



Properties of **Ecosystems**



God's Design® for Chemistry & Ecology is a complete chemistry and ecology curriculum for grades 3–8. The books in this series are designed for use in the Christian school and homeschool, and provide easy-to-use lessons that will encourage children to see God's hand in everything around them.

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Welcome to GOD'S DESIGN®

CHEMISTRY & ECOLOGY



You are about to start an exciting series of lessons on chemistry and ecology. *God's Design® for Chemistry & Ecology* consists of three books: *Properties of Atoms & Molecules*, *Properties of Matter*, and *Properties of Ecosystems*. Each of these books will give you insight into how God designed and created our world and the universe in which we live.

No matter what grade you are in, third through eighth grade, you can use this book.

3rd–5th grade

Read the lesson.



Do the activity in the light blue box (worksheets will be provided by your teacher).



Test your knowledge by answering the **What did we learn?** questions.



Assess your understanding by answering the **Taking it further** questions.

Be sure to read the special features and do the final project.

There are also unit quizzes and a final test to take.

6th–8th grade

Read the lesson.



Do the activity in the light blue box (worksheets will be provided by your teacher).



Test your knowledge by answering the **What did we learn?** questions.



Assess your understanding by answering the **Taking it further** questions.



Do the Challenge section in the light green box. This part of the lesson will challenge you to do more advanced activities and learn additional interesting information.

Be sure to read the special features and do the final project.

There are also unit quizzes and a final test to take.

When you truly understand how God has designed everything in our universe to work together, then you will enjoy the world around you even more. So let's get started!

UNIT 1

Introduction to Ecosystems

- 1 What Is an Ecosystem? • 8
- 2 Niches • 13
- 3 Food Chains • 16
- 4 Scavengers & Decomposers • 19
- 5 Relationships Among Living Things • 22
- 6 Oxygen & Water Cycles • 25

- ◇ Identify and describe ecosystems and niches.
- ◇ Identify and describe food chains and food webs.
- ◇ Identify roles of scavengers and decomposers.
- ◇ Explain the various roles plants and animals play.
- ◇ Describe the oxygen and water cycles.



1

What Is an Ecosystem?

Biomes



How big is an ecosystem?

Words to know:

habitat	ecosystem
ecology	biome
biosphere	flora
biotic	fauna
abiotic	climate

Challenge words:

biogeographic realm	ecozone
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Where do you live? You probably live in a house or an apartment with your family. Your home is in a neighborhood with other homes. The people who live around you are your neighbors. Your home and neighborhood make up your **habitat**; it is the environment in which you live. Animals and plants live in neighborhoods, too. The study of plants and animals and the environment in which they live is called **ecology**. In this book you are going to learn about many habitats and how the plants, animals, and other organisms in them interact.

The **biosphere** is the part of the Earth that contains life. The biosphere includes the atmosphere, the

surface of the Earth, a small part of the crust of the Earth, and the water that covers most of our planet. As we study ecology, we will be learning about the many different areas within the biosphere of Earth. The Earth is the only known planet that has a biosphere; it is the only planet known to contain life. This life was created by God, and when He created life, He designed the Earth so that things work together to allow life to continue. The Bible does not tell us whether organisms such as bacteria or fungi exist on other celestial bodies. While we would not expect such life to exist, it is not entirely out of the question.

The biosphere contains both biotic and abiotic things. **Biotic** describes things which are alive. Other things around us are **abiotic**, which means they are not alive. What kinds of things are biotic? Plants and animals make up the most visible of biotic organisms. Fungi, bacteria, and single-celled organisms are

Fun Fact

The Greek word for habitat is *oikos*. The study of habitats is thus oekologie from which we get the word *ecology*. The word *ecosystem* is a shortened version of ecological system, and the word *biome* is a shortened version of biological home.

also biotic. What kinds of things are abiotic? Some non-living things include the minerals in the soil, water, chemicals, sunshine, and man-made objects. All of the living and non-living things in a particular area affect each other.

All of the biotic and abiotic items in a particular area make up an **ecosystem** and many ecosystems together make a **biome**. The plants in an ecosystem are called the **flora** of the ecosystem and the animals are called its **fauna**.

There are many different ecosystems in the world. The types of living things in an ecosystem are determined by many factors. The most important factor determining which plants and animals live in a certain area is the **climate**, which is the general or average weather conditions of a certain region, including the amount of sunlight the area receives, the average temperatures, and the amount of moisture available. Because the Earth is tilted with respect to the sun, the amount of sunlight that an area receives depends on where you are located between the poles and the equator. The poles receive very little direct sunlight,



A coral reef is an example of a marine ecosystem.

whereas the equator receives a large amount of direct sunlight.

Ecosystems change as you move from the poles toward the equator. Ecosystems also change as you move from east to west across a continent. The terrain causes changes in the climate so the environments are varied in different locations. As you study the lessons in this book you will learn about the many wonderful ways that God created the life on our planet to interact with its environment. ✨



My backyard habitat

Purpose: To become aware of different elements in your surroundings or habitat

Materials: string, yardstick/meter stick, “My Backyard Habitat” worksheet, magnifying glass

Procedure:

1. Although most animals live in the same habitat their whole lives, humans move about from one habitat to another. Make a list of all of the habitats you spend time in each week.
2. Closely examine the habitat in your backyard. Use string to mark out a square that is 1 yard (1 m) long on each side.
3. While standing up, carefully look at what is inside your square. Write your observations on a copy of the “My Backyard Habitat” worksheet.
4. Now, get down on your knees and use a magnifying glass to closely observe the smaller things in your square. Look for small animals, decaying plants, small twigs, paper, plastic, etc. Record all of your observations on your worksheet.
5. Listen to the sounds that can be heard from your square. Again record your observations.
6. Record the weather conditions on your worksheet.
7. List any ways that you think the animals that you observe use the other things that you have observed in your square.
8. Take photos of your area and what you found. Save your worksheet and your photos and include them in the notebook you are going to be making throughout this study.

Conclusion: Nothing can live in isolation. Even the smallest insect needs food and shelter and uses objects in its environment to provide these things. This in turn affects other animals and plants that are living in the area.

What did we learn?

- What is ecology?
- What is the biosphere?
- Give an example of something that is biotic and something that is abiotic.
- What is flora?
- What is fauna?

Taking it further

- What factor has the greatest effect on the plants and animals that live in a particular ecosystem?
- How does your habitat change throughout the day?
- List some ways that climate affects the habitats of people.

Ecozones

As we study the different types of ecosystems we will see that some animals live only in certain parts of the world even though the climatic conditions in other parts of the world would support those animals. For example, zebras do not live on the great plains of North America even though the environment is very similar to the savannah in which they live in Africa. Another example is the many marsupials that live only in Australia. If conditions are right for these animals to live in other places, why are they only found in a particular area?

There are many different possible explanations, but one likely explanation is called the Ararat migration hypothesis. The Bible tells us that representatives from all of the land animals were saved from the Great Flood on Noah's Ark and that the Ark came to rest on the mountains of Ararat. Thus, all of the animals had to make their way from Ararat to the other parts of the world.

It is believed that after the Flood there was an Ice Age which created large ice sheets around the world. This lowered the water level and would have exposed land bridges between areas of the world separated by water today. This would have allowed animals

to migrate over the land into areas that are farther from Ararat, which is in modern Turkey. After several hundred years, the ice sheets began to melt, creating barriers that prevented further migration.

The natural barriers of large bodies of water, such as the oceans, as well as very high mountains or large deserts, keep many animals from migrating over large distances. Today, scientists recognize six major areas of land that are separated by one or more of these large barriers. These areas of land are called **biogeographic realms** or **ecozones**.

The *palaearctic realm* is the area containing Eurasia and north Africa. It is isolated from other realms by oceans to the north, west, and east, and the Himalayan mountains and Sahara Desert to the south. Sub-Saharan Africa is part of the *afrotropical realm*, which is surrounded by oceans on the west, south, and east and the Sahara Desert on the north. The *Indo-Malay realm* is the area west and south of the Himalayan mountains and includes India and most of southeast Asia. Australia and the surrounding islands comprise the *Australian realm*. North America makes up the *Nearctic realm* and Central and South America comprise the *Neotropical realm*.

These realms are relatively isolated so the animals that live in one realm cannot easily move to another realm. On a copy of the World Map:

1. Label each of the following barriers:
 - a. Atlantic, Pacific, Indian, Arctic, and Antarctic Oceans
 - b. Sahara Desert
 - c. Himalayan Mountains
2. Color each biogeographic realm a different color.
3. Create a key to label and identify each realm.
4. Save this map to add to the first section of your notebook.

Garden of Eden

The first ecosystem

As Adam walked along with Eve he reached up and grabbed a perfectly ripe fruit from the tree and offered it to Eve. “Hungry?”

“Yes, thank you.” Eve took the fruit and bit into it as Adam reached up again and took one for himself.

The two walked on a little further as they thought about the conversation Adam had with God the night before. They both enjoyed their time with God and looked forward to it. God had given them everything they needed. The weather was always perfect, food was always just an arm’s reach away, and even when they were separated from each other, God had provided animals of all kinds to keep them company. It was a perfect world—it was the Garden of Eden.

The Garden of Eden was the very first ecosystem. No one knows exactly what the Garden was like or where it was located; but we do know a few things based on what the Bible says. In Genesis 1, as God is making the universe, six times He says that what He made was “good.” This meant without any flaws or defects. Genesis 1:31 says, “Then God saw everything that He had made, and indeed it was very good. So the evening and the morning were the sixth day.”

All God made worked together perfectly and all was beautiful.

In chapter 2 we see a little more detail about the last day of creation:

This is the history of the heavens and the Earth when they were created, in the day that the LORD God made the Earth and the heavens, before any plant of the field was in the Earth and before any herb of the field had grown. For the LORD God had not caused it to rain on the Earth, and there was no man to till the ground; but a mist went up from the Earth and watered the whole face of the ground. And the LORD God formed man of the dust of the ground, and



breathed into his nostrils the breath of life; and man became a living being.

The LORD God planted a garden eastward in Eden, and there He put the man whom He had formed. And out of the ground the LORD God made every tree grow that is pleasant to the sight and good for food. The tree of life was also in the midst of the garden, and the tree of the knowledge of good and evil. . . .

Then the LORD God took the man and put him in the garden of Eden to tend and keep it. And the LORD God commanded the man, saying, ‘Of every tree of the garden you may freely eat; but of the tree of the knowledge of good and evil you shall not eat, for in the day that you eat of it you shall surely die.’

And they were both naked, the man and his wife, and were not ashamed” (Genesis 2: 4–9, 2:15–17, 2:25).

From these passages we can learn a few things about the first ecosystem. God watered the plants by using a mist, which may have been a fog or a very fine rain. We know that man and animals could eat all the fruit that grew on the trees; both man and the animals ate only plants. Since man had not sinned yet there was no death of man or animals in the world. We know that all the trees and plants were very pleasing to look at. The insects that flew or crawled to pollinate the plants did not sting, bite, or bother Adam, Eve, or any of the animals. Man and all the animals lived in harmony with each other and with the plant life around them.

We can conclude from verse 25 that the weather was very mild. Adam and Eve had no need for clothing because they had not sinned. We can surmise from this that the temperatures were mild enough that they were not cold, even at night, without coverings.

The evidence of this mild tropical climate is not only found in the Bible but also in fossil records from around the world. Fossils show tropical plant life in almost every location on the globe. This shows that at one time much of the Earth was warm and moist. Again, our observations of the natural world confirm the history contained in God's Word.

So why and how did the Earth change? Why do we have such extreme conditions now? Did man cause it? As we read in Genesis 3:17–18, after man sinned:

Then to Adam He said, "Because you have heeded the voice of your wife, and have eaten from the

tree of which I commanded you, saying, 'You shall not eat of it':

"Cursed is the ground for your sake; in toil you shall eat of it all the days of your life. Both thorns and thistles it shall bring forth for you, and you shall eat the herb of the field."

From this passage we know that thorns and thistles are part of the curse; therefore, before man sinned the plants did not have thorns, and thistles did not grow. We can also see that God took away Adam's easy supply of food. Adam would now have to work for his food. Not only were Adam and Eve punished for their sin, the whole Earth and universe were cursed because of it (see Romans 8:20–22). This means that not only did man lose his ready supply of food and have to work for it, but the curse on the Earth applied to all the animals, plants, and all living things. Now they too would have to struggle to survive.

Many of the things you will learn about in the following lessons did not apply to the original creation. You will learn about competition, food chains, overpopulation, and extinction. These are a result of the curse brought on by man's sin. In the original ecosystem there were no predators and prey because there was no death. However, even though the world we have today is cursed, it is still a magnificent place to live. Even though the original perfection is gone, the mark of the Creator remains and can still declare His glory.