Life Science

Animals and Plants in Their Environment

Advanced Level

What Happens When Ecosystems Change?

LOOK INSIDE FOR:

- Core Curriculum Covered
- Student Book
- Assessments and Reading Activities

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What Happens When Ecosystems Change?

What roles do plants and animals play in their environments?

CORE CURRICULUM STATEMENTS

Organisms maintain a dynamic equilibrium that sustains life.

The health, growth, and development of organisms are affected by environmental conditions such as the availability of food, air, water, space, shelter, heat, and sunlight.

Plants and animals depend on each other and their physical environment.

An organism's pattern of behavior is related to the nature of that organism's environment, including the kinds and numbers of other organisms present, the availability of food and other resources, and the physical characteristics of the environment.

When the environment changes, some plants and animals survive and reproduce, and others die or move to new locations.

Human decisions and activities have had a profound impact on the physical and living environments.

Humans depend on their natural and constructed environments.

Over time humans have changed their environment by cultivating crops and raising animals, creating shelter, using energy, manufacturing goods, developing means of transportation, changing populations, and carrying out other activities.

Humans, as individuals or communities, change environments in ways that can be either helpful or harmful for themselves and other organisms.

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What Happens When Ecosystems Change?

AL

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FOCUS ON SCIENCE

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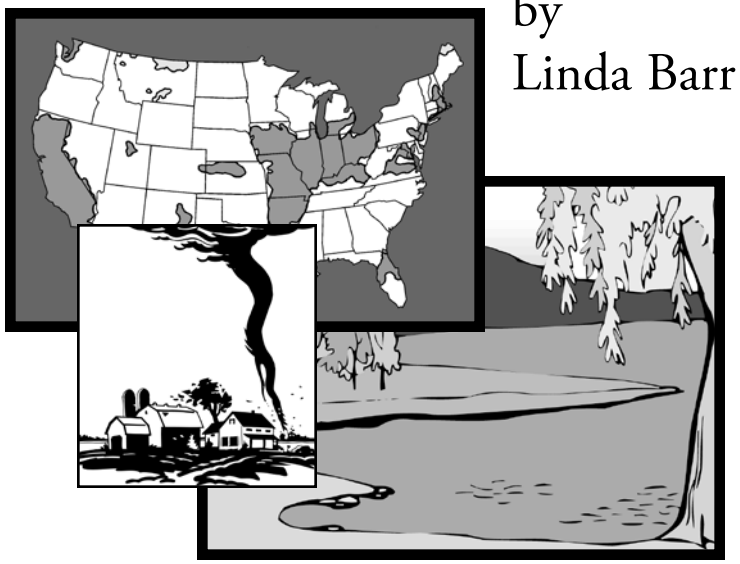
by Linda Barr



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FOCUScurriculum

Curriculum materials for **your** content standards

Table of Contents

– Predict –
Look at the chapter titles. What do you think you will learn from this book?

INTRODUCTION

Things Change

Has your **habitat** changed lately? Have people built more houses near your home? Do new roads lead to those houses? Was an old building torn down to make room for a park—or a parking lot? Maybe a nearby river flooded and destroyed some homes on its banks. Perhaps a hurricane or a tornado caused some damage.

Environments, including yours, can change in helpful or harmful ways. Natural forces, such as the weather, cause some changes. People cause many other changes by clearing forests or spreading fertilizers, for example. Some of these changes are made on purpose, while others are accidental.

In this book, you will read about the ways that environments and **ecosystems** change and the ways that living things respond to those changes.

habitat: the place where a living thing can meet all of its needs
ecosystem: a large community of living things and their environment; can include many different habitats

CHAPTER 1

Changes Caused by Wind, Water, and Fire

Hurricanes

Hurricanes can cause huge changes in ecosystems. In 2005, Hurricane Katrina hit the Gulf Coast. The Gulf Coast is a very **populated** part of the United States. Many people lost their lives, while many more lost their homes. Damaged buildings are still being repaired. Hundreds of homes and other buildings have been abandoned.

Wildlife was also greatly affected. Important habitats on islands near Louisiana were wiped out. Hundreds of acres of **marsh** and wetlands along the coast became open water. At least sixteen wildlife refuges were damaged and had to be closed. They contained 365,000 acres of land. Rare birds lost their habitats. Nesting sites for rare sea turtles were destroyed. Further inland, forests were knocked down. Much timber and many more habitats were lost.

populated: a place where many people live
marsh: land that is underwater some of the time

Katrina washed **pollution** into lakes and rivers. It included human and animal waste. Seven major oil spills sent 6.5 million gallons of oil into waterways. Flooding also brought huge amounts of saltwater into freshwater lakes. Many fish and wildlife lived in or near that water. The effects on them are still being measured.

Tornadoes

Tornadoes are smaller than hurricanes. Still, their winds can destroy both human and animal environments. They can also destroy lives.

In 1974, thirty-three people died when a huge tornado ripped through Xenia, Ohio. More than 1,600 people were injured. The tornado took out buildings, swept houses from concrete slabs, destroyed businesses, uprooted trees, and tore down power lines. More than 1,400 buildings were damaged or destroyed and property damage was estimated at $75 million to $100 million. The tornado changed the landscape of Xenia in a matter of seconds.

pollution: harmful substances that enter the environment

Flooding

High winds often bring heavy rains. Flooding can wash away plants that provide shelter and food for animals. Floods can also strip away rich topsoil. The soil left behind contains fewer nutrients for the plants that survive the flood.

On the other hand, that rich topsoil doesn't just disappear. A flooding river carries this soil downstream. When the rain stops, the river flows more slowly and drops the topsoil it is carrying. That's why crops and other plants grow well in the rich soil in low-lying fields along rivers.

Forest Fires

Forest fires also change environments. Lightning starts only one in ten of these fires. People cause the rest, mostly by accident. About one-fourth of all forest fires are set on purpose.

Between 2003 and 2007, fires burned about 6,800,650 acres of forest a year. A wall of flames can quickly wipe out habitats, but forest fires can also help living things.

– Compare –
How does flooding both help and harm environments?

For example, ashes from burned wood add nutrients to the soil. When trees burn and fall, more sunlight reaches the forest floor. The extra nutrients and sunlight help new plants grow. Soon after a fire, small plants begin to sprout, followed by bushes and then **saplings**. In time, a young forest grows where the old one once stood.

After wind, water, or fire destroys trees and plants, some animals that ate those plants will survive. Yet they cannot wait months for new plants to grow, so many of them will move to a nearby ecosystem. There, they must **compete** for food, water, shelter, and space with the plant-eaters that already live there. However, too many plant-eaters will upset that ecosystem, eating all the available food.

saplings: young trees
compete: to fight for something

When the plant-eaters leave a damaged ecosystem, the predators there go hungry. Then they, too, must move or starve. Like the plant-eaters, the predators may move to a nearby forest. Then they must compete with the **predators** already there.

Maybe most of the surviving plant-eaters and predators will move to the same forest. Then they may completely upset the balance of plants, plant-eaters, and predators in that ecosystem.

While the ecosystem is struggling to regain its balance, perhaps the predators will eat most of the plant-eaters. Then the plants in that ecosystem will thrive. Yet the predators will begin to starve. Now most of those predators must move to yet another habitat.

In this way, what happens in one environment can affect many others.

– Restate –
How does a forest habitat change after a fire?

predators: animals that get their energy by eating other animals

CHAPTER 2

Changes Caused by Plants and Animals

Animals can change their own environments. For example, too many deer can strip a forest of leaves, killing many of the plants and trees. Then they and other plant-eaters must find a new source of food, which may mean moving to a different habitat.

Beaver Dams

When beavers build a dam, they block the flow of a river or stream. Plants and animals that need flowing water can no longer stay in that environment, but animals that like ponds, such as wood ducks, move in.

Beavers cut down trees to make their dams. They like some trees, such as aspens and willows, more than others to build their dams. This changes the forest near their dam. As the aspens and willows disappear, new plants grow in the sunlight where those trees used to stand.

– Evaluate –
Does a beaver dam cause helpful or harmful changes?

Earthworms

You might have read that earthworms are beneficial because they dig burrows, or tunnels, that mix air and water into the soil. Earthworms also eat decaying plants and produce waste that enriches the soil. This is true for gardens and fields with hard, packed soil.

However, scientists at the University of Minnesota have found that earthworms can harm certain forests. Near the Great Lakes are forests without earthworms. The trees there produce tons of dead leaves every year. The leaves form a thick, spongy layer on the forest floor. Many plants in the forest obtain their nutrients from this layer of decaying leaves. The layer of leaves also protects roots under the soil, helping to keep them cool in summer and warm in winter.

If earthworms were present in these forests, they would eat the decaying leaves, changing them into a thick, solid layer of their own wastes. Insects and small animals that live in the loose layer of decaying leaves would lose their habitat. Plants would not grow as well in the thick earthworm wastes, which also would not protect their roots from heat or cold.

The earthworms actually destroy the forest floor. They also nibble on some roots and eat some seeds. Some types of plants, such as wild oats and sugar maple trees, disappear after earthworms appear. Other plants, such as ash trees, grow better.

As you can see, living things can change their own environment, for better or for worse. As the environment changes, the plant and animal populations there must adjust, leave, or die.

– Infer –
How have our ideas about earthworms changed as we have gained new knowledge?

CHAPTER 3

Changes Caused by People

People have changed their ecosystem and continue to change it in many ways. For example, a community may decide to expand. The people living there allow **developers** to cut down forests to make room for new houses or malls. In this way, people gain new homes or shops. These buildings become part of our environment. Yet many other living things lose their habitats.

People also turn grasslands into farm fields. This wipes out more habitats. It also means fewer tree and plant roots hold the soil in place, so it's easier for wind and water to carry it away.

For many years, developers filled in wetlands to make room for more buildings. Now we understand how wetlands help keep our water clean and reduce flooding. They also provide habitats for many rare plants and animals. New laws have slowed the loss of wetlands, but we still lose 70,000 to 90,000 more acres every year.

developers: companies that build new houses, stores, and other buildings

Loss of Wetlands
1780s–1990s

Low level of wetland loss

Moderate level of wetland loss

High level of wetland loss

– Interpret –
Has New York lost any wetlands?

Pollution

Some human activities cause pollution. We put fertilizers and weed and insect killers on our farm fields and lawns. Then rain washes these chemicals into streams and lakes, where they can harm or kill the living things there.

We burn gasoline to power our cars, trucks, and other engines. We burn coal, another **fossil fuel**, to produce electricity. The gases released by burning fossil fuels rise into the air, mix with drops of water, and form clouds of **acid rain**. Wind can push these clouds for many miles.

For example, there are many coal-burning power plants in the Midwest. The pollution released into the air from these power plants is transported east by the wind. The acid rain that develops sometimes falls in the Adirondack Mountains in New York. When acid rain falls, it prevents trees in the Adirondacks, and other areas, from absorbing water and nutrients from the soil. It pollutes water, killing fish, frogs, and other living things.

fossil fuels: coal, oil, and natural gas
acid rain: rain, snow, or sleet that has been made acidic by pollution in the air

Transporting Plants and Animals

Individual people can also change environments. For example, sometimes people transport plants and animals to new environments. A gardener in California might trade seeds with a friend in Maine. Someone on vacation far from home might bring a new plant back. Perhaps that plant is home to a few insects, or even a snail.

What's the problem? New plants might grow faster than the ones already there. New animals might have no predators. Soon the new plant or animal is crowding out the old ones. The plant is spreading everywhere, or the animal is quickly reproducing and eating all the available food.

One example is the zebra mussels that arrived on ships from Poland. Zebra mussels have been invading the Great Lakes. They are threatening the native wildlife. For example, they attach themselves to native clams. So many attach that the clams cannot open their shells to eat. With human help, new plants and animals are changing habitats.

– Formulate –
What are some other ways that people might take plants or animals to new environments?

Protecting Environments

As we learn more about environments, we are trying to protect them. When developers build houses, they replace the trees they cut down and add ponds and parks. Sometimes they bring water to dry areas, creating new habitats.

Farmers and gardeners are finding safer ways to protect their crops from insects and weeds. We are trying to burn less gasoline. We are also making more products from recycled glass, plastic, and paper. That uses less energy, which means burning less coal.

Many habitats are now protected. For example, the Wertheim National Wildlife Refuge on Long Island is a safe place for about 300 species of birds. Many birds stop here during their migration. Two to three thousand ducks spend the winter at the refuge. The Carmans River, which flows through it, is one of the last bodies of water to freeze on the south shore of Long Island.

CHAPTER 4

Changes in the Climate

Are rising temperatures worldwide a problem? People have different opinions about that. Some think this increase is just part of a cycle. Earth, they point out, goes through periods of warm weather and then periods of cold weather. Earth has even had several ice ages and then warmed up again. These people believe that our climate will cool off in time.

Other people are worried about the rising temperatures and think it means big changes are ahead for Earth. Carbon dioxide and other gases are building up in our **atmosphere**. By increasing the **greenhouse effect**, these gases are trapping more of the sun's heat. If we keep producing large amounts of these gases, even more heat will be trapped. Earth will keep getting warmer.

atmosphere: the blanket of air surrounding Earth
greenhouse effect: gases allow the sun's energy to pass through Earth's atmosphere, but then prevent most of this energy from escaping back into outer space

Learning More

We know that a fact is something that can be proven and an opinion is what someone believes. As we gain knowledge, sometimes our opinions or conclusions change. We do not fully understand many things about Earth's climate. Our ideas are changing as we learn more. However, according to the U.S. **EPA**, we do know these things:

- Human actions are changing Earth's atmosphere. These actions include burning gasoline and other fossil fuels. Burning fossil fuels releases greenhouse gases into the air.
- The amount of greenhouse gases in our atmosphere has increased. These gases stay in the atmosphere for many years, even centuries. As we continue to release gases, the amount in the atmosphere will keep rising.
- An increase in these gases tends to warm Earth's climate.
- Earth's average temperature has increased over the past one hundred years. Our four warmest years have occurred since 1998.

EPA: the Environmental Protection Agency; a government agency that watches over our environment

An increase of less than two degrees seems small, but a small change can make a big difference. During the last ice age, Earth was an average of only seven degrees colder than it is today! Back then, glaciers covered most of the United States, including New York. The Finger Lakes were carved by **glaciers**.

A warmer climate could mean more rain in some areas and less rain in others. A change in rainfall, plus higher temperatures, could happen too fast for plant and animal populations to adjust. Many kinds of living things would die.

The glaciers near the North and South Poles are already melting. During the last one hundred years, the level of the oceans has risen six to eight inches. If all of the glaciers melt, cities on the coasts may be flooded.

glacier: a very large piece of thick ice that moves slowly down a slope and spreads out on flat land

We are becoming more aware of the changes that we are making in our ecosystems, for better or worse. We cannot stop hurricanes or tornadoes, but we can control some of the other changes. As you have read, we are conserving more of our forests and wetlands. We are also finding ways to reduce pollution and learning more about the greenhouse effect.

We know that living populations of things can adapt to some slow changes. However, fast changes can be harmful. Some changes are harmful even if they happen slowly. That's why we must think carefully about the kinds of changes we make in Earth's ecosystems. They must have positive results. After all, we—and the other living things on Earth—will have to live with these results.

– Propose –
What are some positive changes that people can make in their ecosystem?

Glossary

acid rain—rain, snow, or sleet that has been made acidic by pollution in the air

atmosphere—the blanket of air surrounding Earth

compete—to fight for something

developers—companies that build new houses, stores, and other buildings

ecosystem—a large community of living things and their environment; can include many different habitats

EPA—the Environmental Protection Agency; a government agency that watches over our environment

fossil fuels—coal, oil, and natural gas

glacier—a very large piece of thick ice that moves slowly down a slope and spreads out on flat land

greenhouse effect—gases allow the sun's energy to pass through Earth's atmosphere, but then prevent most of this energy from escaping into outer space

habitat—the place where a living thing can meet all of its needs

marsh—land that is underwater some of the time

pollution—harmful substances that enter the environment

populated—a place where many people live

predators—animals that get their energy by eating other animals

saplings—young trees

To Find Out More . . .

Want to learn more about environments and ecosystems?

Try these books

Changing Climate by Sally Morgan. Franklin Watts, 2005.

Climate Change by Shelley Tanaka. Groundwork Books, 2006.

Here are two books about endangered wildlife:

Elephant Rescue: Changing the Future for Endangered Wildlife by Jody Morgan. Firefly Books, 2004.

Rainforest Bird Rescue: Changing the Future for Endangered Wildlife by Linda Kenyon. Firefly Books, 2006.

Access these Web sites

Go to this site to learn more about different kinds of habitats.
www.nationalgeographic.com/geographyaction/habitats/

This EPA Web site will help you understand climate change.
www.epa.gov/climatechange/kids/index.html

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Assessments

What Happens When Ecosystems Change?

Print pages 20–22 of this PDF for the assessments.

What Happens When Ecosystems Change?

Check Understanding

Shade the circle next to the correct answer or write your answer on the lines provided.

1. Many animals depend on plants for their food. Some animals are predators who depend on other animals for food. Describe the effect that a major flood would have on predators.

_____

_____

_____

_____

_____

2. Which is the best example of a human-caused ***negative*** change to the environment?

Ⓐ acid rain

Ⓑ tornadoes

Ⓒ wildlife refuges

Ⓓ flooding

3. A beaver chops down trees near a river bank to build a dam. Identify **one** harmful change and one helpful change to the environment.

(1) _____

_____

_____

(2) _____

_____

_____

4. Identify **one** reason an animal population might move to a new location.

_____

_____

Check Understanding

Shade the circle next to the correct answer or write your answer on the lines provided.

5. Scientists have discovered that Earth's average temperature has increased 0.7° F to 1.5° F over the past one hundred years.

Identify **two** concerns about this change and predict what effect they might have on Earth.

1) _____

_____

_____

_____

_____

2) _____

_____

_____

_____

_____

6. Which is likely to happen when a habitat is destroyed by wind, water, or fire?

Ⓐ The plants and animals supported by the habitat are likely never to reestablish themselves.

Ⓑ Different species of plants and animals will establish themselves in the new habitat as it recovers.

Ⓒ The surviving animals supported by the habitat are likely to remain because they will face less competition.

Ⓓ The animals supported by the habitat are likely to move and compete elsewhere for food, water, shelter, and space.

7. Which statement is an example of how nature has changed the environment?

Ⓐ A forest is cleared to make space to plant corn.

Ⓑ A rainstorm floods and destroys a corn field.

Ⓒ Corn is harvested to feed cattle.

Ⓓ The water used to irrigate a corn field becomes polluted.

What Happens When Ecosystems Change?

Assessment Scoring Guidelines

1. A major flood would destroy plant life in the habitat. This would force plant-eaters to leave the area. Predators would then have fewer prey for food.

2. Answer A is correct.

3. Animals that need flowing water can no longer live in this environment. New plants grow using the sunlight that the trees once blocked.

4. They may need to find a new source of food.

5. Change in rainfall patterns
Animal and plant populations may not be able to adjust to the change in available water.

Change in temperature patterns
Animal and plant populations may not be able to adapt to warmer temperatures.

Melting glaciers
This may lead to rising sea levels and flooding along the coast.

6. Answer D is correct.

7. Answer B is correct.

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English Language Arts Activities

What Happens When Ecosystems Change?

Print pages 24–28 of this PDF for the reading activities.

Connotation and Denotation

A denotation is a dictionary definition. A connotation is an emotional meaning, and it can be positive or negative.

For example, a dog might be a collie/shepherd mix (a positive connotation) or a mutt (a negative connotation).

A neighbor might be called curious (a positive connotation) or nosy (a negative connotation).

The words that you choose as you write can show your feelings about your topic, so choose them carefully. The words that you read in a book or a passage often show whether that author has positive or negative feelings about his or her topic.

TRY THE SKILL

Shade in the letter of the word with the more positive connotation.

1. People cause _____ changes to ecosystems.

Ⓐ accidental

Ⓑ thoughtless

2. The East Coast is one of the most _____ parts of the United States.

Ⓐ crowded

Ⓑ populated

Shade in the letter of the word with the more negative connotation.

3. Floods can _____ away topsoil.

Ⓐ carry

Ⓑ strip

4. Some people _____ that rising temperatures worldwide are not a problem.

Ⓐ claim

Ⓑ believe

Word Origins

Many English words are based on Latin and Greek prefixes, suffixes, and roots. If you know the meanings of these word parts, you can often figure out the meanings of the English words. These word parts were used in this book:

Word Part	Meaning	English Words
hab, hib	"hold"	*habitat, inhabit, prohibit*
pop	"people"	*populated, population*
serv	"watch over"	*conserve, preserve*
vac	"empty"	*vacation, vacate*

TRY THE SKILL

Read each sentence, and think about the meanings of the word choices. Shade in the letter of the word that completes the sentence.

1. A country with many citizens is _____.

Ⓐ reservoir
Ⓑ populous
Ⓒ inhibited
Ⓓ vacuum

2. If you hold back your feelings, people might say you are _____.

Ⓐ reservoir
Ⓑ populous
Ⓒ inhibited
Ⓓ vacuum

3. A _____ has nothing in it.

Ⓐ reservoir
Ⓑ populous
Ⓒ inhibited
Ⓓ vacuum

4. A place that protects the water supply is called a _____.

Ⓐ reservoir
Ⓑ populous
Ⓒ inhibited
Ⓓ vacuum

Use Graphic Organizers

Graphic organizers help you organize information. You can use them to help explain the main points in your reports or to better understand and remember what you read.

Here are some common graphic organizers:

- **Time lines** show events in the order they occurred. One might show a timeline of discoveries relating to transportation.
- **Line graphs** show changes over time. For example, a line graph could show changes in the average rainfall during the past four years.
- **Charts** can classify information into groups or categories. For example, a chart could show changes caused by natural forces, plants and animals, and people. Charts can also help you record observations during an experiment.
- **Venn diagrams** are two overlapping circles. They help you compare and contrast two things. You describe each thing in one circle and tell how they are alike in the overlapping part.

TRY THE SKILL

Choose one of the graphic organizers described on this page, and use it to share some information about changes to ecosystems. Complete your graphic organizer with facts or examples from this book.

Use the Internet

A search engine will provide you with a list of Web sites related to a topic, but you must choose among the sites carefully. Here are some tips:

1. Avoid personal Web sites. Anyone can publish information on the Internet. No one checks to make sure the information is accurate. Many personal Web sites include a tilde sign (~) follow by someone's name or the word *members* or *users*. The information in these sites might be excellent—or just someone's opinion. Be aware that some sites, such as Wikipedia, can be edited by readers.

2. Seek out sites sponsored by government agencies (.gov), colleges and universities (.edu), or other reliable organizations.

3. Make sure that the site is up to date. At the bottom of the site, look for the last time it was updated. For most of your reports, the newer the information, the better.

4. Choose sites that you can understand. The ones written for researchers or scientists might be too technical for most readers.

TRY THE SKILL

You are writing about the greenhouse effect. Shade in the letters of the two sites you would skip. Then explain why.

Ⓐ **The Greenhouse Effect**
The greenhouse effect is the rise in temperature that the Earth experiences…
www.epa.gov/climatechange/greenhouse.html

Ⓑ **The Greenhouse Effect**
CO2 traps solar-derived heat near Earth's surface, thus contributing to…
www.sask.edu/tfi/activity/greenhouse.html

Ⓒ **Global Warming**
What is the greenhouse effect and how is it affecting our climate?…
www.ncdc.noaa.gov/oa/climate/globalwarming.html

Ⓓ **The dreaded greenhouse effect!**
The media is at it again! What will they blame on fossil fuels next?…
www.thoughts.Jerryblog.com

1. I would not choose ___ because _____

_____

2. I would not choose ___ because _____

_____

Answer Key

Connotation and Denotation

1. A

2. B

3. B

4. A

Word Origins

1. B

2. C

3. D

4. A

Use Graphic Organizers

Possible examples for students' graphic organizers: a timeline showing changes in an ecosystem and the ways that living things react to them; a line graph showing changes in the average temperature worldwide; a chart of the different causes of changes in ecosystems; a Venn diagram comparing two kinds of change, such as a forest fire and acid rain.

Use the Internet

1. I would not choose B because I probably would have trouble understanding it.

2. I would not choose D because it seems to be one person's opinion.