



# Rangers in the Classroom Program Plan



## Life in the Zone

**Grades:** 3rd - 4th

**Essential question:** How does climate shape life in the mountains of the park?

**Duration:** 1 hour

**Standards Addressed:**

3rd Grade

4th Grade

**Vocabulary:**

adaptation, alpine, behavior, conifer, climate, elevation, foothills, habitat, life zone, montane, physical, treeline

### **Introduction:**

Welcome to the Rangers in the Classroom—Life Zones of the Sierra Nevada presentation. This program introduces students to the concept of life zones within the Sierra Nevada by taking students on a virtual trip up into the mountains. Students explore how climate (temperature and precipitation) shapes a landscape and discover how plants and animals adapt to survive in each life zone. This lesson culminates in a hands-on group game.

**Essential Question:** How does climate shape life in the mountains of the park?

**Enduring Understanding:** Climate changes as you journey up a mountain; plants and animals must adapt to survive.

### **Materials:**

- Power point presentation
- Plant Materials: (from nursery)
  - Young blue oak
  - Young giant sequoia
- Life Zones Game: species cards, bonus cards, and game board
- Park maps and student fee waivers

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## Program Introduction:

- Today we're all going to take a trip up the mountains of Sequoia and Kings Canyon National Parks! [This trip will also prepare you for when you bring your family to the parks! ]
- Do you think it's different up there? How? If we went up there wearing what we're wearing now, would we be ready?
- When we travel, we have to think about how we'll get our **habitat** needs: **shelter, water, food, and space.** [ Most mornings we wake up in our shelter, we know where to find a faucet to fill our water bottle. We open the cupboard to get breakfast and have enough space to not feel crowded. ] But when we travel, we have to *learn about the place we're headed to and use that knowledge to adapt.*
- We will research the different **habitats** in the mountains of our parks and learn from the locals, the plants and animals that live there, to discover how to adapt to survive in each **life zone**. We will then use what we've learned to travel up the mountain in the life zone game!

## Your life zone

- A **life zone** is like a neighborhood of *habitats* that are associated with elevation changes.
- Your life zone is called the Central Valley. You all are experts at surviving here!
- If someone wanted to visit you here, what would you tell them to bring? What kind of clothes should they bring? How would you advise them on getting shelter from the sun?

## Welcome to the Foothills

- Let's start with the bottom of the mountain, the life zone closest and most similar to the Central Valley, the **foothills!**
- The foothills is an amazing place to visit! [Show picture of green, flowering foothills.] But it doesn't always look like this... [Show brown, dry foothills]
- What happens between winter [green picture] and summer [brown picture] ? *Have students pair share their answers and report back. Yes! The foothills are extra hot and dry in the summer.* Let's investigate further.

## Measuring the foothills

- **Main idea:** the foothills landscape is one where water (and food) is often scarce and shelter from extreme heat is necessary.

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- Let's take what we noticed, our **observations**, and test them with scientific tools. [Introduce thermometer, rain gauge, and soil sample jar]
- Show students winter in the foothills and discuss.  
[ *Background:* Foothills Elevation 1,000—5,000 feet. Temperatures: Low temperatures in the winter average above freezing (32 degrees F) at 34 degrees F. Highs temperatures in the summer average near 100 degrees F. Precipitation: About 25 inches per year of rainfall from November to April. Soil Composition: Corse, sandy, and rocky soil. Under these conditions, there are few plants to break down into soil. So the soil there is dry and rocky. ]
- Have students predict summer temperatures and rainfall and pair share. Discuss.
- Ask students what is most challenging about life in the Foothills. [Water is scarce, soil provides little food for plants, life needs shelter from extreme heat.]

*Transition:* To find out how plants and animals find the food, water, shelter and space to survive here in the foothills, we will ask the locals.

## Foothills Local plant: blue oak

- **Main idea:** the blue oak shows us how it adapts to survive in the hot dry foothills.
- What is an **adaptation?** A superpower! A physical or behavioral characteristic that has developed to allow an organism to better survive in its environment. It's *how* plants and animals find the food, water, shelter, and space it needs.
- Blue oak adaptations: shape: outstretched, reaching for rain, roots: 2/3 the size of the entire tree, reaching deep into the soil to search for water, light colored to reflect light and waxy (sunscreen) to prevent moisture loss
- Invite students to feel leaves of baby blue oak tree, pair share their observations, and report back to the class.

## Foothills Local animal Acorn Woodpecker

- **Main idea:** Some foothills animals spend their winters preparing for the hot dry summers.
- Show picture of woodpecker and acorn filled tree. Ask students to discuss with one another what they believe the woodpecker is doing to survive.
- [ *Background:* The Acorn Woodpecker is a master at food storage. In the fall they collect as many acorns as they can and store them in pre-pecked holes. This is important because the food they need becomes scarce in summer months.]

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**Foothills cheer:** Before we leave let's do the foothills cheer so we remember what we've learned! [Students put arms outstretched like a blue oak and cheer, "FOOTHILLS! HOT AND DRY!" ]

*Transition:* So we have explored the hot, dry foothills and met a plant and animal that have adapted to survive there. As we move up the mountain, the challenges change, and so do the communities of plants and animals.

## Welcome to the Montane!

- **Main Idea:** Lifezones further up the mountain are colder; the montane is cold and snowy.
- [ Background: As we move up into the montane, things get cooler. Elevation 5,000 to 9,000 feet Characteristics: Mix conifer forest with sparsely vegetated rock outcroppings and meadows. Temperature: Low temperatures in the winter average in the 20's degrees F. High temperatures in the summer average in the 70's degrees F. [ For every 1,000 feet gained in elevation the temperature drops approximately 3.5 degrees Fahrenheit. (Known as, U.S. Standard Atmospheric Lapse Rate) ] Precipitation: Mostly snow with an average 43-48 feet of snow each year which converts 40-45 inches of rain. 1 inch of rain = 13 inches of snow. Soil Composition: wet environment is good for breaking down dead plants and turning them into soil. With so many plants thriving in the moist montane, there's plenty of ingredients to make soil. Thus, montane soil is deep, dark, and rich. ]
- Montane summer: Ask students to recall how hot summers are in the foothills, and point to that number on the thermometer. Have students predict if the montane summers will be colder or warmer. Reveal the temp reading. Rain gauge reveals slight precip. Ask students if they could find water and food in the soil sample. Yes!
- Montane winter: Ask students to recall how cold winters are in the foothills (just above freezing.) Students may predict how cold the montane will be. Reveal winter data on slide. Explain what below freezing means. Water turns into ice! Draw attention to the winter precip gauge. The montane gets tons of snow!

*Transition:* Life in the montane can be challenging. Let's meet the species who live here and see how they adapt.

## Montane Plant local, Giant Sequoia

- Bring baby sequoia tree around for students to feel. Ask them how the tree seems

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different than the blue oak. Discuss.

- **Shape:** like the roof of a house, slanted to let snow slide off. Bring up two students. Turn one into a blue oak, and have class imagine that blue oak living up in the montane. Help them visualize snow accumulating on branches. The branches would break. Turn second student into sequoia tree—hands up making a pointed top. Help class visualize snow falling. Would it all accumulate on top? No! It would slide off, and put the snow down on the roots where the tree needs it.
- **Leaves:** needles also help snow slide off, stay on the tree year round (evergreen)
- **Roots:** roots don't need to dig deep for water, but rather spread wide and shallow and help stabilize the tree.

*Transition:* Trees of course are not the only things living in the montane. The ‘local’ animal we’re about to meet, likes to den up inside hollowed out Sequoias, and is adapted to live in the montane and the foothills.

## Montane Animal local, American black bear

- Play video clip: Before playing, ask students to think about how this animal is adapted for finding food, water, shelter, and space in the montane.
- Background: Nose helps sniff out food, claws help tear through rotting logs. Tongue slurps up insects, thick coat shelters from cold. Black bears may also migrate between life zones, living in the foothills in the fall to take advantage of acorn crops.

**Montane cheer:** Before we leave let’s do the montane cheer so we remember what we’ve learned! [Students put arms up like a Sequoia and say, “MONTANE! SNOWY IN THE MIDDLE!” ]

*Transition:* Well if you think the black bear is tough and the montane challenging to live in, check out this next life zone and the life adapted to live there...

## Welcome to the Alpine!

- **Main idea:** In the alpine, while there is plenty of space, extreme cold and wind make survival challenging.
- **Background** [ **Elevation** above 9,000 feet. **Characteristics:** It is essentially a cold desert with a very short growing season (about six to eight weeks). **Weather:** Low temperatures in the winter average 10's degrees F at 10,000 ft and -10 degrees F at 14,000ft. High temperatures in the summer average 50's degrees F at 10,000ft and

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40's degrees F at 14.000ft. Long, very cold winters with short, cool, dry summers and high winds. The air is thin and dry. **Precipitation:** Falls mostly as snow equaling about 46 inches of liquid. Extreme winds blow away snow and make this life zone drier than the montane. ]

- Reveal data on PowerPoint, and have students make predictions or recall summer and winter temps in the lower life zones for comparison.

*Transition:* What would be challenging here? Habitat Challenge: Not much shelter, water is frozen in winter and scarce in the summer, and food scarcity.

## Alpine Local plant, Whitebark pine

- Shape: Flagging, limbs growing with the prevailing wind (go with the flow)  
**Activity:** have students put up arms as branches and blow imaginary wind towards them from different sides of the room. They're branches should bend the way the wind is blowing.
- Leaves: tough needles
- Roots: roots can grow and twist to grab a hold in the thin, rocky soil

*Transition:* how might animals adapt to this harsh habitat?

## Alpine Local animal, American Pika

- **Video activity:** as we watch this video, think about how the Pika is surviving in the alpine.
- [ Background: The Pika's small size helps keep it warm (by reducing surface-area-to-body ratio). With its calls, the Pika is defending its precious territory where it find food, water, shelter, and space. By collecting flowers (fireweed in the video) the Pika is building its food supply (haystack) for the winter. The Pika will lay these flowers to dry before storage. It will even collect certain flowers like Alpine Avens that contain toxins, but help preserve the haystack. The Pika adds these to its food storage and does not eat them until the toxin has dissipated. ]

**Alpine cheer:** ask students what they'd like to do. They could put up arms like whitebark pine branches and cheer ALPINE! COLD AND WINDY!

*Transition:* But let's not forget about the other life zones we explored today. Before we play our Life in the Zone game, let's review.

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**Life Zone Review:** Get students up and standing and review the Life Zones using the cheers.

## Activity—Life Zones Game

The goal of this game is to have the students apply what they learned during the presentation by separating eighteen different plants and animals into one of the three life zones discussed in the presentation: Foothills, Montane or Alpine. The students should also be able to discuss *why* each plant and animal is part of a particular life zone.

### Instructions:

1. Divide the students into small groups.
2. Give each group a game board (two pieces) and a deck of cards (two plant and two animals for each life zone)
3. Encourage students to develop a system for reading through the cards (e.g. taking turns pulling one card and reading aloud) Otherwise, students will be inclined to argue over divvying cards or to place cards without reading. Always ask student *why* they placed the card there.
4. If students have matched all cards, you can give them bonus cards (two extra cards for each life zone.)
5. Before putting game away you might have groups present what they found.

**Conclusion:** When we started you were experts in your life zone, the Central Valley. Now you're experts in the three life zones of Sequoia National Park. You can bring your family and take your own journey up the mountains to see many of the same plants and animals we've learned about today! When you bring your family to visit, what will you tell them about the foothills? The montane? The alpine? We can't wait to see you up there! [ Hand out free passes! ]