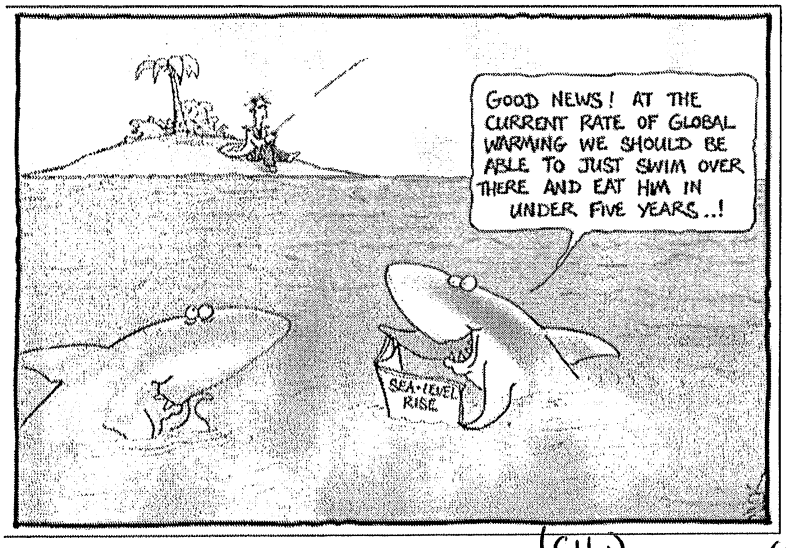
- What does the ozone do for the Earth?
  Acts as Earth's sunscreen - thin layer protects from UV light
- Chemical formula for ozone: O_3, chemical formula for oxygen gas: O_2
- What does the sun do to oxygen gas molecules in the atmosphere?
  Breaks it down to $O_2 \rightarrow O$ and O which reforms O_3.
- How does UV light harm humans directly?
  Cancer
- What is happening to the ozone?
  Being depleted/destroyed
- Where is it most affected?
  South Pole
- When did we first notice that there was a problem with the ozone layer?
  mid-70's, hole in 1981
- Which molecule is the biggest culprit in the depletion of the ozone layer?
  CFC's



- What is/was this molecule used for, mostly?
  factory fumes, refridgerants, styrofoam, aerosols
- Which part of the molecule is the problem, and what does it do?
  Chlorine - it attacks and destroys up to 100,000 O_3 molecules.
- What did we do to solve this problem?
  Montreal Protocol 1987
  - Banned use of CFC's
- Is it working?
  Yes! Leveling out + hole decreasing
- What is the projected outcome?
  return to normal by 2065.



Global Climate Change



FACT – The global climate is changing.

FACT – The earth undergoes natural warming & cooling periods.

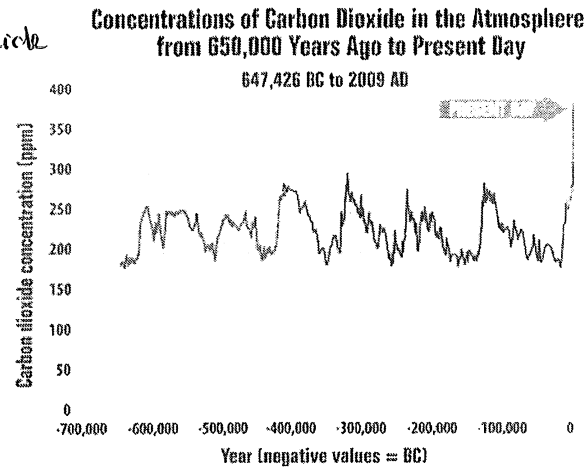
QUESTION – Is human activity the cause for the RATE at which the global climate is changing?

- What are the major greenhouse gases? Methane (CH_4), Carbon Dioxide (CO_2), water vaper (H_2O)
- Which one are we most concerned with? CO_2 - carbon dioxide
- What is the concentration of CO_2 in the atmosphere right now?

  Almost 400 parts/million
- Before the current CO_2 spike, approximate the average CO_2 concentration over the last 650,000 years.

  About 225 parts/million
- How do we know these values for CO_2 concentration?

  Ice cores drilled & sample for those years. We have cores dating back ~650,000 yrs.

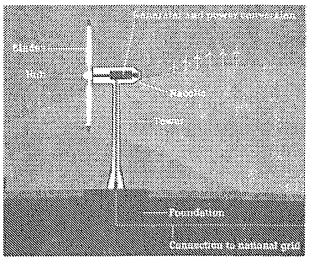


- What fluctuates in concert with the CO_2 concentration in the atmosphere?

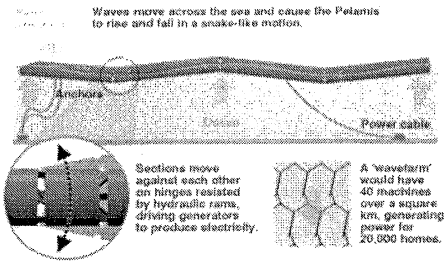
  The temperature (More CO_2 = warmer temps)
- Four effects of global climate change are:
  - Oceans becoming more acidic
  - Arctic Sea Ice melting
  - Plant Hardiness levels changing (moving North)
  - Increased rate of temp change

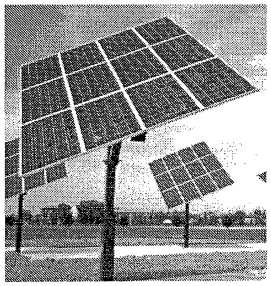
What can we do to make a difference?

Harnessing Natural Energy



- Natural Energy - any form of energy that does not contribute to the CO_2 Concentration in the atmosphere.
- **Wind Energy –** Wind turbines are spun by wind energy.
- **Wave Energy –** the pelmalis device captures energy from the waves.
- **Solar Energy –** on a bright, sunny day, the sun shines approximately 1000 watts of energy per sq. meter on the planet's surface. If we could collect all of that energy we could easily power our homes and offices for free.



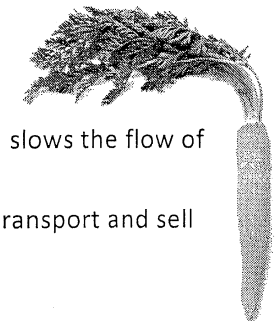


Green Roof

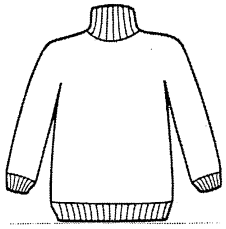
- What is a green roof?
  A roof that has drainage + plants + soil.

- How is a green roof beneficial to the home/building owner?
  - reduce summer energy demands by 75%.
  - lasts longer than ordinary roofs
  - insulates building
  - reduce need for drainage system
- How is a green roof beneficial to the environment?
  - improves air quality
  - reduces urban heat island effect
  - reduces CO_2 foot print
  - less waste

What can I do at home?



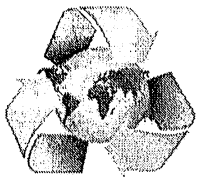
- Plant a garden
  - Gardens absorb carbon dioxide, reduces energy retained by paved surfaces, and slows the flow of water into storm water sewer systems.
  - Growing your own vegetables eliminates the energy needed to package, store, transport and sell produce in grocery stores.



- Wear a sweater
  - Half of the energy consumed in the average home is used to run its heating and cooling systems. You can curb greenhouse gases by adding a layer of clothes in the winter (or taking one off in the summer).

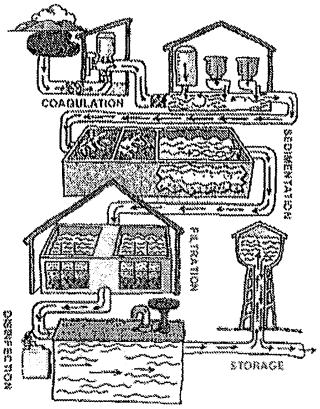
- Plant a TREE

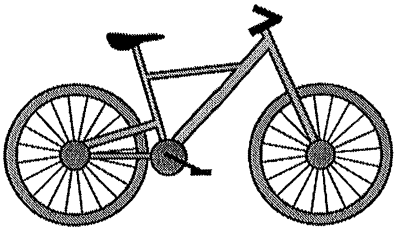
  - Urban forests are the plants and trees that beautify a city, provide shade, remove pollution and reduce traffic noise.
  - The average urban tree removes one ton of greenhouse gas from the air in its first 40 years of life.



- Reduce, Reuse + Recycle
  - Biodegradable materials do not biodegrade in landfills. Bacteria that decompose materials require oxygen. Landfills are so compacted that not even _____ can penetrate their depths.

- Control Your Water Usage
  - Water treatment takes up the largest portion of municipal electricity.
  - List some ways that you can control your water usage:





- Use less gasoline
  - Ride a bike
  - Take a walk
  - Consolidate errands
  - Public transportation
  - Hybrid cars

Clearcutting.	A resource that cannot be replenished by natural processes in a lifetime.	The increasing concentration of harmful substances at higher trophic levels in a food web. Example: DDT in the Bald Eagle.	Using natural resources at a rate that does not deplete them.
Planting and harvesting crops. (This practice lead to the beginning of civilization.)	Overgrazing, poor farming practices or draught turns productive land into unproductive desert.	In the 1950's the world's food supply was being strained so scientists came up with farming practices that increased crop yields. This was called the ...	A resource that can regenerate quickly, and is therefore, replaceable.
A species that is moved from one area to another and causes harm in some way to humans or other species in the new habitat.	A mixture of pollutants and water in the atmosphere that creates a haze.	Hunting only for what you need to survive. This practice puts little strain on the environment compared to today's methods, but it still managed to drive some species, like the wolly mammoth, to extinction.	When water combines with nitric and sulfuric acid from pollutants in the atmosphere, this is formed. (Lichens are very sensitive to this stuff, so lichens are a good indicator of pollution.)
A sustainable use practice for fishing. Basically a fish farm, where fish are raised for the purpose of eating.	The wise management of natural resources for the purpose of preserving and protecting biodiversity and ecosystem diversity.	A harmful material in the land, water or air.	When an area is deforested the land is exposed to water and wind which wears away the top soil.
A farming practice that allows farmers to produce large amounts of ONE crop. This process depletes the soil of nutrients, requiring the use of chemical fertilizers.	One of our greatest natural resources that has provided us with foods, medicines and industrial products. This resource is constantly threatened and depleted and includes all of the variety of species in the bioshpere.	When a habitat is broken into sections by development, such as roads, neighborhoods and businesses. This breaks up populations, making them more vulnerable.	A species whose population size is rapidly declining, and will become extinct if the trend continues.