Basic Natural Resource Management
Wildlife and the Natural Environment

PURPOSE

To introduce the student to types of renewable and nonrenewable natural resources and their relationship to ecosystems

MATERIALS NEEDED

PowerPoints:
- Environmental Natural Resources
- Ecosystems

Copies:
- Wildlife and the Natural Environment Guided Notes
- Ecosystems Guided Notes
- Natural Resources Puzzle Instructions, Template, and Grading pages
- Predator-Prey Simulation pages
- Wildlife and the Natural Environment Crossword Puzzle
- Wildlife and the Natural Environment Test

Activity Materials:
- colored pencils, markers, and/or crayons
- scissors
- envelopes (or Ziploc bags)
- spoons (can be plastic or from the lunch room)
- candy pieces (M&Ms, Skittles, or similar) or small beads
- containers or paper and tape to make a shallow box

TIME REQUIRED

2+ to 3.5+ hours

- 20 to 30 minutes to discuss the Environmental Natural Resources PowerPoint and complete the Guided Notes
- 30 to 50 minutes for students to create the Natural Resources Puzzle
- 15 to 25 minutes to discuss the Ecosystems PowerPoint and complete the Guided Notes
- 35 to 50 minutes to perform the Predator-Prey Simulation 1
- 10 to 15 minutes to complete the Predator-Prey Simulation 2 (extension activity)
- 10 to 20 minutes answer the Crossword Puzzle for review
- 15 to 30 minutes to take the Written Test

STANDARDS

AFNR-BAS-10: Demonstrate basic skills in natural resource management.

- 10.1 Describe the importance of the forestry and natural resource industry to Georgia's economy.
- 10.6 Explain the relationship between wildlife and the environment.
- 10.7 Compare and contrast approved practices in managing wildlife.

ESSENTIAL QUESTION

How do natural resources and ecosystems relate and what is our role in them?

Wildlife and the Natural Environment
Instructor's Notes

PowerPoints. Use the lesson PowerPoints to introduce the content and discuss the important concepts. The slideshows may be saved to your computer so that you can add your own examples if desired. A content outline is provided for you to follow and there are Guided Notes for students to fill in.

Natural Resources Puzzle. Decide if you will have students working alone or in pairs or groups and then handout the activity instruction page and the puzzle template. Either allow students to choose from the list of natural resources on the activity page or go around the room and assign one to each group or individual.

Students will illustrate a puzzle with facts and pictures about a natural resource. Be sure they have access to coloring supplies, scissors, and information resources (their notes, textbooks, the internet). Provide a bag or envelope to put their puzzle pieces in when they have finished. Staple or tape a grading sheet to each envelope for evaluation.

If there is time, have the students trade puzzles and put each others together. This will help reinforce the content as well as give peer-to-peer feedback on creativity.

Predator-Prey Simulation. This is a great kinesthetic activity that is simple to set up and easily demonstrates natural resource principles.

Provide each student pair or group of students with 50 candy pieces (or small beads). M&Ms or Skittles work best. If you use something smaller like Nerds, you will want to increase the number of prey that must be captured. Each group also needs a spoon and a container to represent their ecosystem. You can provide flat-bottomed tupperware or shoeboxes but the easiest solution is as follows. Give each group 1 piece of paper and then pass around tape. If they fold up the edges about an inch and tape the corners it will make a shallow container.

Students will follow the instructions on the activity page to perform the simulation, record their data, and answer the questions. If there is time, lead a discussion on their results.

Predator-Prey 2: Extension Activity. If you have time or want to expand the activity to encompass more than simple predator-prey relationships. Have students perform a second round using the #2 activity page. Students will follow the same guidelines as the first activity but with the addition of an outside influence. Go around the room and assign each group one of the impact situations on their activity page. At the end of the activity (or as a class starter the next day), have each group present their impact situation and how it affected their populations.

Review and Assessment. A Crossword puzzle on content vocabulary and concepts is provided to use as a review tool. It also make a great Bellringer, end-of-class wrap up, or as part of a substitute lesson activity. A multiple-choice and matching test is also included that you may use as an end-of-lesson evaluation.

Environmental Natural Resources

Renewable Resources, Nonrenewable Resources, and Sustainablity

AG-BAS-3: The student distinguishes between types of environmental natural resources and draws conclusions about human impact on the environment.

Plant and Forest Resources

- plants are used for food, fiber, beautification, and as in producing many everyday products
- almost half of our land area is still in forest
- noncommercial forests: not usable for forest production but can be maintained for wildlife habitat and recreation
- commercial forests: produce more wood and fiber each year than the year before
- good forest management keeps mature forests healthy and young forests growing which includes cutting down trees

Advances and Technologies

- off-shore wind power turbines for clean energy that doesn't take up land area
- dam-less hydro systems that derive kinetic energy from currents in rivers and oceans
- building with materials that have light-dispersing properties and designing for natural air circulation
- biomass energy: using plant material and wastes for energy
- biofuelsl made from plant oils, animal fats, and recycled greases
- geothermal energy: tapping into the heat of the earth itself

What are natural resources?

- materials in nature that sustain life or that can be used by humans
- include soil and land area, water, fish and wildlife, plants and forests, air, minerals, and energy sources
- different resources are used to fill different needs: food, clothing, shelter, energy, entertainment/recreation

Air Resources

- oxygen is essential for animals to breathe, plants to perform photosynthesis, and other organisms to function
- the earth's atmosphere can be damaged by human activitygood air quality (free from pollution) is essential to a healthy habitat
- planting trees and establishing green spaces help to clean the air

Nonrenewable Resources

- resources that form extremely slowly (more than a lifetime) or do not form naturally in the environment
- examples are fossil fuels (coal, petroleum, and natural gas), minerals (calcium, aluminum, phosphorous, copper, gold, silver), and nuclear power (uranium)
- used for fuel, heat, manufacturing, fertilizer, feed supplements, jewelry, coins, etc.
- a major concern is our present consumption depletes the availability of resources for future generations;
- depletion: to use up a supply or abundance of something

Soil and Land Resources

- soil: the outer layer of the earth's surface consists of minerals, organic matter, water, and air
- much of our land is no longer available for production agriculture because it is covered by buildings, roads, and other man-made structures
- not all land is suitable for production and even less for crop production
- erosion: soil loss due to the washing or blowing away of the upper layer of soil

Mineral and Energy Resources

1. Minerals
   - calcium, aluminum, phosphorous, copper, gold, silver are just a few
   - used for fertilizer, feed supplements, jewelry, coins, etc.
2. Energy Sources
   - fossil fuels: coal, petroleum, and natural gas
   - nuclear power: uranium
   - also the sun and wind provide direct and indirect energy sources
   - used for fuel, heat, manufacturing, etc.

Sustainable Agriculture

- sustainability: able to be maintained at a certain rate or levelagricultural practices that maintain our ability to provide for the foreseeable future
- requires knowledge of the environment and natural processes to develop sustainable techniques

Water Resources

- covers 70% of the earth's surface and is found in the atmosphere but not all of it is usable or reachable
- need it for drinking, irrigation, harvesting fish and other aquatic life, as an energy source, as soil moisture, and more
- human use of water pollutes much of it
- runoff: washing of substances from the surface into water sources
  - a problem with chemicals and other industrial products

Renewable Resources

- resources that can or will be replenished in a relatively short time
- examples: plants, animals, water, air, solar energy

Examples of Sustainable Practices

- recycling crop and livestock waste
- planting legume crops to replace nitrogen in the soil
- using longer-term crop rotation schedules
- no-till planting to reduce erosion
- low-level or drip irrigation
- developing drought and insect resistant crops
- composting and recycling materials

Fish and Wildlife Resources

- wildlife: non-domesticated animals that can be game or non-game animals, as well as uncultivated plant life
- management is important to maintain the balance of our ecosystems (communities of interacting organisms)
- many people enjoy wildlife for recreation (hunting, fishing, hiking, etc.)
- wildlife areas and habitats can be threatened by human expansion and pollution
- conservation: preserving and protecting the natural environment
- overprotecting can cause problems as well by disrupting natural cycles

Renewable Pros and Cons

Advantages	Disadvantages
• use repeatedly without depletion therefore it is sustainable	• consumption cannot exceed replacement
• minimal impact on the environment	• can be difficult to produce in the large quantities that we consume
• low cost of application	• can be expensive to build and/or use
• economic benefit to the region	• supply can be unreliable

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Ecosystems

The Interrelationship of Natural Resources and Ecosystems

AG-BAS-3: The student distinguishes between types of environmental natural resources and draws conclusions about human impact on the environment.

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What are Autotrophs?

- Autotrophs: produce organic matter from inorganic substances
- in other words they make their own food through chemical reactions using minerals, gases, and light energy
- example: green plants
- also known as "Producers"

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What are ecosystems?

- biosphere: the area of Earth that supports life
  - extends from the Earth's crust to the atmosphere
- ecosystem: a community of living organisms interacting with its environment in a specific area
  - all the factors are linked together through energy flow and nutrient cycles while maintaining a balance
  - the more biodiversity an ecosystem has, the more stable it will be
  - biodiversity: the range or variety of organisms within an ecosystem
  - many different kinds of ecosystems exist and can be small or cover a very large area

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What are Hetertrophs?

- *obtain energy by feeding on autotrophs and/or other heterotrophs*
1. Consumers: get their energy by eating other living things such as plants and animals
   - ex. humans, animals, parasites
2. Scavengers: feed on the dead bodies of other animals to obtain their energy
   - ex. crabs, vultures
3. Decomposers: live off of dead plants and animals; breakdown non-living tissue into organic matter that goes back into the ecosystem for reuse
   - ex. bacteria, fungi, and other microorganisms

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Other Ecosystem Terms

- community: plants, animals and other organisms that live in the same area
- habitat: the place or area where a particular organism lives naturally that provides for all its needs
  - includes its climate, land type, soil, water, and other organisms in the area
- niche: the effect or role a species has within its ecosystem
  - could be essential to the balance or survival of the ecosystem especially if it is unique

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Why are food webs important?

- all organisms in an ecosystem are dependent upon each other even though some relationships are indirect
- all parts of the ecosystem are affected if one part is removed by external forces (natural or man-made)
- renewable resources need to be conserved in order to prevent depletion or extinction

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Subsystems

1. Biotic Factors: *all living organisms in an ecosystem*
   - examples: plants, animals, bacteria, viruses, fungiall compete with each other for food, water, and space
   - make up a food web or food chain
2. Abiotic Factors: *all non-living parts of the environment in that area*
   - examples: air, water, soil, minerals, sunlight, wind, temperature, space
   - determines what type of life can survive

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What are Food Webs?

- food web: the transfer of energy through a series of food chains
- food chain: organisms dependent upon each other as food sources
- composed of:
  1. Autotrophs (a.k.a. Producers)
  2. Heterotrophs (a.k.a. Consumers and Decomposers)

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Wildlife and the Natural Environment
Content Outline

I. Environmental and Natural Resources
- materials in nature that sustain life or that can be used by humans
- include soil and land area, water, fish and wildlife, plants and forests, air, minerals, and energy sources
- different resources are used to fill different needs: food, clothing, shelter, energy, entertainment/recreation

   A. Soil and Land Resources:
   - soil: the outer layer of the earth's surface consists of minerals, organic matter, water, and air
   - much of our land is no longer available for production agriculture because it is covered by buildings, roads, and other man-made structures
   - not all land is suitable for production and even less for crop production
   - erosion: soil loss due to the washing or blowing away of the upper layer of soil

   B. Water Resources:
   - covers 70% of the earth's surface and is found in the atmosphere but not all of it is usable or reachable
   - need it for drinking, irrigation, harvesting fish and other aquatic life, as an energy source, as soil moisture, and more
   - human use of water pollutes much of it
   - runoff: washing of substances from the surface into water sources
       - a problem with chemicals and other industrial products

   C. Fish and Wildlife Resources:
   - wildlife: non-domesticated animals that can be game or non-game animals, as well as uncultivated plant life
   - management is important to maintain the balance of our ecosystems (communities of interacting organisms)
   - many people enjoy wildlife for recreation (hunting, fishing, hiking, etc.)
   - wildlife areas and habitats can be threatened by human expansion and pollution
   - conservation: preserving and protecting the natural environment
   - overprotecting can cause problems as well by disrupting natural cycles

   D. Plant and Forest Resources:
   - plants are used for food, fiber, beautification, and as in producing many everyday products
   - almost half of our land area is still in forest
   - noncommercial forests: not usable for forest production but can be maintained for wildlife habitat and recreation
   - commercial forests: produce more wood and fiber each year than the year before
   - good forest management keeps mature forests healthy and young forests growing which includes cutting down trees

   E. Air Resources
   - oxygen is essential for animals to breathe, plants to perform photosynthesis, and other organisms to function
   - the earth's atmosphere can be damaged by human activity
   - good air quality (free from pollution) is essential to a healthy habitat
   - planting trees and establishing green spaces help to clean the air

F. Mineral and Energy Resources
   1. Minerals
      • calcium, aluminum, phosphorous, copper, gold, silver are just a few
      • used for fertilizer, feed supplements, jewelry, coins, etc.
   2. Energy Sources
      • fossil fuels (coal, petroleum, and natural gas)
      • nuclear power (uranium)
      • also the sun and wind provide direct and indirect energy sources
      • used for fuel, electricity, heat, manufacturing, etc.

II. Renewable vs. Nonrenewable Resources
   A. Renewable Resources
      • *resources that can or will be replenished in a relatively short time*
      • these are plants, animals, water, air, solar energy
      • advantages:
         • use repeatedly without depletion therefore it is sustainable
         • minimal impact on the environment
         • low cost of application
         • economic benefit to the region

      • disadvantages:
         • consumption cannot exceed replacement rates (ex. plants and animals)
         • can be difficult to meet demand
         • expensive to build and/or use
         • supply can be unreliable

      • renewable resource advances and technologies:
         • off-shore wind power turbines for clean energy that doesn't take up land area
         • dam-less hydro systems that derive kinetic energy from currents in rivers and oceans
         • building with materials that have light-dispersing properties and designing for natural air circulation
         • biomass energy: using plant material and wastes for energy
         • biofuels made from plant oils, animal fats, and recycled greases
         • geothermal energy: tapping into the heat of the earth itself

   B. Nonrenewable Resources
      • *resources that form extremely slowly (more than a lifetime) or do not form naturally in the environment*
      • examples: minerals and fossil fuels
      • a major concern is our present consumption depletes the availability of resources for future generations
      • depletion: to use up a supply or abundance of something

   C. Sustainable Agriculture
      • sustainability: able to be maintained at a certain rate or level
      • agricultural practices that maintain our ability to provide for the foreseeable future
         • requires knowledge of the environment and natural processes to develop sustainable techniques
         • examples: recycling crop and livestock waste, planting legume crops to replace nitrogen in the soil, using longer-term crop rotation schedules, no-till planting to reduce erosion, low-level or drip irrigation, developing drought and insect resistant crops

III. Ecosystems
   A. Ecosystems
      • <u>biosphere</u>: the area of earth that supports life
         • extends from the earth's crust to the atmosphere
      • <u>ecosystem</u>: a community of living organisms interacting with its environment in a specific area
         • all the factors are linked together through energy flow and nutrient cycles while maintaining a balance
         • the more biodiversity an ecosystem has, the more stable it will be
         • <u>biodiversity</u>: the range or variety of organisms within an ecosystem
         • many different kinds of ecosystems exist and can be small or cover a very large area
      • <u>community</u>: plants, animals and other organisms that live in the same area
      • <u>habitat</u>: the place or area where a particular organism lives naturally that provides for all its needs
         • includes its climate, land type, soil, water, and other organisms in the area
      • <u>niche</u>: the effect or role a species has within its ecosystem
         • could be essential to the balance or survival of the ecosystem especially if it is unique

   B. Subsystems
      1. <u>Biotic Factors</u>: all living organisms in an ecosystem
         • examples: plants, animals, bacteria, viruses, fungi
         • all compete with each other for food, water, and space
         • make up a food web or food chain

      2. <u>Abiotic Factor</u>s: all non-living parts of the environment in an ecosystem
         • examples: air, water, soil, minerals, sunlight, wind, temperature, space
         • determines what type of life can survive

   C. <u>Food Web</u>: the transfer of energy through a series of food chains (organisms dependent upon each other as food sources)
      1. <u>Autotrophs</u>: produce organic matter from inorganic substances; in other words they make their own food through chemical reactions using minerals, gases, and light energy (ex. green plants)
         • a.k.a. Producers

      2. <u>Heterotrophs</u>: obtain energy by feeding on autotrophs and/or other heterotrophs
         a) <u>Consumers</u>: get their energy by eating other living things such as plants and animals (ex. humans, animals, parasites)
         b) <u>Scavengers</u>: feed on the dead bodies of other animals to obtain their energy (ex. crabs, vultures)
         c) <u>Decomposers</u>: live off of dead plants and animals
            • breakdown non-living tissue into organic matter that goes back into the ecosystem for reuse
            • examples: bacteria, fungi, and other microorganisms

      3. Importance
         • all organisms in an ecosystem are dependent upon each other even though some relationships are indirect
         • all parts of the ecosystem are affected if one part is removed by external forces (natural or man-made)
         • renewable resources need to be conserved in order to prevent depletion or extinction

Wildlife and the Natural Environment Guided Notes

Section I: Natural Resources

1. Define natural resources.

   _____

2. List types of natural resources.

   _____   _____

   _____   _____

3. Soil is the _____ of the earth's surface.   _____

4. What does soil consist of?

   _____

5. The loss of soil to wind or water is called…   _____

6. Water can be found on the earth and in the _____.   _____

7. Substances washing into water sources is called…   _____

8. Non-domesticated animals and uncultivated plants are…   _____

9. Many people utilize wildlife resources for _____.   _____

10. Preserving and protecting the natural environment is…   _____

11. Cutting down trees can keep managed forests _____.   _____

12. Good quality air is essential for healthy _____.   _____

13. Mineral resources are used for _____ , feed supplements, and manufacturing.   _____

14. Give examples of types of energy resources.

   _____

Wildlife and the Natural Environment Guided Notes

15. Natural resources that can be replaced are called...

                                       _____

16. List examples of renewable resources.

      _____

17. What are advantages of renewable resources?

      _____

18. What are disadvantages of renewable resources?

      _____

19. Resources that can not be replenished are called...

                                       _____

20. Give examples of nonrenewable resources.

      _____

21. To use up a supply or abundance of something is called…

                                       _____

22. Give examples of renewable resource advances or technologies.

      _____

23. The ability to maintain something at a certain rate or level is

                                       _____

24. Sustainable agriculture requires ____ of natural processes.

                                       _____

25. Give examples of sustainable agriculture practices.

      _____

Wildlife and the Natural Environment Guided Notes

1. Define natural resources.

    materials in nature that sustain life or that can be used by humans

2. List types of natural resources.

    soil and land   *water*

    fish and wildlife   *forests and plants*

    air   *minerals and energy sources*

3. Soil is the ____ of the earth's surface.   *outer layer*

4. What does soil consist of?

    minerals, organic matter, water, and air

5. The loss of soil to wind or water is called…   *erosion*

6. Water can be found on the earth and in the ____.   *atmosphere*

7. Substances washing into water sources is called…   *runoff*

8. Non-domesticated animals and uncultivated plants are… *wildlife*

9. Many people utilize wildlife resources for ____.   *recreation*

10. Preserving and protecting the natural environment is… *conservation*

11. Cutting down trees can keep managed forests ____.   *healthy*

12. Good quality air is essential for healthy ____.   *habitats*

13. Mineral resources are used for _____ , feed supplements, and manufacturing.   *fertilizer*

14. Give examples of types of energy resources.

    coal, petroleum, natural gas, uranium, sun, wind, water

Wildlife and the Natural Environment Guided Notes

15. Natural resources that can be replaced are called...   *renewable resources*

16. List examples of renewable resources.

plants, animals, water, air, solar energy

17. What are advantages of renewable resources?

sustainable, low environmental impact, low cost, economic benefit

18. What are disadvantages of renewable resources?

consumption can not exceed replacement rates, difficult to meet to demand, unreliable supply, can be expensive

19. Resources that can not be replenished are called...   *nonrenewable resources*

20. Give examples of nonrenewable resources.

fossil fuels (coal, petroleum, natural gas), minerals, nuclear power

21. To use up a supply or abundance of something is called...   *depletion*

22. Give examples of renewable resource advances or technologies.

wind turbines, dam-less hydro power, biomass energy, biofuels, geothermal energy use

23. The ability to maintain something at a certain rate or level is   *sustainability*

24. Sustainable agriculture requires _____ of natural processes.   *knowledge*

25. Give examples of sustainable agriculture practices.

waste recycling, long-term crop rotation, no-till planting, drip irrigation, resistant crops

Ecosystems Guided Notes

1. The area of earth that supports life is the _____.

   _____

2. Define ecosystem.

   _____

3. The variety of organisms within an ecosystem is its…

   _____

4. Plants, animals, and other organisms living in an area are a:

   _____

5. The area a particular organism lives is its…

   _____

6. The effect or role a species has within its ecosystem is its…

   _____

7. All living organisms in an ecosystem are called…

   _____

   …and examples are:

   _____

8. All non-living parts of an ecosystem are its…

   _____

   …and examples are:

   _____

9. A food web transfers ____ through a series of food chains.

   _____

10. Organisms that produce their own food are…

    _____

    …and examples are:

    _____

11. Organisms that obtain energy from other organisms are…

    _____

12. Feeding on dead animals is how ____ get their energy.

    _____

    …and examples are:

    _____

13. Breaking down dead tissue into organic matter is a job for…

    _____

    …and examples are:

    _____

14. All organisms in an ecosystem are ____ on each other.

    _____

Ecosystems Guided Notes

1. The area of earth that supports life is the _____.   *biosphere*

2. Define ecosystem.

   a community of living organisms interacting with its environment in a specific area

3. The variety of organisms within an ecosystem is its…   *biodiversity*

4. Plants, animals, and other organisms living in an area are a: *community*

5. The area a particular organism lives is its…   *habitat*

6. The effect or role a species has within its ecosystem is its…   *niche*

7. All living organisms in an ecosystem are called…   *biotic factors*

   …and examples are: *plants, animals, bacteria, fungi*

8. All non-living parts of an ecosystem are its…   *abiotic factors*

   …and examples are: *air, water, soil, space, sunlight*

9. A food web transfers ____ through a series of food chains.   *energy*

10. Organisms that produce their own food are…   *Autotrophs or Producers*

    …and examples are: *green plants*

11. Organisms that obtain energy from other organisms are…   *Heterotrophs or Consumers*

12. Feeding on dead animals is how ____ get their energy.   *scavengers*

    …and examples are: *crabs, buzzards, vultures*

13. Breaking down dead tissue into organic matter is a job for…   *decomposers*

    …and examples are: *fungi, bacteria, microorganisms*

14. All organisms in an ecosystem are ____ on each other.   *dependent*

Natural Resources Puzzle

Objective: Create a puzzle of an natural resource that illustrates its importance to the environment and humans.

Materials:
- puzzle templates or plain paper
- colored pencils, markers, and/or crayons
- scissors
- envelope (or Ziploc bag)

Instructions:
1. Choose one of the natural resources listed below (or circle the one your were assigned).
2. Using the internet and your notes, research the importance of your natural resource.
3. Find and write down following information:
   - a minimum of three ways we use/benefit from this resource
   - a minimum of two ways this resource is depleted or endangered or polluted
4. Get a puzzle template and markers or colored pencils from your instructor.
5. Write the name of your resource in bold or block letters across the middle of your puzzle.
6. Draw or paste pictures that illustrate the uses or benefits of your resource.
7. Under your illustrations, label and list the information you found during your research.
8. Your puzzle should be colorful with all the words written in marker so it is easy to read. You may add any additional illustrations that add to the information.
9. Write your name or the names of your group members on the back.
10. Cut your puzzle along the piece lines as neatly as you can or make your own pieces if you are not using the template.

11. Place the pieces in an envelope (or bag.) Write your name (or names) on the envelope.

Grading:
- title across the middle   10 points
- ways we benefit/use the resource   30 points
- ways the resource is depleted/polluted   20 points
- illustrations accurately reflect information   20 points
- colorful, neat and easy to read   20 points

                    Total Possible   100 points

Topics:
1. water
2. air
3. soil
4. land
5. plants
6. fish
7. wildlife
8. forests
9. energy sources
10. minerals
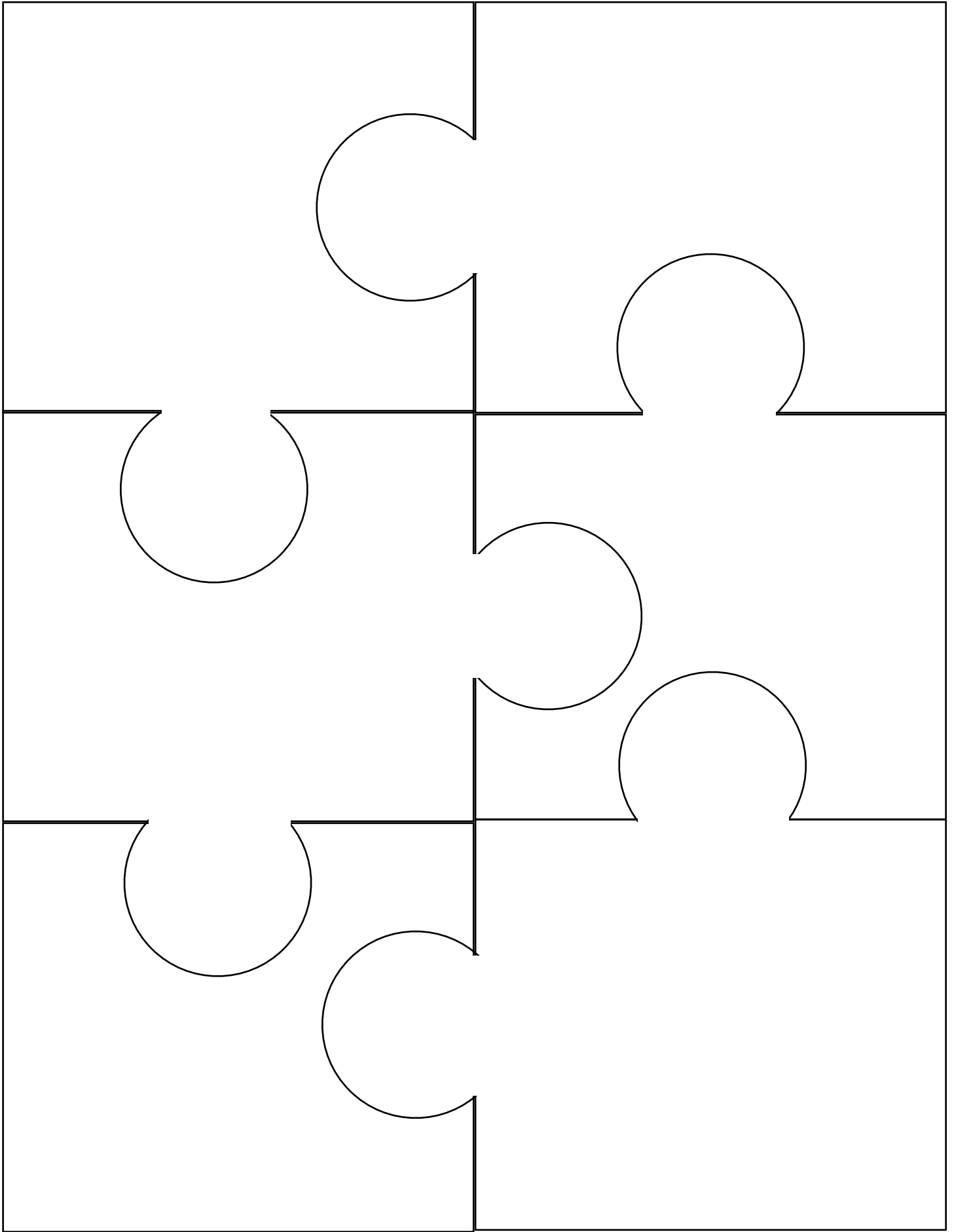
Natural Resources Puzzle

Instructions: Make copies of this page and cut out the grading sheets below into strips. Staple one to the bag that contains of each student's puzzle.

Group Members:

NATURAL RESOURCES PUZZLE

Item	Possible	Earned
title across the middle	10 points	
ways we benefit/use the resource	30 points	
ways the resource is depleted/polluted	20 points	
illustrations accurately reflect information	20 points	
colorful, neat and easy to read	20 points	
Total Possible	100 points	

Group Members:

NATURAL RESOURCES PUZZLE

Item	Possible	Earned
title across the middle	10 points	
ways we benefit/use the resource	30 points	
ways the resource is depleted/polluted	20 points	
illustrations accurately reflect information	20 points	
colorful, neat and easy to read	20 points	
Total Possible	100 points	

Group Members:

NATURAL RESOURCES PUZZLE

Item	Possible	Earned
title across the middle	10 points	
ways we benefit/use the resource	30 points	
ways the resource is depleted/polluted	20 points	
illustrations accurately reflect information	20 points	
colorful, neat and easy to read	20 points	
Total Possible	100 points	

Predator-Prey Simulation

Objective: You will simulate predator-prey interactions and graph the results to explore population dynamics and how they are influenced by other factors. In this activity, the ecosystem is the box or container, your predator (a hawk) is represented by a spoon scooped through the box, and your prey (mice) are represented by small candy or beads.

Materials:

- container to represent the ecosystem
- one spoon to represent your predator
- 50 pieces of candy (or small beads) to represent your prey

Rules of the Simulation:

1. The box represents your ecosystem. In this case, it is a meadow or field.
2. Mice are your prey that live in the field. They are represented by the candy or beads.
   - In each generation, at least 10 prey are initially present in the meadow (either by reproduction or immigration from other areas). So if you are going to begin a generation with only 5 surviving mice, add 5 more to bring the starting population up to 10.
   - The surviving generation of prey (mice) always doubles its numbers. (So if 6 mice survive from Generation One, you will start Generation Two with 12 mice.)
3. The spoon is your predator (a hawk) that hunts in the field.
   - In each generation, at least one predator (hawk) is present in the meadow (by reproduction or immigration).
   - To simulate the predator "hunting", you will randomly scoop the spoon through the box and try to "capture" prey. You can only make one scoop through the box per predator each generation. (So if you have 3 predators, you will scoop 3 times for that generation.)
   - In order for the predator to survive, it must capture at least 3 prey. If it does not it will die or emigrate from the meadow.
   - For each 3 prey the predator captures, it will produce one offspring. Predators may capture more than 3 prey each turn. (So if your hawk captures 4 mice, in the next generation you will have two hawks.)

Instructions:

1. Put 10 prey into your ecosystem.
2. You begin with one predator. Scoop the spoon once randomly through the box to "capture" prey.
3. Remove any prey that were captured and record the starting number and surviving number of predators and prey on your chart.
4. Count how many prey you had left and double that number in your ecosystem.
5. If your predator died during round one, that is okay, a new predator moves in. If your predator captured enough prey to reproduce, then make two scoops through the box this time.
6. Continue the procedure and record data for 20 generations, graph the results and answer the thought questions.
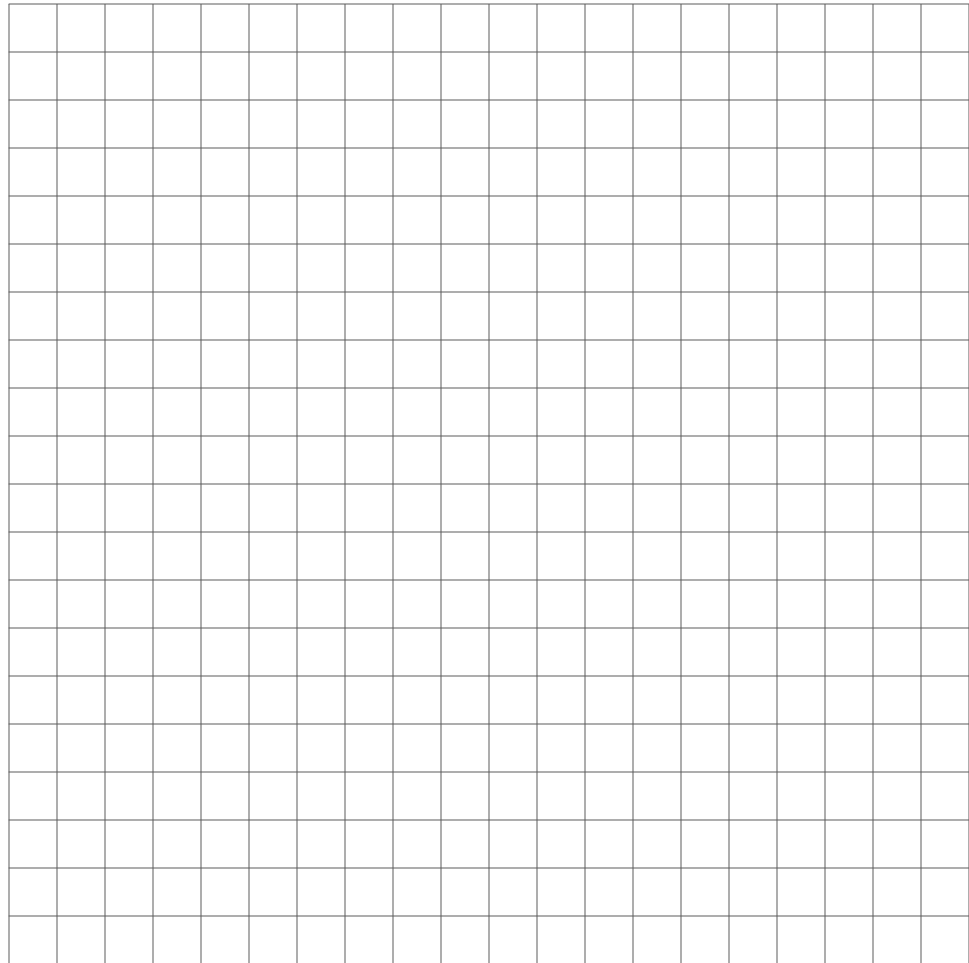
Vocabulary:

- <u>carrying capacity</u>: *the ability of an ecosystem to support a population*
- <u>emigration</u>: *to leave an area and intend to stay away*
- <u>immigration</u>: *to come into an area to live*
- <u>limiting factor</u>: *something that controls the growth of a population (examples: space, water, food, shelter, competition, predation, disease)*

Record Your Data:

Generation	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
# of Predators Starting																				
# of Prey Starting																				
# of Predators Remaining																				
# of Prey Remaining																				

Graph Your Results:

Use the X-axis for generations and the Y-axis for population numbers. Put a dot for the number of predators each generation and then connect the dots with a solid line. Do the same for the prey population but use a dashed line instead. (If you have colored pencils, use two different colors.)

Analyze Your Results:

1. Describe the relationship between predator and prey populations. (What happens to one as the other increases or decreases?)

2. Does the predator population peak at the same time as the prey population? Why or why not?

3. Explain how changing the size of the habitat would affect the population sizes.

Predator-Prey 2: Extension Activity

Objective: You will again simulate predator-prey interactions and graph the results to explore population dynamics. In this extension activity, you will follow the same rules as the first activity with the addition of an outside influence. This time your predator is a bobcat (a.k.a. lynx) and the prey are rabbits.

Instructions:

1. As before, at least 10 prey are initially present in the meadow.
2. The surviving prey (rabbits) doubles its numbers each generation.
3. At least one predator (bobcat) is present in the meadow each generation.
4. In order for the predator to survive, it must capture at least 3 prey. If it does not it will die or emigrate from the meadow.
5. For each 3 prey the predator captures, it will produce one offspring. Predators may capture more than 3 prey each turn.
6. Your "ecosystem" is being impacted by something other than simple predation. The impact situations are listed below. Circle the one assigned to you by your instructor and follow that rule while you perform the simulation.
7. Record the number of predators and prey on your chart for each generation.
8. Continue to record data for 20 generations, graph the results and answer the thought questions.

Impact Situations: *(circle the one that you will apply to your simulation)*

A. Development has reduced the habitat area. Limit the space you have to perform your simulation by one-half.
B. The food supply for your prey has been depleted by human use. Your prey population will only increase by one-half each time. *(Example: If you have 8 surviving prey, instead of 16 prey the next generation will have 12.)*
C. Hunting regulations change. Predator populations are reduced by one each generation. *(Example: If you have 2 predators that capture enough prey to reproduce, the next generation you will have 3 instead of 4 predators.)*
D. Pollution affects prey reproduction. Prey populations only double every other generation. *(Example: if you have 20 prey survive Generation Three, you will only have 20 for Generation Four. If you then have 15 survive Generation Four, then you will have 30 for the next generation.)*
E. Another predator population is relocated to the area. Add an additional predator to the population each turn. *(Example: If you are supposed to have 3 predators for the next generation, make it four.)*
F. Bag limits are increased for the prey in this area. Take away 4 from the prey population each turn. (However, if prey numbers drop below 10, always start the next generation at 10 but subtract 4 from the surviving number on your chart.)
G. The habitat is leveled by human development. Prey no longer have adequate cover. Every predator can now survive/reproduce on 2 prey each turn.

Vocabulary:

- <u>bag limit</u>: *the number of animals that hunters are allowed to take in a given season*
- <u>depletion</u>: *to use up a supply or abundance of something*
- <u>pollution</u>: *the introduction into the environment of a substance or thing that has harmful or poisonous effects*

Record Your Data:

Generation	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
# of Predators Starting																				
# of Prey Starting																				
# of Predators Remaining																				
# of Prey Remaining																				

Graph Your Results:

Use the X-axis for generations and the Y-axis for population numbers. Put a dot for the number of predators each generation and then connect the dots with a solid line. Do the same for the prey population but use a dashed line instead. (If you have colored pencils, use two different colors.)

Impact Situation:

Write the situation that impacted your populations here.
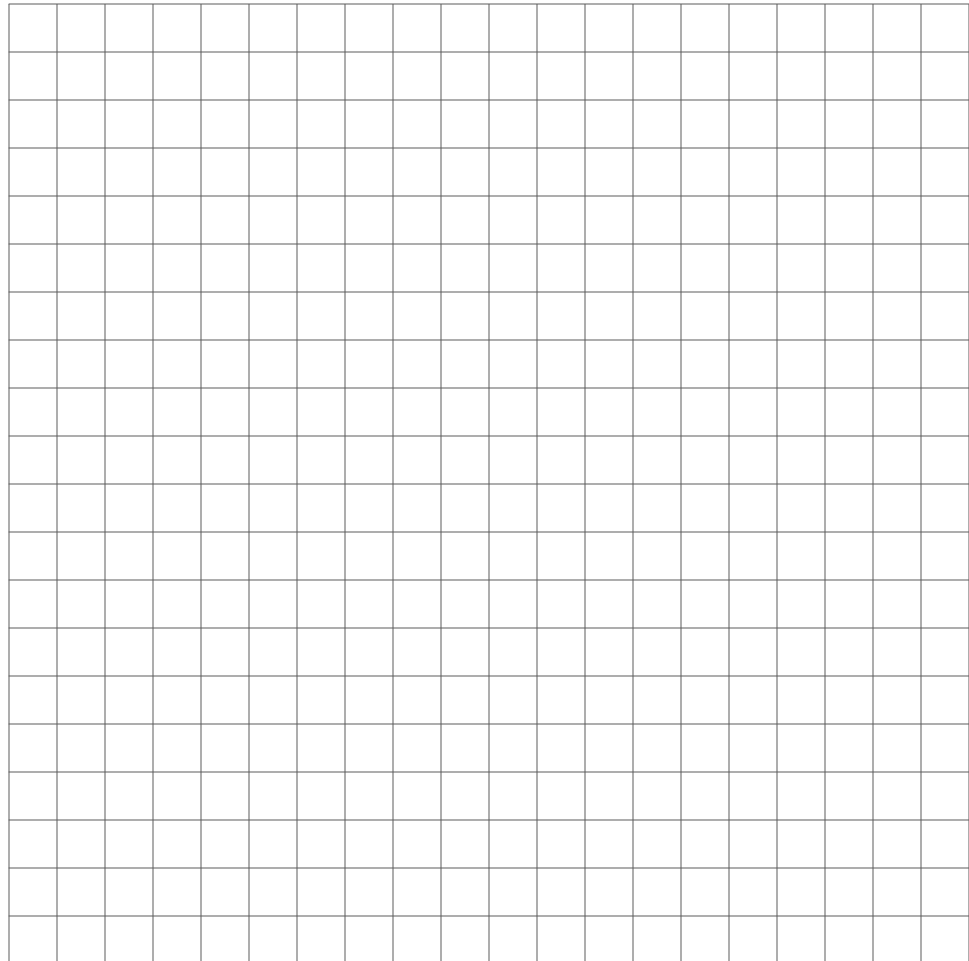
Analyze Your Results:

1. Explain how the situation impacted the prey population.

2. How were the predator populations affected?

3. Predict what would happen to the populations if you collected data on these populations and this situation over another 80 generations.

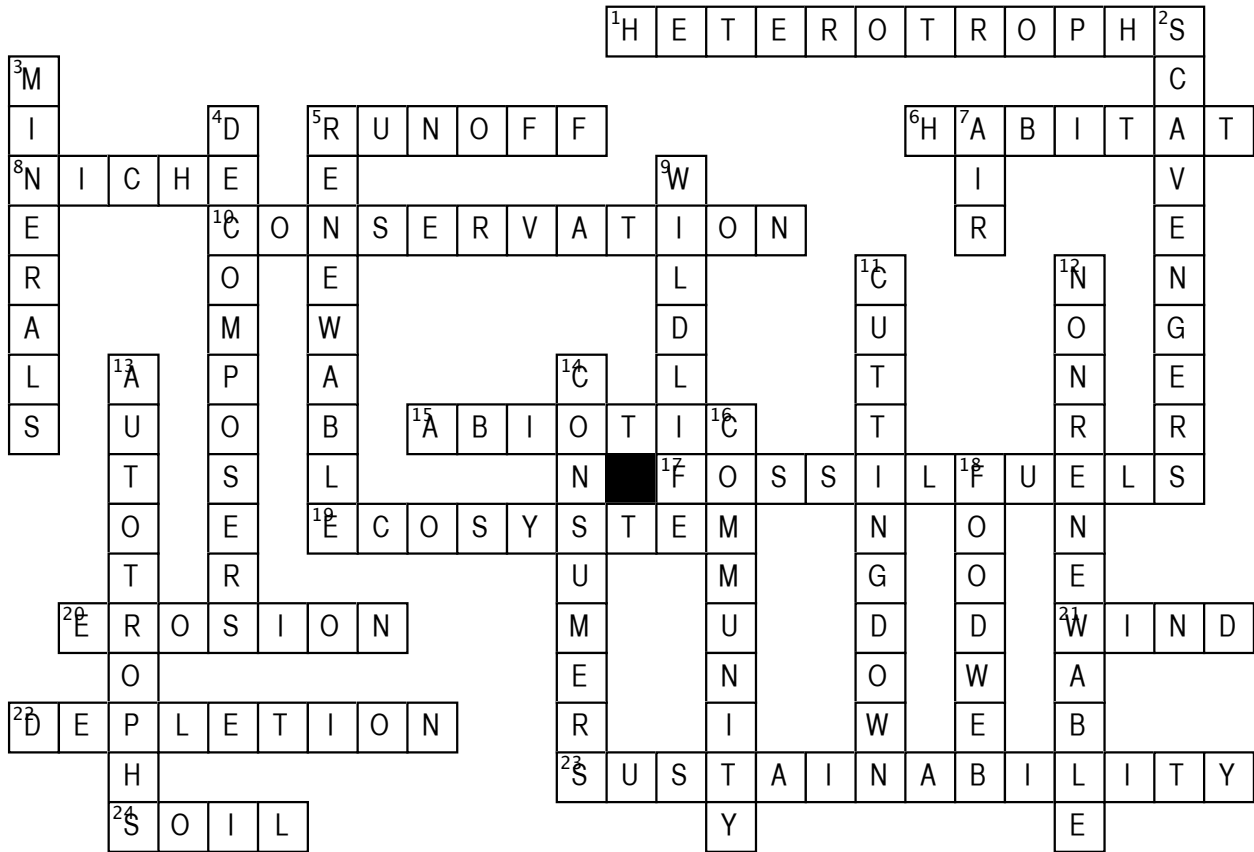# Wildlife & the Natural Environment Crossword
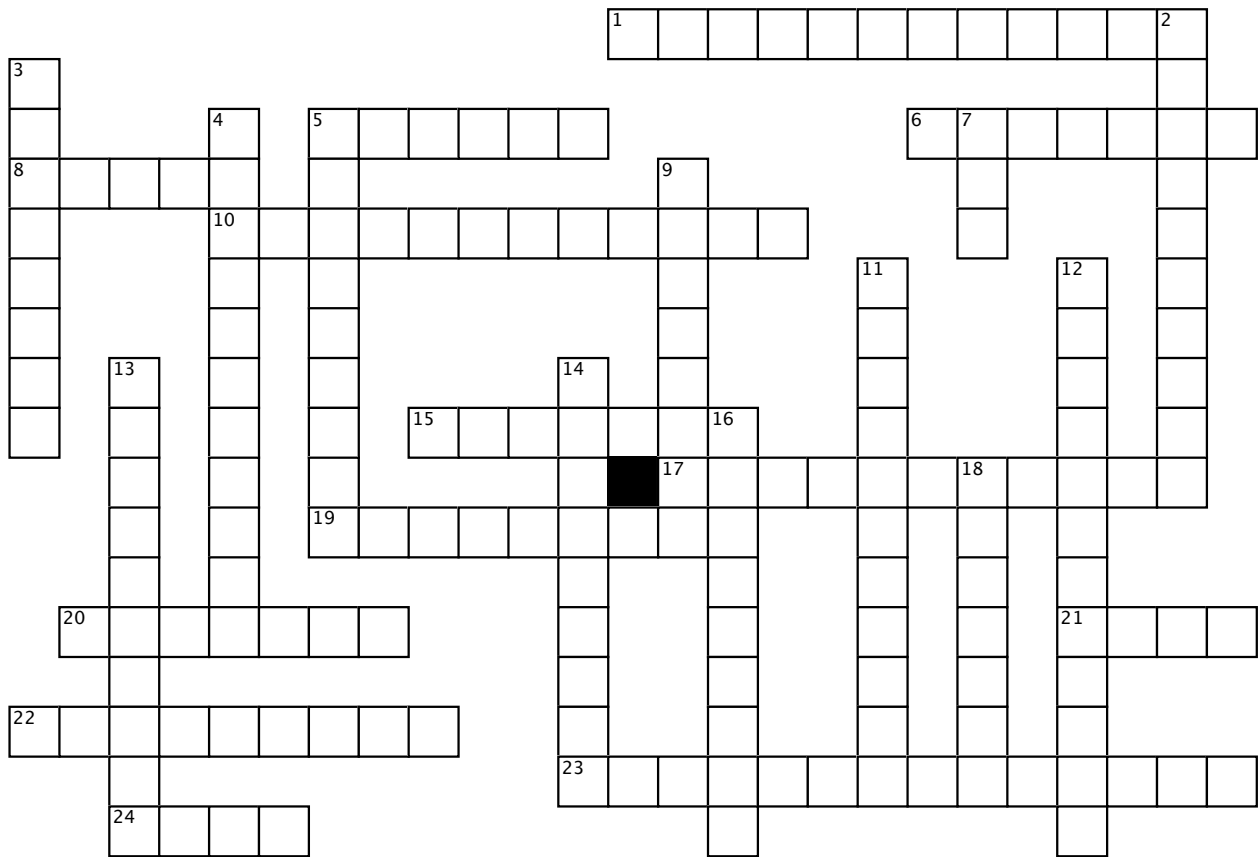
Across

1. obtain energy by feeding on autotrophs and/or other heterotrophs
5. washing of substances from the surface into water sources
6. the place or area where a particular organism lives naturally that provides for all its needs
8. the effect or role a species has within its ecosystem
10. preserving and protecting the natural environment
15. all non-living parts of the environment in an ecosystem_____ factors
17. energy resources such as coal and petroleum
19. community of living organisms interacting with its environment in a specific area
20. soil loss due to the washing or blowing away of the upper layer of soil
21. the sun and _____ provide direct and indirect energy sources
22. the using up of a supply or abundance of something
23. able to be maintained at a certain rate or level
24. the outer layer of the earth's surface

Down

2. feed on the dead bodies of other animals to obtain their energy
3. resource used for fertilizer and feed supplements
4. live off of dead plants and animals
5. resources that can or will be replenished in a relatively short time
7. good _____ quality is essential to a healthy habitat
9. non-domesticated animals and uncultivated plant life
11. keeping forests healthy includes _____ trees
12. resources that form extremely slowly
13. produce organic matter from inorganic substances
14. get their energy by eating other living things such as plants and animals
16. organisms that live in the same area
18. the transfer of energy through a series of food chains

Wildlife & the Natural Environment Crossword

(Crossword grid with completed answers)

Across

1. obtain energy by feeding on autotrophs and/or other heterotrophs [HETEROTROPHS]
5. washing of substances from the surface into water sources [RUNOFF]
6. the place or area where a particular organism lives naturally that provides for all its needs [HABITAT]
8. the effect or role a species has within its ecosystem [NICHE]
10. preserving and protecting the natural environment [CONSERVATION]
15. all non-living parts of the environment in an ecosystem____ factors [ABIOTIC]
17. energy resources such as coal and petroleum [FOSSILFUELS]
19. community of living organisms interacting with its environment in a specific area [ECOSYSTEM]
20. soil loss due to the washing or blowing away of the upper layer of soil [EROSION]
21. the sun and _____ provide direct and indirect energy sources [WIND]
22. the using up of a supply or abundance of something [DEPLETION]
23. able to be maintained at a certain rate or level [SUSTAINABILITY]
24. the outer layer of the earth's surface [SOIL]

Down

2. feed on the dead bodies of other animals to obtain their energy [SCAVENGERS]
3. resource used for fertilizer and feed supplements [MINERALS]
4. live off of dead plants and animals [DECOMPOSERS]
5. resources that can or will be replenished in a relatively short time [RENEWABLE]
7. good _____ quality is essential to a healthy habitat [AIR]
9. non-domesticated animals and uncultivated plant life [WILDLIFE]
11. keeping forests healthy includes _____ trees [CUTTINGDOWN]
12. resources that form extremely slowly [NONRENEWABLE]
13. produce organic matter from inorganic substances [AUTOTROPHS]
14. get their energy by eating other living things such as plants and animals [CONSUMERS]
16. organisms that live in the same area [COMMUNITY]
18. the transfer of energy through a series of food chains [FOODWEB]

Wildlife and the Natural Environment Test

Multiple Choice

Choose the best answer for each question or that completes each statement.

_____ 1. Coal, petroleum, natural gas, and uranium are all examples of...
   A) land resources   C) nonrenewable resources
   B) renewable resources   D) mineral sources

_____ 2. The ability to maintain something at a certain rate or level is called...
   A) biodiversity   C) conservation
   B) sustainability   D) recreation

_____ 3. Crabs, buzzards, and vultures are examples of...
   A) scavengers   C) autotrophs
   B) decomposers   D) producers

_____ 4. What are organisms that produce their own food (like green plants) called?
   A) consumers   C) heterotrophs
   B) producers   D) B and C

_____ 5. Plants, water, solar energy are all examples of what kind of resources?
   A) renewable   C) soil and land
   B) nonrenewable   D) biosphere

_____ 6. Substances washing into water sources is called...
   A) erosion   C) runoff
   B) conservation   D) sustainability

_____ 7. What does soil consist of?
   A) air and water   C) organic matter
   B) minerals   D) all of the above

_____ 8. Fungi and bacteria are examples of...
   A) scavengers   C) autotrophs
   B) decomposers   D) producers

_____ 9. The variety of organisms within an ecosystem is its...
   A) niche   C) habitat
   B) community   D) biodiversity

_____ 10. Consumers obtain their energy from...
   A) other organisms   C) the sun
   B) scavengers   D) mineral sources

Wildlife and the Natural Environment Test

Matching

Match the term with the definition.

A. abiotic factors   F. erosion

B. biotic factors   G. natural resources

C. community   H. niche

D. conservation   I. nonrenewable

E. depletion   J. renewable

_____ 11. soil loss

_____ 12. all living things in an ecosystem

_____ 13. resources that can be replaced or restored

_____ 14. the effect or role a species has within its ecosystem

_____ 15. all non-living things in an ecosystem

_____ 16. materials in nature that sustain life or can be used by humans

_____ 17. to use up a supply or abundance of something

_____ 18. the plants, animals, and other organisms living in an area

_____ 19. resources that can not be replenished or replaced

_____ 20. preserving and protecting the natural environment

Short Answer and Fill-in-the-Blank

21. An ecosystem is a community of organisms _____ within its

environment in a _____ area.

22. Explain why all organisms in an ecosystem are dependent on each other.

Wildlife and the Natural Environment Test KEY

Multiple Choice

Choose the best answer for each question or that completes each statement.

C   1. Coal, petroleum, natural gas, and uranium are all examples of...
   A) land resources   C) nonrenewable resources
   B) renewable resources   D) mineral sources

B   2. The ability to maintain something at a certain rate or level is called...
   A) biodiversity   C) conservation
   B) sustainability   D) recreation

A   3. Crabs, buzzards, and vultures are examples of...
   A) scavengers   C) autotrophs
   B) decomposers   D) producers

B   4. What are organisms that produce their own food (like green plants) called?
   A) consumers   C) heterotrophs
   B) producers   D) B and C

A   5. Plants, water, solar energy are all examples of what kind of resources?
   A) renewable   C) soil and land
   B) nonrenewable   D) biosphere

C   6. Substances washing into water sources is called...
   A) erosion   C) runoff
   B) conservation   D) sustainability

D   7. What does soil consist of?
   A) air and water   C) organic matter
   B) minerals   D) all of the above

B   8. Fungi and bacteria are examples of...
   A) scavengers   C) autotrophs
   B) decomposers   D) producers

D   9. The variety of organisms within an ecosystem is its...
   A) niche   C) habitat
   B) community   D) biodiversity

A   10. Consumers obtain their energy from...
   A) other organisms   C) the sun
   B) scavengers   D) mineral sources

Wildlife and the Natural Environment Test KEY

Matching

Match the term with the definition.

A.	abiotic factors	F.	erosion
B.	biotic factors	G.	natural resources
C.	community	H.	niche
D.	conservation	I.	nonrenewable
E.	depletion	J.	renewable

F   11.   soil loss

B   12.   all living things in an ecosystem

J   13.   resources that can be replaced or restored

H   14.   the effect or role a species has within its ecosystem

A   15.   all non-living things in an ecosystem

G   16.   materials in nature that sustain life or can be used by humans

E   17.   to use up a supply or abundance of something

C   18.   the plants, animals, and other organisms living in an area

I   19.   resources that can not be replenished or replaced

D   20.   preserving and protecting the natural environment

Short Answer and Fill-in-the-Blank

21. An ecosystem is a community of organisms **INTERACTING** within its environment in a **SPECIFIC** area.

22. Explain why all organisms in an ecosystem are dependent on each other.

(answers will vary but should include how organisms have relationships with their environment and other organisms in their ecosystem and rely on each other for many different things)