

SCIENCE

Student Book

▶ **5th Grade** | Unit 4

SCIENCE 504

BALANCE IN NATURE

| | |
|--|-----------------|
| Introduction | 3 |
| 1. The Balance of Nature | 5 |
| The Physical Environment | 8 |
| The Chemical Cycle | 13 |
| Ecosystems | 15 |
| Self Test 1 | 25 |
| 2. The Prairie Web of Life | 28 |
| The Prairie Ecosystem of the Past | 30 |
| Changes in the Prairie Balance of Nature | 39 |
| Self Test 2 | 43 |
| 3. Humans and the Web of Life | 46 |
| Problems | 47 |
| Stewardship | 50 |
| Self Test 3 | 54 |
| LIFEPAC Test | Pull-out |

Author:

Barry G. Burrus, M.Div, M.A., B.S.

Editor:

Alan Christopherson, M.S.

Editor:

Brian Ring

Illustrations:

Brian Ring

Media Credits:

Page 3: © Givga, iStock, Thinkstock; **5:** © somchai, iStock, Thinkstock; **11:** © snapgalleria, iStock, Thinkstock; **15:** © pigphoto, iStock, Thinkstock; **16:** © Maxim Kulko, iStock, Thinkstock; © Eric Isselee, iStock, Thinkstock; © Eriklam, iStock, Thinkstock; © Jezperklauzen, iStock, Thinkstock; **20:** © GlobalIP, iStock, Thinkstock; © antpkr, iStock, Thinkstock, © Eric Isselee, iStock, Thinkstock; © Melinda Fawver, iStock, Thinkstock; © PicturePartners, iStock, Thinkstock; © a-poselenov, iStock, Thinkstock; **22:** © armckw, iStock, Thinkstock; **28:** © mike proto, iStock, Thinkstock; **30:** © Ten03, iStock, Thinkstock; **33:** © jesiotr9, iStock, Thinkstock; **34:** © m_grageda, iStock, Thinkstock; © PaulReevesPhotography, iStock, Thinkstock; **37:** © lukaves, istock, Thinkstock; © mart_m, iStock, Thinkstock; **39:** © ekina, iStock, Thinkstock; **41:** © Natalia Bratslavsky, iStock, Thinkstock; **46:** © Fuse, Thinkstock; **47:** © Ingram Publishing, Thinkstock; **48:** © michal kodym, iStock, Thinkstock; **49:** © Hung_Chung_Chih, iStock, Thinkstock; © Dmitry Berkut, iStock, Thinkstock; **50:** © michaeljung, iStock, Thinkstock



804 N. 2nd Ave. E.

Rock Rapids, IA 51246-1759

© MM by Alpha Omega Publications, Inc. All rights reserved.

LIFEPAC is a registered trademark of Alpha Omega Publications, Inc.

All trademarks and/or service marks referenced in this material are the property of their respective owners.

Alpha Omega Publications, Inc. makes no claim of ownership to any trademarks and/or service marks other than their own and their affiliates, and makes no claim of affiliation to any companies whose trademarks may be listed in this material, other than their own.

BALANCE IN NATURE

In the first three LIFEPAcs of this series, you learned about cells, the basic unit of life. All living things are made of cells. You also learned about the life cycles of many living things, especially plants and animals. God has created all these living things. He has given a wonderful variety to all living things.

God has also planned that all living things depend upon one another. You have learned how animals depend upon plants for oxygen and food. Plants, in turn, depend upon animals for carbon dioxide and nutrients. Some plants also depend upon animals to help them reproduce. For example, flowering plants depend upon bees and other insects to help in the process of fertilization. In some way, all living things are connected to other living things and depend upon them.

Have you ever seen a spider's web? The threads of the web are connected to each other so that it forms one whole web. The different parts of the web support one another because they are connected. In a similar way, all living things are "connected" to one another and to the air, water, and earth. We call this great system of the connection among all living things *the web of life*.

In this LIFEPAc® you will learn more about the web of life that God has established among all living things. You will learn how God has planned a *balance of nature* in His creation on earth. You will examine the web of life in one particular type of region on earth—the *prairie*. You will also learn how God has placed human beings on the earth to help care for His creation and to be good stewards of the web of life. Finally, for an experiment, you will have the opportunity to build a small, living model of the web of life—a *terrarium*!

Objectives

Read these objectives. The objectives tell you what you will be able to do when you have successfully completed this LIFEPAAC. Each section will list according to the numbers below what objectives will be met in that section. When you have finished this LIFEPAAC, you should be able to:

1. Describe three cycles in the physical environment.
2. Explain the balance of nature in the web of life.
3. Explain what is meant by a food chain and to give examples.
4. Know some details about the web of life in a prairie ecosystem.
5. Name two problems that human beings have made for God's web of life.
6. Name at least five things that you can do for plants and animals that will help care for the web of life that God has created.



1. THE BALANCE OF NATURE

God has created everything that exists. God planned for a great variety of things in His Creation. In previous LIFEPACS, you have learned something about the great variety of living things that God has created. There is also a great variety of nonliving things that God has created such as the water, air, soil, rocks, minerals, and chemicals. We often refer to all these things in our world that God has created—both living and nonliving—as **nature**.

Objectives

Review these objectives. When you have completed this section, you should be able to:

1. Describe three cycles in the physical environment.
2. Explain the balance of nature in the web of life.
3. Explain what is meant by a food chain and to give examples.

Vocabulary

Study these new words. Learning the meanings of these words is a good study habit and will improve your understanding of this LIFEPAC.

affected (ə fekt' ed). To have had an effect on someone or something.

consumers (kən süm' urz). Someone or something that uses up or destroys things.

decomposers (dē' kəm pōz' ərz). Tiny organisms that eat the dead remains of former living things.

dew (dü). Moisture from the air that settles on cool surfaces during the night.

drought (drout). A long time without rain. Plants begin to dry up during a drought.

ecology (ē kol' ə jē). The scientific study of the relationships of living things to one another and to their environment.

ecosystem (e ko' sis təm). The complex level of organization within nature consisting of both the physical and biological environments.

environment (en vī' rən mənt). Everything around a living thing—such as the earth, air, water—that helps to determine how it develops.

evaporates (i vap' ə rätz'). The natural process that occurs when a liquid changes to a gas or vapor.

nature (na' chər). All of the living and nonliving external things in our world that God has created.

nitrogen (nī' trə jən). A very important gas that makes up most of the air. It is colorless, tasteless, and odorless. It is part of the chemical cycle in nature.

population (pop' yə lā' shən). The members of one species of living things within a given area.

precipitation (pri sip' ə tā' shən). Water that falls to the earth such as rain, snow, sleet, hail, mist, dew, or some other form of water.

producers (prə dü' sərz). Green plants that grow and are partly or fully eaten by animals.

rodents (rōd' ntz). A member of a group of animals with teeth that are especially good for chewing wood, woody plants, or seeds.

terrarium (tə rer' ē əm). A transparent container (plastic or glass) in which small plants or animals are kept. It reproduces as closely as possible a natural setting or environment.

Note: All vocabulary words in this LIFEPAC appear in **boldface** print the first time they are used. If you are unsure of the meaning when you are reading, study the definitions given.

Pronunciation Key: hat, āge, cāre, fār; let, ēqual, tèrm; it, ĩce; hot, ōpen, ôrder; oil; out; cup, pūt, rüle; child; long; thin; /FH/ for then; /zh/ for measure; /u/ or /ə/ represents /a/ in about, /e/ in taken, /i/ in pencil, /o/ in lemon, and /u/ in circus.

God has so arranged nature that living things are able to exist by depending on other living and nonliving things for food and energy. For example, green plants receive energy from the sun. The plants receive minerals, nutrients, and water from the soil. Plants also receive carbon dioxide from the air. The plants give off oxygen to the air.

Rabbits feed on the plants. The rabbits also receive oxygen from the air and water to drink. Rabbits give off carbon dioxide as they breathe and add chemicals to the soil through their wastes.

Foxes sometimes eat rabbits for food. The foxes also receive oxygen from the air and water to drink. The foxes, like other animals, give off carbon dioxide to the air and add minerals to the soil through wastes. Eventually, the foxes will die and their dead bodies will provide food for other organisms. Their dead bodies will also be turned into minerals and nutrients for the soil which will, in turn, be used by new plants.

In this example, we see how the life needs of living things are met. When the life needs of all the living things in an area of the earth are met, we say that there is a *balance of nature*. When there is a balance of nature, the **population** of one species of living things stays fairly stable. For example, the population of rabbits and the population of foxes would be stable over time when there is a balance of nature. Enough of these animals would receive adequate food, oxygen, and water in order to survive, grow, and reproduce.

If something happened so that adequate water, food, or air was not received by the rabbits or foxes, the balance of nature would be upset, and the populations of rabbits and foxes would begin to change. However, in time, the balance of nature could be restored as the living things adjust to the changes. God also wants human beings to help keep or restore the balance of nature. The balance of nature has been provided by God so that the life needs of all living things are met. Through the balance of nature, the web of life continues.

There is a name for the scientific study of the balance of nature and the relationships of living things to one another and to their **environment**. This science is called **ecology**. The scientists who study these relationships are called *ecologists*.

In this first section of the LIFE PAC, you will learn more about the balance of nature. You will learn how nonliving things help meet the life needs of living organisms. These are such things as water, the air, the soil, and the weather. This can be called the *physical environment*. You will also learn in this section about the way living things within the environment depend on one another, especially for food. The living things make up what can be called the *biological environment*. Finally, you will have an opportunity to build a small, living model of the web of life—a **terrarium**.

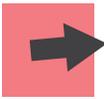


Answer these questions.

- 1.1** What are some of the nonliving things that God has created? _____
- _____
- _____
- _____

1.2 What is *the balance of nature*? _____

1.3 What is the difference between the physical environment and the biological environment? _____



Do this activity.

1.4 Look up Psalm 104: 24-30 in the Bible. Explain how this passage relates to *the balance of nature*. _____

The Physical Environment

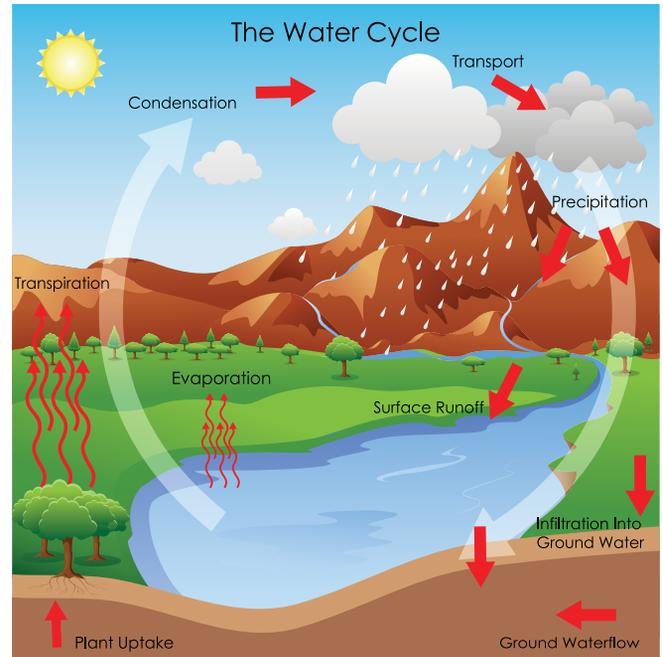
The physical environment includes such nonliving things as water, the air, the soil, and the weather. These things help support life on the earth. They help supply the life needs of living things. Some parts of the physical environment go through *cycles* as they help support living things and the balance of nature. We will consider three of these cycles: the *water cycle*, the *carbon cycle*, and the *chemical cycle*.

Water cycle. Water is the most common substance that God has put on the earth. Water covers more than 70 percent of the earth's surface. Water is in the oceans, rivers, lakes, and other streams of the earth. It is also in the ground and in the air.

Without water, there would be no life on the earth. Every living thing consists mostly of water. In fact, the cells in all living things are mostly water. Your body is about 65 percent water. An elephant is about 70 percent water. A potato is about 80 percent water. So, all living things need water to support life.

Water helps living things grow and survive. It helps the cells do their work. Water helps the nutrients dissolve and flow to the different parts of plants and animals. Water is also used to transport wastes out of plants and animals. The water that is lost by the plants and animals must be replaced or they will die.

Organisms that live in the sea, lakes, or rivers can easily receive water. Plants and animals that live on the land receive water through the rain or **dew** that falls on the earth. The plants absorb this water, primarily through their roots. This water is collected into lakes, rivers, and streams from which the animals can drink. Animals also receive water through the food they eat. God has provided a way for all living things to receive water.



| The water cycle.

All of the water on the earth continually goes through a *water cycle*. In the water cycle, the waters of the earth move continuously from the oceans, lakes, rivers, and streams to the air. It does this when the sun's heat **evaporates** the water so that it enters the air. Actually, some of the water on the earth also evaporates into the air. The water that evaporates becomes water vapor. The water vapor mixes with the cool air in the atmosphere and forms clouds. Eventually, enough water vapor collects so that it produces rain, snow, dew, or some other form of **precipitation**. The precipitation falls from the clouds to the earth and to the bodies of water on the earth. This precipitation not only supplies the water needed to "make up" for the water that has evaporated, but it also supplies the water needed to support the living things on earth and in the waters.

Eventually, much of the water that falls on the earth collects into streams and rivers and makes its way back to the ocean. Then the water evaporates again, and the water cycle continues over and over. In the process, God provides water to support the web of life.

The balance of nature is supported by the water cycle. It is also **affected** by the water cycle. For example, if there is not enough rain or precipitation in an area or region of the earth, **drought** occurs. The soil then dries up. Water levels in lakes, rivers, and streams go down. Some of the plants and animals that depend on the soil or these bodies of water may die. The balance of nature changes.

Too much water in an area or region of the earth may also cause a problem. Floods may occur, causing drowning of plant and animal life. Snow may cover the earth too long, making it difficult for animals to get adequate food. Again, the balance of nature changes, depending upon the way the water cycle is working.

Fortunately, God is watching over His creation. The water cycle eventually returns to favorable conditions. The balance of nature is restored. The web of life adjusts and continues.



Write the correct word in the blank space.

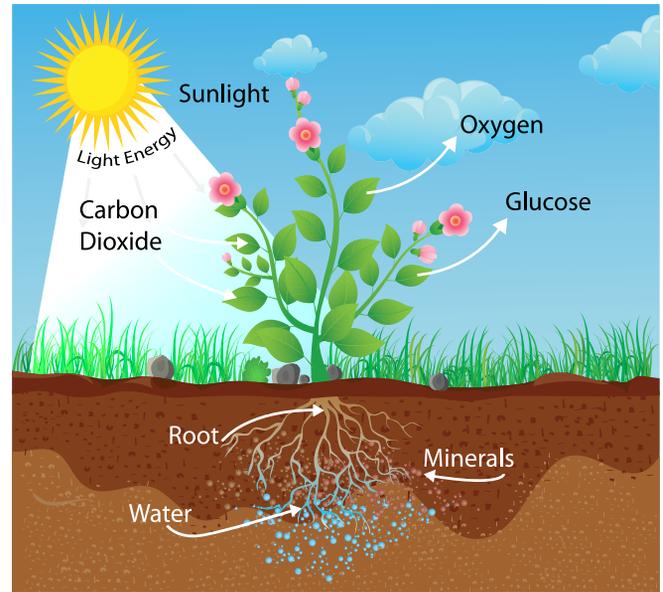
- 1.5** The most common substance on earth is _____ .
- 1.6** The cells in all living things are mostly _____ .
- 1.7** The heat from the sun _____ water so that it enters the air.
- 1.8** Rain, snow, dew, and hail are all forms of _____ .
- 1.9** If there is not enough rain or precipitation in an area, _____ occurs.
- 1.10** The _____ of nature is supported by the water cycle.



Answer this question.

- 1.11** What is the water cycle? Describe what happens. _____

Carbon cycle. There is another “cycle” in the physical environment that helps support living things and the balance of nature. Green plants use energy from the sun to convert carbon dioxide and water into food and oxygen. As you learned in LIFEPAK Science 501, this process is called *photosynthesis*. Plants and animals, in turn, “burn” food by combining it with the oxygen produced by photosynthesis to release energy for growth. Carbon dioxide and water are given off in this process, which is called *respiration*. Respiration is the reverse of photosynthesis. Plants then use the carbon dioxide produced by respiration to produce more oxygen. Thus, there is a cycle of carbon dioxide and oxygen being used and produced by plants and animals. This cycle is called the *carbon cycle*. The oxygen and carbon dioxide produced in the carbon cycle are part of the physical environment that supports life.



| Photosynthesis

The balance of nature also depends on this carbon cycle of oxygen and carbon dioxide. For example, consider what would happen in a small pond if all the plants died. If the plants died, there would not be any more oxygen produced by the plants for the water. Soon, the fish and other microscopic organisms would not have enough oxygen to survive. Other animals that feed on the fish and the microscopic organisms in the pond would not have adequate food supplies, and they, too, would die. The balance of nature would be upset by the death of the plants, and, eventually, the other living things would die. The web of life would be broken.



Complete this activity.

1.12

Draw a diagram of the carbon cycle on a separate piece of paper. (Use a cow, some grass, and the sun as some examples in your diagram. Use other plants and animals, too, if you wish.) Refer to the carbon cycle diagram in Section 3 of LIFEPAK Science 501 if you need to.



Teacher check:

Initials _____ Date _____



Write *true* or *false*.

1.13

_____ Plants would die without carbon dioxide.

1.14

_____ Part of the carbon cycle includes plants giving off oxygen.

1.15

_____ Fish give off oxygen into the water.

1.16

_____ Cells burn oxygen.

1.17

_____ The balance of nature needs carbon dioxide.

SELF TEST 1

Match these items (each answer, 3 points).

- | | | | |
|--------------|----------------------|----|--|
| 1.01 | _____ nature | a. | movement of hydrogen, nitrogen, phosphorus, and sulfur |
| 1.02 | _____ ecology | b. | the complex level of organization within nature |
| 1.03 | _____ water cycle | c. | all living and nonliving things in our world |
| 1.04 | _____ carbon cycle | d. | the study of the relationships of living things to their environment |
| 1.05 | _____ chemical cycle | e. | get their food from producers |
| 1.06 | _____ ecosystem | f. | bacteria and fungi |
| 1.07 | _____ food chain | g. | movement from oceans to air to earth |
| 1.08 | _____ producers | h. | oxygen and carbon dioxide are used and produced |
| 1.09 | _____ consumers | i. | transparent containers |
| 1.010 | _____ decomposers | j. | a mixture of air and water |
| | | k. | the way energy and food move through the ecosystem |
| | | l. | green plants like grass and trees |

Answer true or false (each answer, 3 points).

- 1.011** _____ The most common substance on earth is water.
- 1.012** _____ Carbon dioxide is used by plants.
- 1.013** _____ Some animals produce their own food.
- 1.014** _____ A bird could be both a consumer and a producer.
- 1.015** _____ Some animals can be part of several food chains.
- 1.016** _____ The balance of nature depends on the food chain.
- 1.017** _____ A food web is an overlapping network of food chains.

Answer this question (this answer, 10 points).

1.027 What is *the balance of nature*? (Use examples if you wish.) _____



Teacher check:

Score _____

Initials _____

Date _____





SCI_Gr3-5



804 N. 2nd Ave. E.
Rock Rapids, IA 51246-1759

800-622-3070
www.aop.com

SCI0504 – Jan '16 Printing

ISBN 978-1-58095-524-9



9 781580 955249