Life in the Balance

In-Parks Education Program
Sequoia and Kings Canyon National Parks
Program Outline—4th and 5th Grades

Grade Level(s): 4th/5th

Setting: Big Stump Picnic Area and Trails, Kings Canyon National Park

Duration: 3 hours

Standards Addressed:
4th Grade:
Common Core:
ELA-Literacy.SL4.1c

5th Grade:
Common Core:
ELA-Literacy.L.5.3
ELA-Literacy.L.5.4b
ELA-Literacy.SL.5.1c and d

NGSS:
5.LS2A-I Interdependent Relationships in Ecosystems
5.LS2.B Cycles of Matter and Energy Transfer in Ecosystems

Vocabulary:
Abiotic
Adaptation
Biotic
Carnivore
Community
Conifer
Consumers
Decomposers
Ecosystem
Elevation
Energy
Food Chain
Food Web
Giant Sequoia
Habitat
Herbivore
Montane
Nutrients
Omnivore
Photosynthesis

Introduction:
Welcome to Sequoia and Kings Canyon National Parks! **Life in the Balance** is a ranger-led program that takes place in the mixed conifer forest of Kings Canyon National Park. Through three different activities, students will explore the important roles that decomposers, producers and consumers play within the forest ecosystem.

Essential Question:
What role do consumers, producers, and decomposers play in ecosystems?

Essential Understanding:
Ecosystems are made up of the interactions among the living and non-living components of an environment. The living parts of every ecosystem include consumers, producers, and decomposers; these three parts keep the system in balance.

Materials:
- Fee Waivers, Lesson Plans for teachers, and evaluation form

Station 1 (teacher 1)
- Decomposer Posters
- Trays
- Magnifiers, Small magnifiers on lanyards
- Decomposer Identification Activity

Station 2 (teacher 2)
- Sequoia cones and leaves
- Key Tree Identification feet (10)
- Tree Information Cards

Station 3 (ranger hike)
- Scat, Tracks, Pelts, Fur, Feathers
- National Geographic poster of President Tree
- Laws Field Guide
- Scat Bandana

Schedule: ****Please let us know ahead of time if your group plans to visit the Grant Tree or Visitor Center after the program.*

9:45	Arrive at Big Stump Picnic Area
9:45-10:00	Bathroom Break
10:00-10:15	Introduction (safety, instructions, greetings)
10:15-11:00	Program Stations: -2 Teacher-led Stations (20 minutes each) -1 Ranger-led Station (45 minutes)
11:00-11:30	Lunch Break
11:30-12:15	Program Stations: -2 Teacher-led Stations (20 minutes each) -1 Ranger-led Station (45 minutes)
12:15-12:45	Closing: Review and Goodbyes
12:45	Load Bus and Depart

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Program Outline:

Welcome/Introduction (at or near parking area)

1. Welcome to Sequoia and Kings Canyon National Parks!
2. Ranger introduces self and parks.
3. Introduce theme/essential question:

Essential Question: What role do producers, consumers and decomposers play in this montane ecosystem?

INPUT PROCEDURE:
-Ask the students what a community is? (a community is a group of people who all live in the same place).
-Ask the students if they can name some important members in their community. (e.g. police officer, doctor, teacher, and etc).
-Next, have the students turn to a partner and explain what would happen if there were no doctors or police in their community. (think pair share)
-Explain how in a community every community member is important and without any one of the members the community will not be the same.
-Explain to the student that they will be talking and learning about a nature community that exists here in the Sequoia National Park also known as an **ecosystem**.
-Discuss how an ecosystem is a place where living and non-living things interact. Everywhere you stand, you are within an ecosystem. We are standing in the **mixed conifer forest ecosystem** in the **montane** life zone, within Sequoia and Kings Canyon National Park. Our focus today will be on the living parts of this ecosystem.
4. Explain activity stations and logistics for the day.
5. Basic Safety Message: Stay with group; stay on trail; and respect and enjoy the place, plants, animals, and other visitors.

Station 1: Decomposers: Down and dirty in the forest!

Led by: Visiting Teacher
Location: Through the tunnel, open area straight ahead (bottom of sled hill, just off main trail)
Duration: 20 minutes

Objectives:
-Students will be able to define what a decomposer is, and explain how decomposers recycle matter from dead plants and animals into minerals that make up soil.
-Students will be able to identify, and describe three or more decomposers found in the mixed conifer forest, montane ecosystem.

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Station 1 Instructions:

1. **Walk** the group through the tunnel, straight ahead into the open space on the other side (at the base of the large open hill that is the winter sledding hill). As you walk through the tunnel, have the students transform into scientists ready to study decomposers.

2. **Circle up** and discuss what it means to decompose and to describe what decomposers are:

A. Talk to the students about what it is to decompose (to break down into smaller parts). Ask them to talk with a partner about what they think a decomposer means, and what role do they think they play in their ecosystem? Give the students an example, for instance you're a consumer in your community you purchase goods and services. A doctor helps people that are ill in its community to get better. How do you think a decomposer helps its ecosystem?

B. Explain that a decomposer is an organism, usually a bacterium or fungus, that breaks down the cells of dead plants and animals into simpler substances. Discuss how a decomposer is an important member in the mixed conifer forest ecosystem, because they help turn organic matter like decaying animals, and plants into vitamin rich compost. Decomposers are also known as nature's recyclers: they keep nutrients moving through food webs.

C. Have the students partner up, and explain how you will be showing them some pictures of different members of the mixed conifer forest ecosystem (e.g. consumers, producers, and decomposers) with their partner the students will decide if the picture being shown is a decomposer or something else. Have the students put up one finger if they think the picture being shown is a decomposer and two fingers up if they think it's something else. If it's a decomposer ask the students what type of decomposer the image displays (e.g. fungi, micro-organisms (bacteria), or invertebrate) or to define what a decomposer is. Ask students what kind of decomposers they might find at home (ants, beetles, worms)

-A great way to remember who decomposers are is by the acronym FBI (Fungus, Bacteria, Invertebrate). Invertebrates have no bones like slugs, snails, worms, and beetles.

3. **Activity**: Now for the fun part! Students become researchers looking for decomposers in the soil. Don't be afraid to let the students get their hands dirty!

A. Ask students to predict what types of decomposers they might find right here in the forest. Where do they live? (In the soil, fallen dead trees, living trees, even on sequoia cones).

B. Distribute the trays and magnifiers to pairs or small groups, and let students know that they can use their hands to dig through the soil.

C. Spread out within teacher-set boundaries and see what decomposers they can find.

D. They can put insects and millipedes in the trays, examine them with the hand lenses, and share them with the other students. If they find fungus attached to something unmovable, ask them to leave it where they find it, but to show the other students. Often, they may find fungus on something small that they can move and put back.

E. **Group up and share** what everyone has found. Ask if anyone observed what the insects were doing when they were found.

-Discuss how decomposers break down decaying matter into smaller substances (e.g. Fungus like mushrooms produce powerful chemicals (enzymes) to break down food).

F. **Ask students to return all things (living and non-living) to the places they were found.**

4. **Closing**:

A. **What would happen if there were no decomposers in the forest?** The forest would look very different with branches, leaves, logs, and dead animals piled up everywhere. These organisms are a very important part of the ecosystem here (and every ecosystem) because they breakdown these dead organisms and make room for living organisms.

B. **How do producers depend on decomposers?** Without decomposers to recycle dead plants and animals, plants would not get the essential nutrients they need to grow and produce food. The food web of the forest depends on decomposers because of the important job they do to release nutrients back into the soil.

Station 2: Producers: Tree Key Activity

Led by: Visiting Teacher
Location: Giant sequoia near trailhead (just off the trail, and use surrounding trees)
Duration: 20 minutes
Objectives:
-Students will be able to use a written key to figure out what species of trees live in this mixed conifer forest.
-Students will be able to explain how plants are the primary source of energy entering the food web.
-Students will be able to identify at least one type of tree that lives in this mixed conifer forest, and give an example of what that tree provides for other members in its ecosystem.

Station 2 Instructions:

1. **Introduction**:

A. Gather students at the giant sequoia tree. Ask the students if they know what kind of tree they're looking at. Introduce the tree and let them explore for a few moments. Ask them to share one observation of the tree (to whole group or in pairs).

B. Ask the students what they think the sequoia tree is famous for. Let the students know the sequoia tree is famous for being the largest tree in the world, and how they only grow here on the western slopes of the Sierra Nevada mountains in California.

C. Ask the students if these giants trees are producers, consumers, or decomposers, and to explain their answer. What other things around here are producers?

D. What do these trees provide for other living organisms in this forest? Trees and plants provide food, shelter, and habitat for animals (consumers) while also depending on decomposers to provide soil to grow in.

E. What trees do you find at home/in your town? Have the students compare and contrast how home trees and the trees in this forest different? How are they the same?

2. **Key Tree Activity:**

A dichotomous key is a tool which helps us to identify things in the natural world: trees, wildflowers, animals, rocks, etc. We will be using a tree dichotomous key to help us identify the trees of the mixed conifer forest.

A. As a group, choose one tree to key out together. Walk the students through the Tree Key Sheet to identify the tree. (If you use a giant sequoia, there are cones and leaves in bag).

B. Split up students into pairs or small groups, give them a tree dichotomous key guide and ask them to spread out and use the tree dichotomous key guide to identify one of the trees around them. Students should be able to see and touch the leaves on their chosen tree to help identify it.

C. After the students have identified their tree give them an information card to read and learn more about their tree. Have the students identify as many trees as they can.

3. **Closing:**

A. Wrap up by asking the students to explain the unique characteristics of the trees they identified (number of pine needles, cone size and shape, appearance of bark, etc.)

B. Return to the question/discussion about what these producers provide for consumers and decomposers. (food and shelter)

Ask the students to give examples of what kind of food the producers provide for specific animals in this ecosystem. For example, they provide acorns, and berries, for the American Black Bear.

C. Review how plants all over the world make their food, just like the plants here in the mixed conifer forest, through a process called, *photosynthesis*. ("photo" meaning "light," and "synthesis" meaning "putting together.") Plants are able to make their food as long as they have carbon dioxide, water, and light. Plants of all kinds produce food and provide some shelter for many animals here in the forest, and in all ecosystems. Plants are also the basis of the entire food web, and are found in every ecosystem.

Station 3: Ranger Hike: Consumers: The Search for Animal Evidence

(45 minute walk with stops, to the edge of the meadow)

Led by: Education Park Ranger
Location: Trailhead towards meadow, loop around meadow if time
Duration: 45 minutes

Objectives:

- Students will be able to describe at least three consumers that live in the forest.
- Students will be able to identify living parts of the ecosystem that those animals are linked to.
- Students will be able to identify what animals do for plants and decomposers (i.e. squirrels/birds spreading seeds), and what plants and decomposers do for animals (i.e., feed them, etc).

Station 3 Procedure:

1. **Trail Hiking Rules**: Stay with your group; walk only on durable (hard) surfaces; respect the plants, animals, people, place; notice and observe everything you can on the trail!

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2. **Intro to CONSUMERS**

A. Briefly discuss and review with the students about what members make up an ecosystem (decomposers, consumers, and producers)

-Remind the students how earlier in the day they talked about communities (people that live in the same area).
-Have the students identify and define what a nature community is—(ecosystem) all living things (plants and animals) and all non-living things(e.g. sand, rocks, soil) that live in a certain area.
-Ask them if they can recall what ecosystem they're living in, a mixed conifer forest that exists in the montane life zone.
-Explain to the students that there are certain members that make up an ecosystem and they are called consumers, producers, and decomposers.
-Ask them to give an example of each.
-Remind the students that all living things need energy to survive.
-With a partner have the students talk about how they get their energy, and why do we need energy.

Next explain that plants and other animals need energy to grow and survive just like we do.
- Discuss how plants get their energy from the sun and through the process of photosynthesis, they make their own food. Plants do not need anything living to grow, but they begin the energy cycle for all other living creatures. That is why they are called **producers**.
Animals that cannot make their own energy and must eat to get energy are called **consumers**.
-Ask the students to name an animal that cannot produce its own energy.
(Any animal, including humans.)
-Explain how we have to eat living things (plants and animals). We can't survive on rocks or other non-living things! Some consumers eat only plants (herbivore) and others eat only animals (carnivore). Some eat both (omnivores)
-Explain how **decomposers** are tiny organisms like bacteria, or earthworms, or mushrooms and molds. Decomposers are a specific type of consumer. They need to consume other organisms, but instead of using the energy they consume to put into their own body, they use a lot of that energy to break up dead matter from other consumers and from producers too. They are what turn decaying organisms (plants and animals) back into the minerals that make up soil, which producers like the Giant Sequoia needs to make their own food.

3. Hike: Ranger and students will hike the trails toward the meadow looking for evidence of local animal life (consumers).

A. Along the way, they will look for evidence of consumers (tracks, scat, fur and feathers) and hopefully hear and see live animals in the forest. The stops along the way will focus on the animals that live here in the parks and the essential links that they have to the living parts of the ecosystem.

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B. Close the hike with discussion: Review with the students how members in the ecosystem are linked together by different food chains and how a food web is created when food chains connect.
-Remind students that all animals eat other living things. Some animals eat plants and others feed on the plant eaters. If you trace back what an animal eats, it will always come back to a plant, a producer. For example: A deer (a primary consumer) eats grass to get its energy. The grass got its energy from the sun, so the deer really gets its energy from the sun too. It is just that the grass turned the sunlight into a form of energy the deer could use.
-Talk about how this pattern of eating is called a **food chain.**
-Ask the students if they can give another example of a food chain that exist in this ecosystem.
-Have the students think about what they ate for breakfast or dinner and make their own connections to the **food web.**

Conclusion: Closing activity, goodbyes, academic fee waiver
Location: Whole group meets in parking/picnic area
Led by: Education Park Ranger

A. **Closing Activity, Debate/Review:**

1. Pose a question by asking the students, who they think plays the most important role in an ecosystem (e.g. consumers, producers, or decomposers).
2. Split the students into groups according to what member they chose, and have them take turns justifying their answers with the class.
3. Briefly explain how decomposers, consumers, and producers all play an important role in keeping an ecosystem balanced.

B. Goodbye: Allow the students to ask any questions about the park, or any of the activities.

C. Fee waivers and departure

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Vocabulary

Abiotic –noun– Nonliving (as in non-living parts of an ecosystem, like sunlight or wind and rocks or minerals).

Adaptation—noun—a change or adjustment in structure or habits that allow a species or individual to improve its condition in relationship to its environment.

Biotic –noun– Living (in an ecosystem, examples of biotic things are bacteria, insects, plants, and animals)

Carnivore--noun– An animal that eats meat.

Community–noun– A group of organisms living in the same place or having a particular characteristic in common.

Conifer—noun—Trees that produce cones (examples are cedars, firs, pines, and sequoias)

Consumers –noun– Organisms in a food web that eat producers or other consumers (i.e. herbivores, carnivores, and omnivores).

Decomposers –noun– The organisms in a food web that consume dead or decaying plants and animals and return the nutrients held in their body to the soil.

Ecosystem—noun—A system made up of interactions of living organisms (plants, animals, and bacteria) and non-living environment.

Elevation –noun– Height above sea level.

Energy--noun– The measure or ability of a system to do work or produce change.

Food Chain--noun– A pattern of energy transfer between organisms. For example, a plant converts sunlight, water, and CO2 into sugar and O2. The plant is eaten by a rabbit, the rabbit is eaten by a fox, and the fox is eaten by a Mountain Lion. Through this food chain the Mountain Lion receives energy from the sun captured by the plant.

Food Web--noun– Two or more food chains that connect. When a member of one food chain eats a member of another food chain.

Giant Sequoia –noun– The largest trees in the world, they are native and endemic to California's Sierra Nevada mountains.

Habitat—noun—The natural environment of an organism including; shelter, water, food, and space.

Herbivore —noun—An animal that eats plants.

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Montane –noun– The middle life zone in the Sierra Nevada mountains, ranging from 5,000 - 9,000 feet, often characterized in Sequoia and Kings Canyon National Parks by a mixed conifer forest.

Nutrients –noun– A substance that provides nourishment essential for growth and life.

Omnivore–noun– An animal that eats both plants and animals.

Photosynthesis–noun– The process by which green plants and some other organisms use sunlight to synthesize foods from carbon dioxide and water.

Producers –noun– Any green plant or any of various microorganisms that can convert light energy or chemical energy into organic matter.

Species—noun—Basic category of biological classification, composed of related individuals that resemble one another, are able to breed among themselves, but are not able to breed with members of another species.

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Additional Resources:

Sequoia and Kings Canyon National Parks Website:
http://www.nps.gov/seki/index.htm. Search for park information, lesson plans, Rangers in the Classroom programs, In-Parks Education programs, in-class pre-program activities, and background information on the parks.
Look under the "For Teachers" tab on the left side of the home page to find education programs.

Background reading for teachers:
Arno, Stephen. *Discovering Sierra Trees*. El Portal, CA: Yosemite Association (1973).
A comprehensive guide to coniferous and broad-leaved trees of the Sierra Nevada.

Grater, Russell. *Discovering Sierra Mammals*. El Portal, CA: Yosemite Association, (1978).
Describes complex and interesting habitats and relationships of Sierra mammals.

Gunsky, Frederic R. *South of Yosemite: Selected Writings of John Muir*. Berkeley, CA: Wilderness Press, (1988). A collection of works written by John Muir, the naturalist who dedicated his life to fighting for the preservation of the High Sierra.

Harteveldt, R.J., H.T. Harvey, H.S. Shellhammer and R.E. Stecker. *Giant Sequoias*. Three Rivers, CA: Sequoia Natural History Association, (1981). Features history, life cycle and distribution of Giant Sequoias. Discusses interrelationships with plants and animals as well as human impacts.

Whitney, Stephen. *The Sierra Nevada*. San Francisco, CA: Sierra Club Books, (1979).
A comprehensive guidebook to the natural history and ecology of the Sierras.

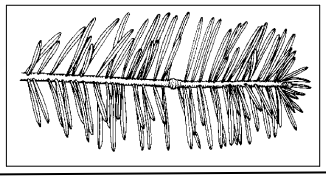
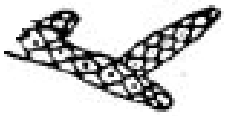
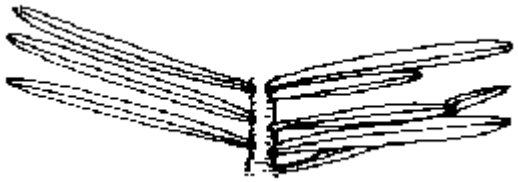
Books to share with your students:
Carrighar, Sally. *One Day on Beetle Rock*. Lincoln, NE: University of Nebraska Press, (1943).* Daily life is explored from the perspective of several animals that make their home in and around Beetle Rock in the Giant Forest in Sequoia National Park.

Donahue, Mike and Susan Dorsey. *The Grandpa Tree*. Niwot, CO: Roberts Rinehart, Inc. Publishers, (1988).* An elementary tale of the life cycle of a tree.

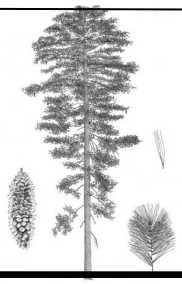
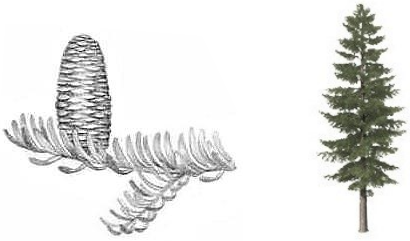
Geisel, Theodore Seuss. *The Lorax*. New York, NY: Random House, (1971).*
This Dr. Seuss classic carries a strong message about environmental preservation.

Tweed, William C. *Sequoia and Kings Canyon: The Story Behind the Scenery*. Las Vegas, NV: KC Publications, (1997).** With stunning full color photographs and detailed text this book moves from the foothills to the Giant Sequoias and from the Kings River to the high country.

KEY TO THE TREES OF THE MIXED CONIFER FOREST

A	If the needles look like this go to **B**  
	If there are scales like this go to **E** 
	If there are ordinary leaves, go to **C** 
B	If the needles are bundled together at the base like this go to **C** 
	If the needles are single, not bundled, and leave smooth round scars where leaves have fallen off the twig go to **D** 
C	If the needles are in bundles of five go to **D** 
	If the leaves are small round to oval, about the size of a quarter or a little bigger go to **F** 

KEY TO THE TREES OF THE MIXED CONIFER FOREST

D	If the needles are dull attached to the branch with a twist, and are 11/2"-2 1/2" inches long yellow green with a white band on the other side go to **E**	
	If the needles are 2 3/4"-4" long, and the cones are over a foot in length, it is a **Sugar Pine** (Pinus Lambertiana)	
E	If the branches and needles look flat, as if they have been ironed, and the rusty-orange fiberous bark is very hard, it is an **Incense Cedar** (Calocedrus Decurrens).	
	If the cones are around 2"-5" inches long barrel shaped, and narrow it is a **White Fir** (Abies Concolor).	
	If the needles are small, pointed and round-shaped, and the rusty-orange, fibrous bark is very soft, it is a **Giant Sequoia** (Sequoiadendron Giganteum)	
F	If the leaves are relatively thick, and stiff, also waxy then it is a **Manzanita Tree**