New Mexico Life Zones

Overview

Students will work in pairs to produce a diagram of a mountain that shows the characteristics of New Mexico life zones.

Concepts

1. Average air temperature decreases and average annual precipitation increases with an increase in elevation.
2. Plant and animal populations vary with changes in elevation.
3. Life zones are classified by the dominant plant species in each zone.

Time

1 hour and 30 minutes

- Introduction: 15 minutes
- Life Zone Diagram: 45 minutes
- Journal Exercise: 10 minutes
- Closure: 20 minutes

Materials

For each student or pair of students:

- one Life Zone Template (two pages)
- one Climate Data Sheet
- one Thermometer Sheet
- one Plant and Animal Information Sheet
- two scissors
- one bottle of glue or glue stick
- three pieces of clear tape
- colored pencils or crayons
- Ecosystem Explorations Journal (for each student)

Teacher Preparation

1. Make a copy of the following pages for each student:
   Life Zone Template
   Climate Data Sheet
   Thermometer Sheet
   Plant and Animal Information Sheet
2. Gather scissors, glue, and colored pencils or crayons.

3. Familiarize yourself with the graphs included in the closure section of this lesson.

Background

A life zone is an area within an ecosystem that has characteristic plant and animal communities. Life zones correspond with particular temperature and moisture conditions. As elevation increases, average air temperatures decrease and average annual precipitation (snow and rain) amounts increase. As a result, plant communities and their dependent animal communities also change with an increase in elevation.

Life zones are defined by the dominant plant species in that area. In New Mexico, we recognize seven life zones: desert (3,000 feet to 4,500 feet above sea level), grasslands (4,500 feet to 5,500 feet above sea level), piñon-juniper woodlands (5,000 feet to 7,000 feet above sea level), ponderosa pine (6,500 feet to 8,500 feet above sea level), mixed conifer (8,000 feet to 9,500 feet above sea level), and spruce-fir (9,000 feet to 11,000 feet above sea level). The alpine life zone occurs above timberline (where trees do not grow) and is present in other mountain ranges in New Mexico but not in the Sandia Mountains.

Botanists and ecologists point out that there are a variety of factors that influence the elevation at which a plant community grows, including aspect (direction the slope is facing), latitude, and water availability. Therefore, change from one life zone to the next is not sharply defined. A particular life zone may begin at a lower elevation on a drier, south-facing slope than on a more moist, north-facing slope. The transition zone between two life zones may span several hundred feet. Many plants grow in several life zones. The strict application of life zones to elevations is not accurate.

Life zones are useful in presenting basic ecology concepts. They illustrate that factors in the environment affect plant growth, animal communities depend on plant communities, and that ecosystems are in a constant state of change. At the Sandia Mountain Natural History Center, students will have the opportunity to investigate the differences and similarities between the life zones in the surrounding ecosystem.

Procedure

<u>Introduction</u>

Begin with a brief discussion of students' perceptions of how climatic conditions change with elevation. Questions to ask include:

- What do you think the temperature is like on the top of the Sandia Mountains today? [It is colder at higher elevations.]
- How much rain and snow falls on the top of the Sandia Mountains as compared to here? [More rain and snow falls on the top of the mountains than down in Albuquerque. Albuquerque receives an average of 8 inches of precipitation per year; the Sandia Crest receives an average of 33 inches.]
- Will we find the same plants and animals living in the mountains as we find here at school? Why? [No. Our school is in a different life zone from the Sandia Mountains.]

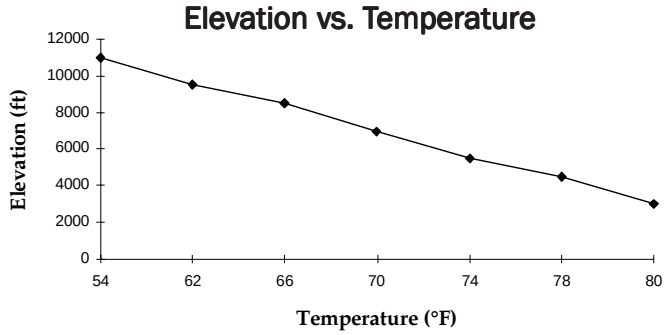
Life Zone Diagram

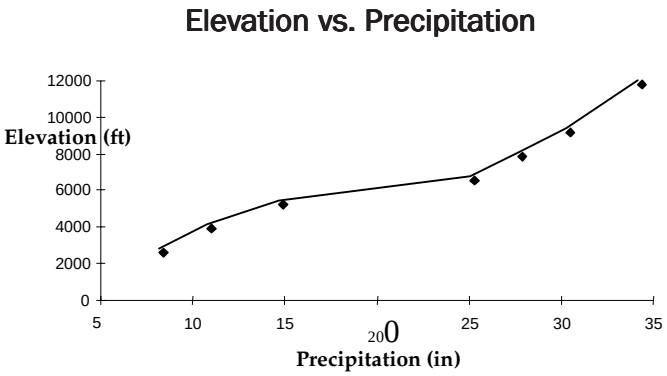
Explain the directions for the following activity. The order of the steps is important for successful completion of this activity. In this lesson, each student will produce one completed diagram describing the characteristics of New Mexico life zones. Provide each student with the Life Zone Template, one Climate Data Sheet, one Thermometer Sheet, one Plant and Animal Information Sheet, scissors, glue, clear tape, and colored pencils or crayons.

1. Working from the data given on the Climate Data Sheet, have each student color the thermometers and rain gauges appropriately and glue them to the Life Zone Template in the appropriate zone.
2. Have students read the description of each plant. Using the temperature and precipitation data already provided, students then decide in which zone each plant most likely lives, cut out the pictures of the plants, and glue them in the appropriate zones.
3. Have students read the description of each animal. Using the temperature, precipitation, and plant data provided, students then decide in which life zone each animal most likely lives. Have students cut out the pictures of the animals and glue them to the life zone diagram in the appropriate zone. Note: some animals may live in more than one zone.
4. If students finish early they may draw additional trees or animals on their diagram or color it.

Closure

1. Draw two graphs (from the next page) on the board. These two graphs use the same elevation, temperature, and precipitation data as given on the student worksheets. You may also want to post student's diagrams and let students observe each other's work.
   - What is the general trend in each graph? [Temperature decreases with an increase in elevation, and precipitation increases with an increase in elevation.]
   - Why do we find different plants and animals in each life zone? [Plants and animals have specific needs and can only live in the zones that best fit those needs.]
   - Which life zones will we visit at the Sandia Mountain Natural History Center? The elevations we will be at are between 6,800 feet to 7,200 feet above sea level. [piñon-juniper (and ponderosa pine) life zones]
   - What can we expect the temperature to be when we visit? [Usually at least 10 degrees cooler than Albuquerque.]


Elevation vs. Temperature
Elevation (ft)
12000
10000
8000
6000
4000
2000
0
54
62
66
70
74
78
80
Temperature (°F)


Elevation vs. Precipitation
Elevation (ft)
12000
10000
8000
6000
4000
2000
0
5
10
15
20
25
30
35
Precipitation (in)

Adaptations for Students with Limited English Proficiency

Use pictures to illustrate how life zones change with elevation. When making the life zone diagram, pair LEP students with stronger English readers who are also bilingual, to help with placement of data in the appropriate life zones. Using the Life Zone Template and the thermometers and rain gauges, model for the students the process of placement on the template. Also, emphasize how to use the numbers for temperature and precipitation to place plants and animals in the appropriate life zone.

Key Words: life zones: las zonas de vida; communities: las comunidades; precipitation: la precipitación; elevation: la altura o la elevación; temperature: la temperatura

Journal Exercise

In their journal, have students respond to the following questions. Students should write at least one sentence for each question.

You have just completed a diagram that shows changes in temperature, precipitation, plants, and animals with elevation. The diagram shows the boundaries between life zones as being a straight line.

- Do you think life zones boundaries are straight lines in nature?
- Other than elevation, what might affect which life zones are present at the Sandia Mountain Natural History Center.
- What kind of life zones do you expect to see when you visit the Sandia Mountain Natural History Center?

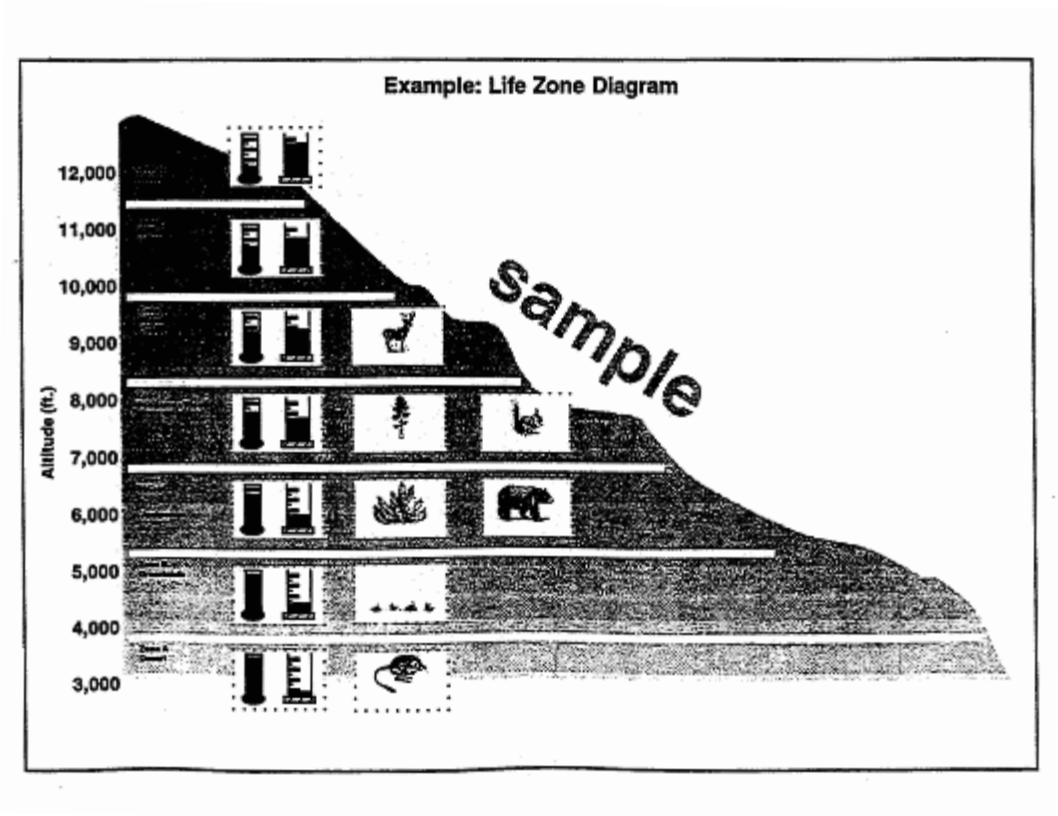
Revisit these questions again after returning from the field trip.

Assessment

The completed life zone diagram serves as an evaluation tool. Compare students' diagrams with the diagram key provided. Note, some of the animals and plants live in more than one life zone.

Extensions

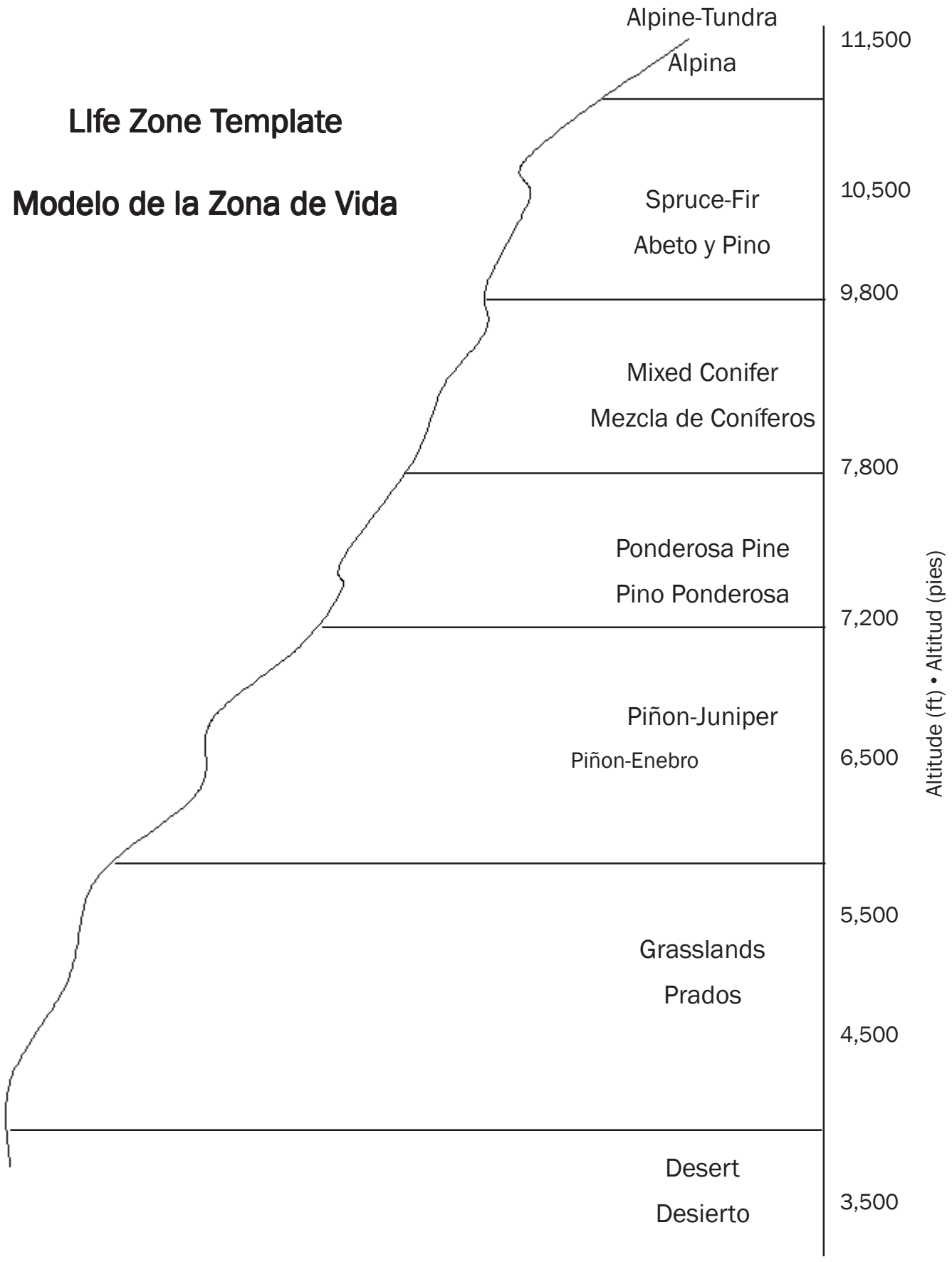
Characterize the life zone at your school. Inventory native plants and animals that live near your school. Maintain a record of the temperature and precipitation.



The diagrams on this page and the following page are adapted from "Everybody Needs Trees," published by the Energy, Minerals and Natural Resources Department's Forestry and Resources Conservation Division in cooperation with Tree New Mexico.

LIfe Zone Template

Modelo de la Zona de Vida



Climate Data Sheet
Hoja de Informacíon Sobre el Clima

Temperature and Precipitation

Fill in a thermometer and a rain guage for each zone. Cut out each thermometer and rain gauge and glue it on the diagram.

Note: Temperatures are average temperatures one would find on a day when the temperature is 70º F at 7,000 feet above sea level. Precipitation is average annual precipitation.

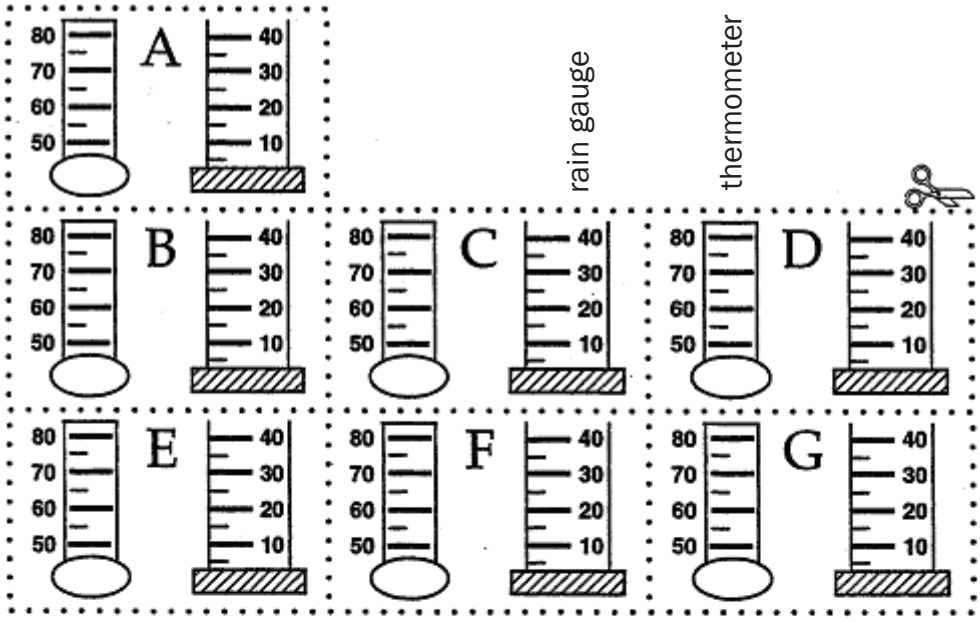
Temperatura y Precipitación

Llena un termómetro y un pluviómetro para cada zona. Recorta cada termómetro y pluviómetro y pégalos en el diagrama.

Nota: Las temperaturas son el promedio de temperatura que uno encontraría en un día cuando la temperatura esté a 70º F a 7,000 pies sobre el nivel del mar. La temperatura se promedia sobre la precipitación anual.

Zone Zona	Temperature Temperatura ° F	Precipitation Precipitacíon in inches/en pulgadas
G Alpine/Alpina	54	35
F Spruce Fir/Abeto y Pino	62	30
E Mixed Conifer/Mezcla de Coníferos	27	66
D Ponderosa Pine/Pino Ponderosa	70	25
C Piñon Juniper/Piñon Enebro	74	15
B Grasslands/Prados	78	12
A Desert/Desierto	80	8

Thermometer Sheet



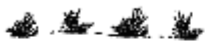
Plant and Animal Information Sheet

Plants

- Read about each plant.
- Decide in which zone each plant might live.
- Cut out each plant and its name and glue it in the correct zone.

One-Seed Juniper

A local name for this tree is the cedar. It grows in places where the temperature averages 74°F and the annual precipitation is about 15 inches.



Bunch Grass

Bunch grass can live in areas with little water. It grows in places where the temperature averages 78°F and the annual precipitation is about 12 inches.

Ponderosa Pine

This tree grows where there is lots of sunshine, the temperature averages 70°F, and the annual precipitation is about 25 inches. The Abert squirrel makes its home in this tree.

Animals

- Read about each animal.
- Decide in which zone each animal might live.
- Cut out each animal and glue it in the correct zone.

Kangaroo Rat

This animal lives where the temperature is between 78°F and 83°F and the annual precipitation is around 10 inches. The kangaroo rat can survive without water for a long time.

Mule Deer

Mule deer live in forests from 5,000 feet to 11,000 feet above sea level.

Abert Squirrel

This squirrel lives in and eats ponderosa pine trees.

Black Bear

This animal can roam great distances. During the summer the bear usually lives anywhere above 6,000 feet above sea level.

Hoja de Información Sobre Plantas y Animales

Plantas

- Lee acerca de cada planta.
- Decide en qué zona cada planta podría vivir.
- Recorta cada planta y su nombre y pégala en la zona correcta.

Enebro

El nombre local para este árbol es el cedro. Crece en lugares donde la temperatura promedio es de 74° F y la precipitación anual es de aproximadamente 15 pulgadas.

Pasto de Mata

El pasto de mata puede vivir en áreas con poca agua. Crece en lugares donde la temperatura promedio es de 78°F y la precipitación anual es de aproximadamente 12 pulgadas.

Pino Ponderosa

Este árbol crece donde hay suficiente luz solar, con temperatura promedio de 70°F, y con una precipitación anual de 25 pulgadas aproximadamente. La ardilla Abert hace su nido en este árbol.

Animales

- Lee acerca de cada animal.
- Decide en qué zona cada animal podría vivir.
- Recorta cada animal y pégalo en la zona correcta.

Rata Canguro

Este animal vive donde la temperatura es entre 78°F y 83°F y la precipitación anual es alrededor de 10 pulgadas. La rata canguro puede sobrevivir sin agua por largo tiempo.

Venado

El venado vive en los bosques desde 5,000 a 11,000 pies sobre el nivel del mar.

Ardilla Abert

Esta ardilla vive en y se come los pinos ponderosa.

Oso Negro

Este animal puede recorrer grandes distancias. Durante el verano el oso usualmente vive dondequiera que sea más de 6,000 pies sobre el nivel del mar.