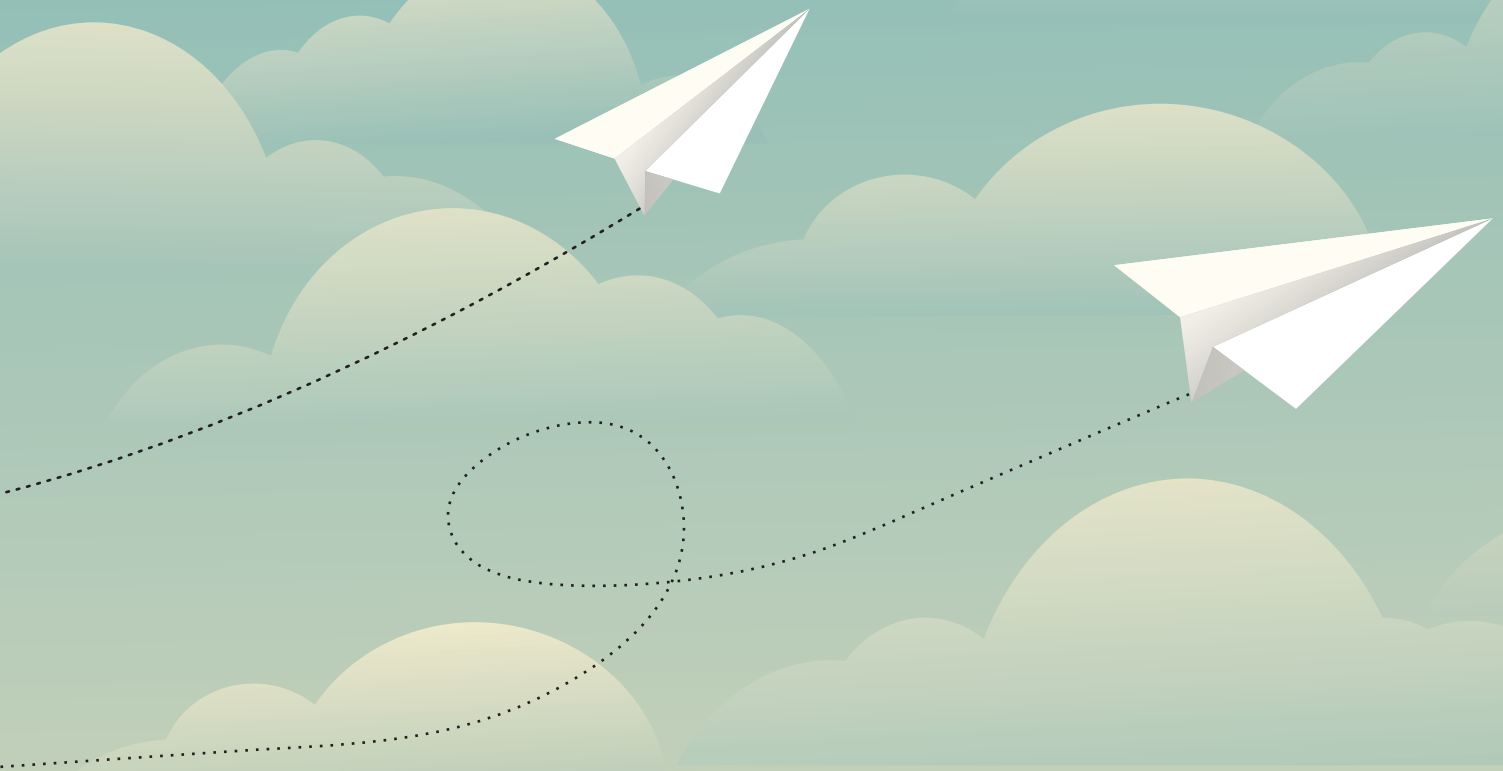
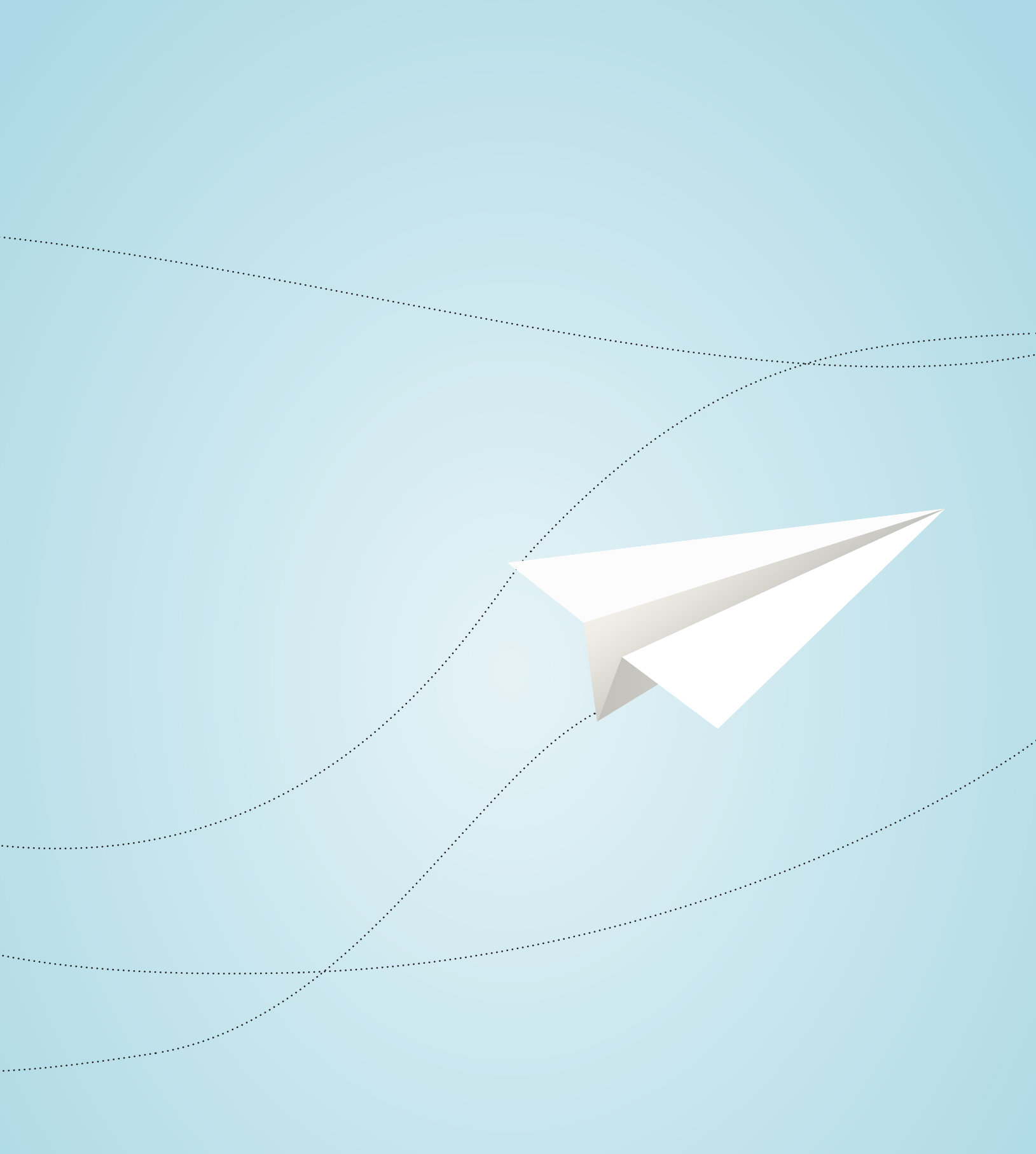


WEATHER AND CLIMATE SCIENCE





Reference in this publication to any specific commercial product, process, or service, or the use of any trade, firm, or corporation name is for general informational purposes only and does not constitute an endorsement, recommendation, or certification of any kind by Purdue Extension. Persons using such products assume responsibility for their use in accordance with current directions of the manufacturer.

WEATHER AND CLIMATE SCIENCE



Science • Level 1 • Grades 3–5

Note to the 4-H Member

Everyone seems interested in the weather. We need to know what the weather will be so we can dress appropriately. That helps us plan our day. Gardeners and farmers need to understand the area's climate. That helps them know what they can plant and what will grow. Homeowners also need to understand our climate. It helps them know which flowers and shrubs to plant around their houses. It also tells them what kind of furnace and air conditioner will work best in this area. And when stormy weather is predicted, people need to be prepared. It is important that they know how to be safe in bad weather, whether they are in their homes or outside.

LEARNING ABOUT WEATHER AND CLIMATE

The Level 1 4-H Weather and Climate Science manual introduces basic weather words and ideas. These activities focus on understanding the signs of weather around you. You will also begin to learn the difference between weather and climate and how these ideas are related.

When you are in grades 6-8, you will use the Level 2 manual. It will introduce you to more complex weather topics. You will learn about air pressure, winds, humidity, and fronts.

When you are in high school, you will use the Level 3 manual. It tells you even more about weather and climate science. This will help you prepare to fully understand weather all through your lifetime.

The two keys to learning in this — or any— 4-H project are to enjoy your studies and to learn at your own pace. We hope this project is just the start of a lifetime understanding the climate you live in and watching the weather!

WHAT YOU'LL LEARN

Weather is the state of the atmosphere at a particular place and time. The climate of the area and many local factors influence the weather.

Climate is the usual, long-term weather conditions for an area or for the entire planet.

Climate system is a complex process in which the earth's water and gas flow or change state because of the sun's energy.

KNOWING THE DIFFERENCE

Weather — The current weather condition of the atmosphere, including temperature, wind, cloudiness, precipitation, and relative humidity.

Climate — The average weather over time.

AUTHORS

Natalie Carroll • professor of youth development and agricultural education

Ted Leuenberger • writer, teacher

Gretchen Leuenberger • writer, teacher

ACKNOWLEDGMENTS

CONTRIBUTORS

Purdue University • West Lafayette, Indiana

Natasha Duncan, Olivia Kellner, Jesse Steinweg-Woods • students

Aime Lillard, Sayde Uerkwitz • administrative assistants

BOOK PRODUCTION TEAM

Lafayette, Indiana

Carol Bloom • Bloom Ink Editorial, copyediting

Nancy Alexander • copyediting

Natalie Powell • Just Natalie Graphic Design, design and layout

CONTENTS

You should be able to complete each activity in about 20–30 minutes. Some activities may take a shorter time. Some may also take longer, particularly when completing a Fly Higher activity.

Comparing Climates	3
Country of Colors	6
Defining Weather Words	8
Earth's Surfaces	10
H ₂ O	12
Invisible Air	14
Reading About Wild Weather	17
'Tis the Season	19
Watching the Wind	22
Weather Affects Plans	25
Weather Alerts	27
Weather or Climate?	30
Where Is the Heat?	32
Glossary	34

COMPARING CLIMATES



How are four U.S. climate areas — temperate, desert, tropical, and tundra — the same, and how are they different?



Weather is the current condition of the **atmosphere**, including temperature, wind, cloudiness, **precipitation**, and **relative humidity**. Climate is the average weather over time. The local climate affects the clothes you wear, when we plant flowers and vegetables, and the crops that farmers grow. There are four climates in the United States: temperate, desert, tropical, and tundra.

A *temperate* climate has seasons with hot and cold weather, but not as hot or cold as in other climates. Indiana has a temperate climate. We also have rain and snow but, generally, not as much as in some other climates. The *desert* climate has very little rainfall and hot temperatures. *Tropical* climates have warm or hot conditions year-round. The *tundra* climate has extremely cold conditions most of the year. All of these climates have seasons, but the seasons are not always as noticeably different as the seasons we experience in Indiana. You will compare data from states in the four U.S. climate areas — temperate, desert, tropical, and tundra — and look for what is similar and what is different.

OBJECTIVE: Compare the four climates found in the United States.

Weather Tote

- Pencil
- Dictionary



- 1 Read the data in the chart below for each of the four climates.
- 2 Answer the questions about the four climates on the next page.
- 3 Answer the follow-up questions.

TEMPERATE CLIMATE

Central Indiana

average temperature
average precipitation



January (winter)	July (summer)	yearly average
25.5°F	75.4°F	52.3°F
2.3"	4.5"	39.9"

DESERT CLIMATE

Central Arizona

average temperature
average precipitation



TROPICAL CLIMATE

Southern Florida

average temperature
average precipitation



TUNDRA CLIMATE

Central Alaska

average temperature
average precipitation



WHICH CLIMATE HAS:

- temperate?
- desert?
- tropical?
- tundra?

The highest average temperature? _____ What is it? _____

The lowest average temperature _____ What is it? _____

The highest July temperature? _____ What is it? _____

The lowest July temperature? _____ What is it? _____

The highest January temperature? _____ What is it? _____

The lowest January temperature? _____ What is it? _____

The highest average precipitation? _____ What is it? _____

The lowest average precipitation? _____ What is it? _____

The highest July precipitation? _____ What is it? _____

The lowest July precipitation? _____ What is it? _____

The highest January precipitation? _____ What is it? _____

The lowest January precipitation? _____ What is it? _____

Look up the word *temperate* in the dictionary, and write the definition below:

The first question in the chart above asked you about climate extremes — highest and lowest of the averages. How many times did the temperate climate have the extreme data for one of the climates?



SHARE WHAT HAPPENED:

- Were you surprised by the differences in the climates?
- What data surprised you?

APPLY:

- What do you think it would be like to live in each of the other climates?
- Which climate do you think that you would be happiest living in year-round? Why?
- How are flowers, plants, and agricultural crops affected by climate?

GENERALIZE TO YOUR LIFE:

- Why doesn't Indiana have many extremes in temperature and rainfall?
- Temperature and rainfall are the major factors in a climate. What might some other factors be?



Fly Higher

- Calculate the difference in average temperature and average precipitation between January and July for each climate. What climate has the largest extremes for temperature? For precipitation?
- Keep track of temperature and rainfall in several different areas around the United States for a week or for one day during the first week of the months of January, April, July, and October.
- Explore what the climate is in five places around the world where you would like to go someday.

Notes

COUNTRY OF COLORS



What is a hardiness zone?



Buds, new leaves on trees, tulips, and daffodils tell us that spring is coming because the weather is warming up. These plants can survive our cold winter temperatures. But many flowers we enjoy need to be planted in the spring after the danger of frost has passed. In this activity, you will learn about **hardiness zones** and how they are determined.

The U.S. Department of Agriculture (USDA) publishes the Hardiness Zone Map to help gardeners and farmers plan what and when to plant. The map shows zones based on the **average annual extreme minimum temperatures** for a 30-year period in the United States. This is important information because many plants are very sensitive to cold temperatures and cannot survive freezing.

AVERAGE ANNUAL EXTREME MINIMUM TEMPERATURES

Average *the sum of all values divided by the number of years*

Annual *over a year*

Extreme *the lowest*

To find the average annual extreme minimum temperature, add the lowest temperature of each year for 30 years and divide the sum by 30. Areas with similar extreme minimum temperatures (within 10°F) are grouped together in zones. Areas with colder winter weather have lower zone numbers. Areas with warmer winters have higher zone numbers.

OBJECTIVE: Know Indiana's hardiness zones.

Question: Why do some flowers bloom year after year, while others need to be planted each year?

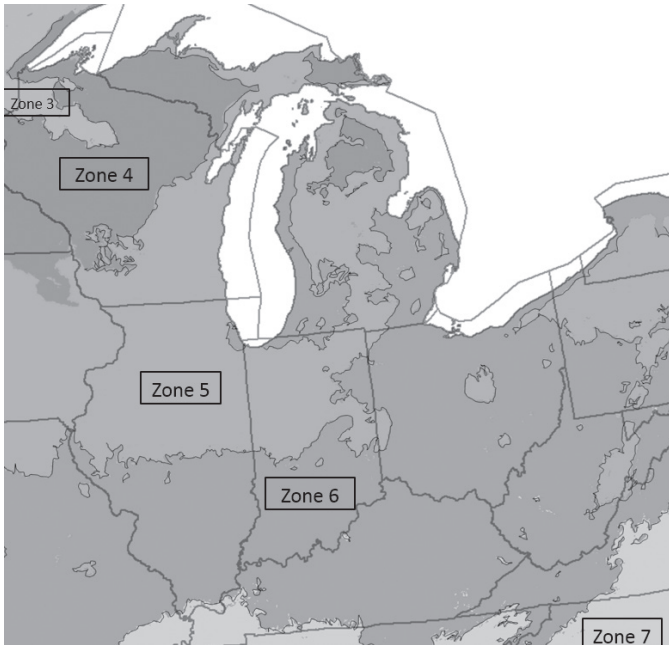
Weather Tote

- Pencil
- Colored pencils, markers, or crayons
- Hardiness Zone Map (on next page)



- 1 Draw a line between Indiana's hardiness zones.
- 2 Color each zone a different color.
- 3 Make a key that shows the color for each zone.
- 4 Place an "x" where you live.
- 5 List five garden plants (flowers or vegetables) that cannot overwinter — not survive a winter and need to be planted each year.

PLANT HARDINESS ZONES



Adapted from the USDA Hardiness Zone map, planthardiness.ars.usda.gov

INDIANA HARDINESS ZONES



Garden plants that cannot overwinter

- 1 _____
- 2 _____
- 3 _____
- 4 _____
- 5 _____



SHARE WHAT HAPPENED:

How many zones did you find in Indiana?

APPLY:

- What is the average annual extreme minimum temperature range where you live?
- What do you think would happen if you planted a hardy perennial flower, a plant that lives more than one year, in Hardiness Zone 9, which includes the warmest parts of the United States.

GENERALIZE TO YOUR LIFE: How do the hardiness zones affect what farmers grow?



Fly Higher

- Visit the USDA Plant Hardiness Zone Map online (and in color) at <http://planthardiness.ars.usda.gov/PHZMWeb/Maps.aspx>, or look at the map to the left. Then answer the following questions.

Where are the warmest zones? What is their average minimum temperature?

Where are the coldest zones? What is their average minimum temperature?

- Find a flower or vegetable seed catalog. Your parent or Extension Educator can help you.

How are the hardiness zones listed for different flowers or vegetables?

What flowers or vegetables did you find that are not recommended for where you live?