KENNETH BRADLEY
ENVIRONMENTAL SCIENCE
4TH PERIOD
NTI PACKET

DAY 1: Activity 4 Part A _______/25 pts
Day 2: Activity 4 Part B _______/25 pts
Day 3: Activity 4 Part C _______/25 pts
Day 4: Activity 12 Part A _______/25 pts
Day 5: Activity 12 Part B _______/25 pts
Day 6: Activity 24 Part A _______/25 pts
Day 7: Activity 24 Part B _______/25 pts
Day 8: Activity 27 Part A _______/25 pts
Day 9: Activity 27 Part B _______/25 pts
Day 10: Activity 27 Part C _______/25 pts

Total points: _______/250 pts
Activity 4

Endangered Species Study

Background

Many species of organisms may appear to be unimportant. Yet many people feel that the loss of even a single species is a tragedy. Each species is a storehouse of substances that scientists know little about. Early civilizations domesticated wild species, making the first farming and ranching possible by selective breeding. Species resources taken from the wild continue to benefit modern societies by providing the raw materials for new medicines, foods, and other materials. What will happen in the coming decades as habitat loss, pollution, and overhunting increase the rate of species extinction?

Part A

There is a great deal of disagreement worldwide about the number of species that exist. Some species-rich ecosystems, such as tropical rain forests, are being destroyed before they can be explored. Therefore, people may never know what species are being lost. Also, differences between species may be small, and scientists do not always agree on whether an organism belongs to a separate species or whether it is a subspecies, or race, of a known species. Examine the chart showing an estimate of the number of species in the world today, and answer the questions that follow.

Estimated Number of Species

<table>
<thead>
<tr>
<th>Number of species</th>
<th>% Unidentified</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low estimate of all species</td>
<td>4,443,644</td>
</tr>
<tr>
<td>High estimate of all species</td>
<td>33,526,024</td>
</tr>
</tbody>
</table>

Estimated Identified Species

<table>
<thead>
<tr>
<th>Types of Organisms</th>
<th>Number Identified</th>
<th>% of Estimated Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microorganisms</td>
<td>5,760</td>
<td>3–27%</td>
</tr>
<tr>
<td>Invertebrates</td>
<td>1,020,561</td>
<td>3–27%</td>
</tr>
<tr>
<td>Plants</td>
<td>322,311</td>
<td>67–100%</td>
</tr>
<tr>
<td>Fish</td>
<td>19,056</td>
<td>83–100%</td>
</tr>
<tr>
<td>Birds</td>
<td>9,040</td>
<td>94–100%</td>
</tr>
<tr>
<td>Reptiles/Amphibians</td>
<td>10,480</td>
<td>90–95%</td>
</tr>
<tr>
<td>Mammals</td>
<td>4,000</td>
<td>90–95%</td>
</tr>
<tr>
<td>Total</td>
<td>1,392,485</td>
<td>69–96%</td>
</tr>
</tbody>
</table>
Analysis

1. Which types of organisms include the greatest number of unidentified species? Why do you think this might be so?

2. If the number of species is 4.4 million and the total number identified is 1.4 million, what percentage of species has been identified?

3. Only 1 percent of the world's species has been properly studied for their potential value for medicine, food, or other industries. What do you think can be done to help preserve species until they can be studied?

4. To identify and study unknown organisms, scientists often have to explore deeply into natural habitats. This exploration itself can damage the habitat. Do you think that scientists should have the right to explore habitats for the sake of identifying potential endangered species? Explain your position.

PART B

Efforts to protect certain species often begin at the grass-roots level of involvement by concerned citizens. Choose an endangered species from the list on page 36 to study. The goal of your study is to determine the future prospects for survival of that species.

1. Select a first, second, and third choice of species from the list. Check your first choice with your teacher to make sure that you have not chosen the same species as a classmate. If so, select one of your other choices to study.

   1st choice ______________________
   2nd choice ______________________
   3rd choice ______________________
2. Explain why you chose this species to study.

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**PART C**

To persuade people to become involved in your endangered species protection efforts, you must prepare a written and oral report about the organism and its habitat and behavior. A completed report should include all of the following graphic and written components.

**Written components**

1. **Issues**: Write an introductory paragraph explaining why your species is endangered. What is the current status of the species in the wild? In captivity?

2. **Preservation Plan**: Write two paragraphs explaining why this species should be preserved, and what other factors must be considered when making decisions about this species. Support your statements with factual information, not emotional reactions.

3. **Decision Making**: What can be done regarding your endangered species? In some cases, wildlife preserves may be an option. In other cases, negotiations with industries or other segments of society may be called for. Sometimes, it may appear that the species is not worth saving because the cost of preservation is greater than the cost of extinction.

4. **Recommendation**: Based on the information you have gathered, what do you think should be done, and why?

**Graphic components**

1. **Geographical Location**: Use an atlas or other resources to mark the location of the species' territorial range on a world map. Identify on your map all areas where the species is found.

2. **Climate**: Using encyclopedias or other resources, construct a climatogram that shows the average temperature and precipitation of the biome in which the species lives. Below the graph, describe any special adaptations the species has that enables it to live in its habitat.

3. **Biology**: Draw a food web that includes your endangered species and at least three producers, three herbivores, and three carnivores. On the same page, include a physical description of the organism, what it eats, how it reproduces, and its life span.

**Presentations**

Each person will be responsible for giving a 3 minute presentation about her or his endangered species. Use note cards to prepare your presentation, and prepare visual aids such as posters or overhead transparencies to help present your information.
Endangered Species List

The following list is just a small sampling of the mammals, birds, and plants known to be endangered.

**NORTH AMERICA**
- Grizzly bear
- Northern spotted owl
- American alligator
- American crocodile
- Whooping crane
- Black-footed ferret
- Key deer
- California condor
- Peregrine falcon
- Florida panther
- Hawaiian monk seal
- Desert tortoise
- Florida manatee
- Grey wolf
- Bald eagle

**ASIA**
- Pere David's deer
- Snow leopard
- White-lipped deer
- Giant panda
- Asian elephant
- Crested gibbon
- Prezewalski's horse
- Black-necked crane
- Yangtze River dolphin
- Clouded leopard
- Crested ibis
- Orangutan
- Indian rhinoceros
- Wild yak
- Baikal seal

**CENTRAL/SOUTH AMERICA**
- Golden lion tamarin
- Short-eared dog
- Jaguar
- Harpy eagle
- Day gecko
- Mahogany tree
- Rosewood tree
- Cocobolo tree
- Keel-billed toucan
- Leather-backed turtle
- Orchids
- Giant river otter
- Three-toed sloth
- Ocelot

**AFRICA**
- Mountain gorilla
- African elephant
- Chimpanzee
- Lemurs (any)
- Rosy periwinkle
- Cheetah
- Grey's zebra
- Reticulated giraffe
- Cranes (any)
- Hippopotamus
- White rhinoceros
- Black rhinoceros
- African wild dog

**AUSTRALIA**
- Wombat
- Cassowary
- Koala
- Wallaby

**MARINE**
- Blue whale
- Finback whale
- Harp seal
- Bowhead whale
- Monk seal
ACTIVITY 12

FOOD PRODUCTION AND CONSUMPTION

BACKGROUND

After World War II, the production of food worldwide increased greatly as a result of the Green Revolution. But currently more than a billion people continue to go hungry. The hungry are too poor to buy or grow the food they need.

Hunger is not just an issue of food production, but of food consumption as well. For example, India is a production success story, but it is also a consumption disaster. With the Green Revolution, India had generated a grain surplus of 24 billion metric tons by the mid-1980s. Yet half of all the hungry people on Earth live in India. A large number of people in that nation cannot afford to buy the food they grow.

PART A  FOOD PRODUCTION

Grains are by far the most important crops for feeding the world's population. Grains are not only consumed directly, these crops are also used to feed cattle, chickens, and other sources of animal protein. Therefore, the production of grains can be used as an indicator of total food production.

Although the production of grains has increased since the Green Revolution, the population of the world has also increased greatly during the same period of time. The tables below show the worldwide production and individual consumption of grains since 1950. Complete the table by calculating the amount and percent change that occurred during each decade. The amount of change can be found by subtracting the larger quantity from the smaller. The percent change is the amount of change divided by the smaller quantity.

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Harvest (in metric tons)</th>
<th>Amount of Change</th>
<th>Percent Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950</td>
<td>631</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1960</td>
<td>847</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>1,103</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1980</td>
<td>1,441</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1990</td>
<td>1,684</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000 (estimate)</td>
<td>1,842</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Consumption per Person (kg)</th>
<th>Amount of Change</th>
<th>Percent Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950</td>
<td>246</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1960</td>
<td>278</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>296</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1980</td>
<td>322</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1990</td>
<td>316</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000 (estimate)</td>
<td>295</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
In the space provided, construct a bar graph showing the production and consumption of grains since 1950 using the data provided on the previous page. Then answer the analysis questions that follow.

Analysis

1. During which decade did the amount of food per person begin to decrease? Use textbooks or other references to identify and describe two changes that occurred during this decade that would have contributed to the decrease.

2. According to the table, the amount of food produced in 1970 was 30 percent greater than the amount produced in 1960. Yet the amount of food consumed per person increased only 6 percent. How can you explain the differences between the two statistics?

3. Between 1950 and 1990, the amount of grain produced per hectare of farmland doubled, an increase of approximately 100 percent. How does this number compare to the percent increase in total food production during the same period of time? What do these statistics imply about the amount of land used for farming between 1950 and 1990, and how might this change affect the global environment?
PART B    FOOD CONSUMPTION

The United Nations has determined that the average global citizen needs approximately 2,500 calories every day to maintain a healthy diet. There are some variations based on the climate where people live and the amount of energy they expend. For most people, eating less than 2,000 calories a day, on a long-term basis, will result in chronic malnutrition.

How does your food consumption compare to the needs of the average global citizen? Record what you eat and drink for a typical 24-hour period. The number of calories contained in the foods can be found on most food labels. Use a calorie-counting guide from the library to determine the energy contained in foods without labels, such as fresh produce. Be sure to adjust the number of calories to reflect the size of the portion you ate.

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Calories</th>
</tr>
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<tbody>
<tr>
<td>Breakfast</td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meal total:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Snack:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lunch:</td>
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<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meal total:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Snack:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dinner:</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meal total:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Snack:</td>
<td></td>
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</tbody>
</table>

TOTAL CALORIES: ___
Analysis

1. People in most countries eat their biggest meal in the middle of the day. Which is the biggest meal for you? Explain why.

2. Compare your food consumption to the amount of each food group recommended by the Department of Agriculture’s food pyramid. Is there any food group that you eat too much or too little of? Explain.

3. If you are very active and participate in sports regularly, your body requires more calories than it would if you were inactive. Describe your usual activities and indicate whether you think you are not very active, moderately active, or very active most days.

4. To lose one pound of body weight, a person must consume 3500 fewer calories than the body needs for energy. If a person whose weight is stable reduces his or her daily consumption by 500 calories, while maintaining the same level of activity, how long would it take for the person to lose 10 pounds?

5. How does your total consumption of calories compare with the needs of the global citizen? Is it reasonable to think that if you were to change the amount of food you consume, it would have an effect on the amount of food available for hungry people in developing nations? Explain your answer.
_ACTIVITY 24

GLOBAL WARMING RESEARCH

BACKGROUND

Carbon dioxide and other gases in the atmosphere act like the glass walls of a greenhouse. Radiation from the sun’s rays go through, but some of the heat that would normally be radiated back into space is trapped, raising the air temperature. Some scientists theorize that this effect, called the greenhouse effect, could cause global warming, resulting in dramatic and rapid climatic changes. Other scientists disagree with this conclusion. Many scientists look at information and observations differently, and they do not always agree with one another about what the data means.

PART A ANALYZING THE ISSUE

One way to evaluate two sides of an issue is to determine whether the statements proposed by the scientists and the media are facts, hypotheses, theories, or beliefs. Read each of the statements about global warming, and decide which kind of statement it is. Identify each as either a fact, hypothesis, theory, or belief. In the space before each statement, place the letter that corresponds to each type of statement.

A. Facts—supported by data and observations
B. Hypotheses—predictions of experimental results based on previous data
C. Theories—explanations that fit a large body of observations and are based on extensive scientific experimentation.
D. Beliefs—opinions usually related to a person’s values

1. _______On average, Earth will become warmer as a consequence of the greenhouse effect. Warmer conditions will probably lead to more evaporation and precipitation overall, but individual regions will vary, some becoming wetter and others dryer.

2. _______Human beings add CO₂ to the atmosphere mainly by burning fossil fuels like coal and oil. Deforestation is the second largest contributor to increasing atmospheric CO₂.

3. _______The NASA Goddard Institute for Space Studies’ (GISS) computer model has been used to calculate the temperature increase during the next 50 years in response to gradual increases in greenhouse gas concentrations, taking into effect the ice core data for the past 200,000 years. The simulation shows a change of two degrees, which would make Earth warmer than it is thought to have been in past history.

4. _______The greenhouse effect will warm the oceans and partially melt glaciers and other ice, increasing sea levels. Ocean water also will expand if it warms, contributing to further sea level rise.

5. _______There is evidence that average surface air temperatures have increased worldwide by about one-half degree Celsius since 1850. The CO₂ level in the atmosphere has increased nearly 25 percent since the early 1800s.
6. People should not worry about global warming because nature has a system of checks and balances that will negate the greenhouse effect.

7. Predictions about the role that clouds and oceans play in the heating and cooling process of Earth's atmosphere are not completely understood and scientists' predictions vary.

8. There is nothing that can be done to prevent global warming because any action would require the cooperation of all nations, many of whom are at war with each other.

PART B    DEBATING THE ISSUE

Participating in a debate will help you to become familiar with the arguments on both sides of an issue. Following is an outline of the important steps of organizing a constructive debate. In this case, the issue is whether or not people should take steps to reduce global warming.

1. Preparation
You will be debating the greenhouse effect in groups of four. Two members will take one side and the remaining two will take the opposing side. Prepare your position statements by gathering and analyzing the facts about the topic. You should begin by reading the position statements that are included at the end of this activity. Obtain more supporting information from the library, databases, and other references. Write each statement that supports your position on an index card to use for easy reference during the debate.

2. Presentation
The two team members on each side present their case, while the others listen. At this time, the opposing team may speak only to ask clarifying questions. They may not challenge the other team's statements. After the first pair is finished, the other pair presents.

3. Challenge
Each side challenges the other side's arguments, insists on facts, and points out any flaws in their presentations. Name-calling and put-downs are not allowed, nor are physical displays of emotion.

4. Switch
Each side now prepares a new set of arguments and presents the strongest case for the opposite side. Repeat the debate by arguing the opposite point of view.

5. Group Discussion
As a group, decide which arguments are most valid from both sides. Write a statement resolution that incorporates the best thinking of the whole team.

6. Group Report
As a group, prepare a written summary report. Choose one issue that you debated and disagreed about and write down that statement. Write a resolution statement that provides the group consensus about the problem, whether it exists, what may be the results globally, and what can be done about it. If no agreement can be reached, discuss the areas of agreement and disagreement, including reasons listed under your resolution section. All team members must sign the report and record the dates they were present to work on the project, if it extends more than one class period.
Position Statements

Position 1  NASA Facts. Goddard Space Flight Center, Greenbelt, MD, NF-182 June 1993
Globally, as the concentration of atmospheric CO₂ rises, temperatures will increase and other climate characteristics will probably change as well:

- On average, surface air temperatures around the world will increase. When the climate has adjusted to a doubling of the CO₂ concentration, researchers estimate a global average temperature increase of 3–8°C. The GISS computer model is close to the higher end of this range.
- Overall, rain, and perhaps snow (at high altitudes), may increase, but this trend may not appear everywhere. Snow cover may recede.
- Conditions locally may differ from global averages in temperature, amounts of rain and snow, and frequency or severity of major storms. Scientists cannot yet produce good estimates of future changes in regional climate because their tools are not sophisticated enough to forecast changes in regional conditions.
- There has been little increase of global temperature in the last 50 years, suggesting that there may be other factors influencing climate. The Upper Atmosphere Research Satellite will contribute further to the study of the greenhouse effect with the Earth Observing System Satellite.


- The 1980s was the hottest decade ever recorded. It included the six warmest years since measurements have been taken. Over the last century the global climate has warmed by between 0.3° and 0.6° C.
- No one can be sure if this is a result of pollution gases or a natural variation in the climate. In May 1990, 300 of the world's top experts, reporting for the official United Nations Intergovernmental Panel on Climatic Change, said they were "certain that man-made emissions are substantially increasing the atmospheric concentrations of the main greenhouse gases" and "these increases will lead to a warming of the earth's surface."
- Their best estimate was that by the year 2020 the world will, on average, be 1.3°C warmer than now, rising to 3°C warmer by 2070. A rise of 3°C would make the world hotter than it has been for the last 2 million years. Sea levels will rise as the world gets warmer because the heat will melt ice and expand the water in the ocean causing levels to rise by more than a meter. This would make 200 million people homeless. Food production will be disrupted and wildlife will be in danger.

Position 3  World Climate Review, Vol. 2, #2, Winter 1994, Dept. of Environmental Sciences, University of Virginia

- "Global warming continues on hold" was the press release about 1993 temperatures from the National Climatic Data Center. According to Thomas Karl, global temperatures measured by ground-level thermometers averaged 0.2°C above the mean for 1951–80 period. This is an amount that no one but scientists would notice and it hasn’t differed much during many of the years in the 20th century.
- Scientists have been predicting a disaster, claiming that gases from cars, power plants, and other factors are creating a greenhouse effect that will boost temperatures dangerously high over the next 75 years or so. But if 1994’s weather was any indication, shouldn’t we start worrying about an ice age instead?
- Bigger trees are the result of an increase in photosynthesis during the day and a decrease in the amount of physiological respiration during the night. This is a result of increased CO₂ levels.

- Myth: Coastal cyclones and hurricanes are getting worse because of global warming. Since the jet stream powers coastal cyclones, global warming will weaken the jet stream and should diminish the number of cyclones.

**Position 4  Richard Lindzen, meteorologist at M.I.T.**

- The water vapor gas information suggests that dense, low-level clouds do not let the sunlight penetrate to the surface so the surface temperature would cool. The models don’t always match the results.

- Everyone wants to see a better environment but you can’t mix environmental advocates and scientific results. Often issues of this type, like global warming, are largely political in nature and are not scientific concerns at all.
ACTIVITY 27

CONSERVATION

BACKGROUND

Conservation efforts have prompted the formation of national and international groups that protect and defend wildlife and their habitats. Can these efforts bring about a sustainable world? Decisions and efforts made by individuals or by large organizations can make a difference.

PART A  CONSERVATION ORGANIZATIONS

Listed below are several conservation organizations. Choose two of the organizations on the list and investigate their activities. Determine the goals of the organization and any actions the group has taken in recent years. Prepare a two minute talk about each organization during which you share what you have found out with the rest of the class. Take notes on other students’ presentations and record the information below.

1. World Wildlife Fund (WWF)


3. United Nations Environment Programme (UNEP)

4. Nature Conservancy

5. Sierra Club

6. Habitat for Humanity International

7. Natural Resources Defense Council

8. Environmental Defense Fund
9. Greenpeace

10. Conservation International

PART B

CONSERVATION SCAVENGER HUNT

An active part of any conservation effort is waste reduction to minimize the use of precious resources. Conduct a conservation scavenger hunt. For a one-week period, collect as many of the following items and perform as many tasks as you can. Get receipts for items or notes from adults for those items that need verification or need to be returned.

1. Energy-efficient fluorescent light bulb
2. Three paper products made from recycled materials
3. Glass soda bottle
4. Ticket from riding public transportation
5. Pictures of five mammals native to your state
6. Recycled plastic product
7. Picture of your state's flower
8. Picture of your state's bird
9. Diagram explaining composting
10. Packet of wildflower seeds
11. Diagram of a water-conserving shower head
12. Design for a drought-resistant 10 meter by 10 meter yard
13. Product that is biodegradable
14. Product that comes in a reusable container
15. Newspaper or magazine article from the past 6 months about conservation.
16. List of all of the hazardous chemicals and wastes in your home.
17. List of three ways you personally can save water
18. List of five ways that you can save energy
19. Clean up trash in your neighborhood, and have your parent sign a sheet saying when and where you completed this activity.
20. Take your used clothes to a Goodwill or other non-profit organization that will make them available for reuse.
21. Set up a paper recycling container in your home.
22. Walk or ride your bike on an errand one mile or less from your house.
23. Collect newspapers and take them to a recycling center.
24. Build a bat house and attach it to the school or your garage.
25. Locate a recycling center in your area and find out where they take their recycled cans, bottles, and paper.
26. Locate the sanitary landfill in your area. What items do they accept, and how do they treat the waste materials that they receive?

27. Find an energy-efficiency label from a new appliance. Write down the information from the label and explain why this product saves energy.

28. Take brown bags to the grocery store and reuse them to carry your groceries.

29. Create a conservation poster that encourages people to be active in conservation efforts.

PART C ONE PERSON CAN MAKE A DIFFERENCE

Find out what people in your neighborhood are doing to help solve the solid and hazardous waste problem. Conduct a survey of 25 people using the questions provided on this page. On page 108, write five additional questions that you can include in your survey. Bring your results back to the class, tally your results, and discuss the responses that you and your classmates received.

Survey Questions:


2. When you go to the grocery store do you ask for paper or plastic, or do you bring your own reusable bags? What do you do with the paper and plastic bags after they are emptied?

3. Have you ever taken toxic or hazardous household materials to a neighborhood or community hazardous-waste collection site? If yes, what materials did you take?

4. What do you do with your grass clippings? With your autumn leaves? With your Christmas tree?

5. What do you or your service garage do with the used oil from your vehicles when you change your oil?

6. What do you consider your community’s greatest waste-disposal problem to be?
Extra Questions

7. 

8. 

9. 

10. 

11. 

Discuss the previous questions with your family and decide what changes they are willing to make to help the environment. Consider also these additional conservation measures. Explain your reasons for any “no” answers.

1. Would you be willing to pack your lunch in reusable containers instead of using paper or plastic bags?

2. Would you be willing to use rechargeable batteries instead of regular batteries?

3. Would you be willing to walk or ride a bike on trips of one mile or less?

4. Would you be willing to start a compost pile to decompose biodegradable plant wastes?

5. Would you be willing to switch to energy-efficient light bulbs that cost more but last longer?

6. Would you be willing to use water-conserving shower heads to save water?