A Giant's Life 2013

In-Parks Field Trip Program
Sequoia and Kings Canyon National Parks
Program Outline—2nd and 3rd Grade

Grade Level(s): 2nd/3rd

Setting: Grant Grove of Kings Canyon National Park (on North Grove Loop Trail)

Duration: 3 hours

2nd Grade Standards:
Common Core, Listening and Speaking:
ELA-Literacy-SL2.3

Next Generation Science Standards:
LS2.A
LS4.D

3rd Grade Standards:
Common Core, Listening and Speaking:
ELA-Literacy SL3.3

Next Generation Science Standards:
LS4.C
LS1.B

Vocabulary:
Adaptation
Elevation
Germinate
Giant sequoia
Habitat
Life cycle
Montane life zone
Nutrients
Photosynthesis
Seedling
Senses
Snag

Introduction:
Welcome to Sequoia and Kings Canyon National Parks! A Giant's Life is a ranger-led education program that introduces students to the largest trees in the world, the giant sequoias. Through three discovery stations, students will have an opportunity to discover and investigate **adaptations**, the process of **photosynthesis**, and the **life cycle** of giant sequoia trees.

Essential Question:
What do all living plants need for survival?

Essential Understanding:
All living things have identifiable characteristics that aid in their survival. All plant life need the same basic things to survive: water, nutrients, sunlight, and specific adaptations to thrive in their environment.

Materials: Giant's Life Backpack
- Program outline
- Instruction copies for teachers
- Photosynthesis spray water bottle (full)
- Spare sequoia cones, seeds, leaves
- Laws Field Guides (3)
- National Geographic Laminated Tree Poster
- Teacher Evaluations
- Academic Fee Waivers
- Grant Grove Trail Map

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	Arrival at General Grant Bus Parking 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 (on the trail)
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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Vocabulary

Adaptation—noun—a change in a plant or animal that makes it better able to live in a particular place or situation

Habitat—noun—the place where a plant or animal normally lives

Species—noun—a group of animals or plants that are similar and can produce young animals or plants

Photosynthesis–noun– The process by which a green plant turns carbon dioxide and water into food when the plant is exposed to light

Life Cycle –noun– The series of stages through which a living thing passes from the beginning of its life until its death

Germinate –verb– The process in which a seed grows into a plant

Snag –noun– A dead standing tree (often used as a home for wildlife)

Chlorophyll –noun- The green colored substance in plants that makes it possible for them to make food from carbon dioxide and water (photosynthesis)

Predict –verb– To guess something that might happen in the future

Estimate –verb– To try and guess the amount or value of something

Senses –noun– The way by which we perceive the world around us; sight, sound, smell, touch, taste

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

Montane Life Zone–noun– The middle life zone in the Sierra Nevada mountains, ranging from about 5,000 - 9,000 feet, often characterized in Sequoia and Kings Canyon National Parks by conifer forests

Elevation –noun– Height above sea level

Seedling—noun—a young plant growing from a seed

Nutrients—noun—a substance that plants, animals, and people need to live and grow

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Program Outline:

Welcome/Introduction (at or near parking area)

1. Welcome to Sequoia and Kings Canyon National Parks!
2. Ranger introduce self and parks.
3. Introduce Essential Question and Essential Understanding:
   We are standing in the midst of a giant sequoia grove. The trees you see around you are some of the largest trees in the whole world! What do you think helps these trees to grow so big? What do giant sequoias need to survive?
   Water, Sun, Soil, Air, Space, Fire, Special Adaptations…
4. Ranger introduce stations and plan for the day.
5. Basic Safety Message: Stay with group, stay on trail, respect enjoy the place/plants/animals.

Station 1: Adaptation Station

Led by: Visiting Teacher
Location: At mature giant sequoia: Walk downhill from parking, look for huge sequoia on the left (off trail) as you come to the Y in trail (Ranger group will split to the right here).
Duration: 20 minutes

Objective:
The students will be able to describe 3 or more **adaptations** of Giant Sequoias, and use observation and description skills pertaining to the area and the trees.

Station 1 Instructions:

1. If you had the per-trip program in your classroom remind students of the Bear Essentials Program. Just like black bears have special **adaptations** to survive, all plants also have adaptations to survive in their environment. (Otherwise, will need to introduce adaptations as related to what you have studied in your class.) **Example: Perhaps the best adaptation of black bears is their ability to eat a wide variety of foods. This adaptation enables bears to survive in a wide variety of habitats as well as survive near human populations, if necessary, because they see human food as an easy meal.**
2. These giant sequoia trees live here all year round, for their whole lives, they can't get up and move around like animals can.
3. Ask students to look around, **observe and describe** what it is like here now… Is it dry, damp, snowy, sunny, hot, cold, what else is growing around the area, etc?
4. Turn to a partner and tell each other what you think it is like here in the middle of winter. Give students a quick moment to discuss, then call on random students to share. **Possible Answers**: very cold every night, lots of snow on the ground, ice, sometimes sunny, sometimes stormy. Tell the students that sequoias don't loose their leaves (needles) in winter.
5. What do you think it is like here in the summer? **Pair Share** **Possible Answers:** warm, very dry, animals are very active, insects are active, wild fires come through the forest.

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6. Imagine being a tiny sequoia tree here...Would it be hard to get water? Would animals and bugs eat you? Would the heavy snow flatten you?
7. Discuss these **adaptations that the sequoias have**, and how each of those helps it to survive. **Be sure to have kids explore the tree/area and see and touch the tree parts that you discuss. Also use the actions/motions/examples listed below with the sequoia adaptations**.
8. Have the students think about how the sequoia trees adapt to living in cold, heart, no water, or bugs crawling and living on it. Address each adaptation as they arise and mention the adaptations they may not mention.

A. **Thick bark**: protects the tree from fire, animals, bugs, disease. **Look for** a spot where you can see the thickness. **Feel** how dense the bark is.

B. **Thin, needle-like leaves**: keep tree from losing lots of water in the hot summers. If you can't reach the leaves, **look on the ground for some fallen leaves to pick up and examine.**

C. **Trunk:** trees grow wide to stabilize themselves, as they have shallow root systems. **Stability Visual**: *Ask for a student volunteer to come up in front of the group. Have the student stand next to the teacher. Tell the rest of the students to imagine that wind or snow came during the winter. Teacher should stand on one leg. Do you think the tree/teacher will fall over if a strong wind storm came? Student volunteer plays role of wind and gently pushes the teacher on the shoulder or arm. Now put both feet on the ground and student volunteer acts as wind again. Notice the teacher/tree is more stable when they have more than one anchor/ foot on the floor and even more so if they were to spread them apart a little.* **Just for fun**—Try to get the whole group to **circle around the tree**...can you reach?

D. **Roots:** grow wide and shallow (average of 3 feet deep, 1/3 of the tree's height wide), interlace with other root systems to stabilize. Shallow roots allow sequoias to thrive in newly developed/shallow soil found in the montane life zone, and collect water from a wide area when water is available. Have students **lace their fingers together to form an example of the roots**, with their own hands or with a partner.

E. **Seedlings:** Young ones grow straight up as fast as they can toward the sunlight, aiming to be tall before other plant life shades the ground. **Can students find any young sequoias in the area?**

F. **Cones:** Sequoia cones can stay closed for years up in the branches, holding on tight to their seeds until a fire comes through and opens up some sunny space on the ground. **Can you find cones in the area?** Are the open or closed? Are there any seeds inside? (Knock open cones on a rock or solid wood to see if seeds fall out.)

G. **Branches**: The downward slope of the branches allows snow to fall off instead of break the branches. Have students look up into the branches and **make the shape** with their arms, pointing down. You can compare to oak branches (arms lifting up) which can't hold much snow weight. How long can kids keep their arms in the two different shapes?

Closing Activity
(Choose one)

Human Adaptations: Have kids partner up and do a Think-Pair-Share activity, think about what adaptations they would need to have to live here all year. Just like the black bears, some adaptations are behavioral (things you would **do** to adapt). Let each pair share their most important adaptation for surviving here in the giant sequoia forest, then have them share.

OR

Create-a-creature: Ask students (in small groups) to create an animal that would live here among the giant sequoias...What would it eat? How would it stay warm in winter? ..stay cool in the summer? ...get water in the dry summer? Have them present to the group, acting out the shape of their creature and telling about two of its special adaptations.

9. **End note**: All plants and animals have special adaptations that help them survive.

(Switch with Station 2 group)

Teacher Background Information for Station 2:

Photosynthesis is the process of converting light energy into chemical energy (or plant food). Plants use photosynthesis to make their own food. During the photosynthesis process, both water and carbon dioxide are taken in through the plant's roots and leaves and are converted into sugars (mainly glucose). A byproduct of this reaction is an excess of oxygen. Thus the process of photosynthesis converts carbon dioxide and water into sugar and oxygen. In most plants, photosynthesis takes place in the plant leaf.

Within the individual cells of plant leaves there are specialized smaller cell parts, called chloroplasts, which contain chlorophyll. Chlorophyll is responsible for the photosynthesis process. Chlorophyll absorbs red and blue light, using these light energy sources to power the process photosynthesis. Chloroplasts reflect green light, making them appear green to our eyes.

Station 2: How do giant sequoias get the food and water they need? Photosynthesis

Led by: Visiting Teacher

Location: Tree near the Y in the trail...You'll need an example tree where kids can see and touch trunk, branches, leaves (and even some roots if possible). It can be any type of tree. Be within site of the other teacher's group, but far enough where they are not a distraction or too loud.

Duration: 20 minutes

Objectives:

Students will be able to interpret the *process and purpose* of **photosynthesis** (in basic terms, ie: plants take in water and sunlight to make their own food) using body movements.

Students will be able to identify different parts of the plant by sight (roots, branches, trunk, leaves/needles, bark).

Station 2 Instructions:

1. Gather students at your tree, or small group of trees.
2. What does this tree need to survive? (food, water, soil, air/CO2, space, sun)
3. How does this tree get food? ...It can't get up and walk to the kitchen and make a sandwich! It has to make its own food.
4. Read the Giant Sequoia Photosynthesis Imagery story (in this packet, pg 7). Students can sit and relax against the tree for the story, or be standing and acting out the motions as you read the story aloud.

5. Activity: Kids are trees that need to gather what they need to survive.

A. Have all kids stand up and plant their roots (feet) in the ground, and be trees.
B. Ask them what they need in order to survive?...how will they make their own food?
C. They will need to gather: air, water, sun, nutrients.
D. Can they gather these things without moving their roots? …Gulp air with their leaves (fingertips/gulping sound), collect nutrients through the soil with their roots (slurp up with your toes), soak up the sun with their leaves (can they reach toward the sun?), and the teacher brings some drops or rain or snow (with the water bottle) to fall on their roots.

6. **Review and assessment**:

A. Explain to touch (without talking) the part of the tree that you describe. (Ideally, you can use two or three plants/trees for the game, depending on size of group. This will spread out the group, and also help illustrate that it is all plants, all trees that photo-synthesize, not just sequoias.)
B. Here is a list of statements that can be used, feel free to add to these.
"Touch the part of the tree that…"
…takes in sunlight
…soaks up water
…absorbs nutrients and minerals (from the soil)
…breathes in carbon dioxide
…breathes out oxygen
…contains chlorophyll (or… that traps the sunlight)
…is still growing (taller or longer or wider)

You can add in adaptations to the game to review (or prep for) the other station:
…insulates the tree from heat during a fire
…reaches wide under the surface of the forest floor and helps support the tree
…can grow up to 36 feet across!

C. What organism around here uses the sun's energy to make food (starches and sug-ars) out of the air, water, sunlight, and nutrients it gathers? (Any plant is correct!)

7. **Closing:** Plants all over the world make their food just like the plants here in the giant se-quoias forest. They all need the same things, which are... (air, water, sun, nutrients).

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Giant Sequoia Photosynthesis Imagery (for Station 2: Photosynthesis)

This enormous tree in front of you, this is a giant sequoia.

Look carefully at the tree, and then imagine spinning slowly around in a circle. As you spin, your are becoming the sequoia tree.

Feel your large roots growing down from your trunk and into the soft soil beneath you. Feel them digging three feet into the ground. Then feel your strong roots spread out just below the surface of the soil. They will spread farther and farther until they reach 100 feet from your trunk! That's as long as the height of 10 classrooms stacked on top of each other! (pause)

Now imagine your branches growing out from your trunk. Stretch your branches (arms) out wide. Feel your large branches divide into smaller and smaller branches. See the leaves at the ends of the branches. What do they look like? Are they large or small? Pointed or round? (pause)

See how green your leaves are and notice that your leaves are thin and long. Soak up the sunlight through your green leaves, just like a sponge soaks up water. Your leaves also have tiny holes that allow you to breathe the air. Imagine taking in some air right through those leaves.

Think back to your roots in the ground, gather water with your roots. Sequoias drink a lot of water… as much as 70 gallons each day! Feel the water going up through your roots, up through your trunk, and out to your leaves.

Now feel the sun's warm rays on your leaves and bark. Soak up the sunlight into your leaves. Imagine your leaves trapping the sunlight. Use the energy from sunlight to change carbon dioxide (from the air) and water (from the soil) into food for you! As a giant sequoia, you make sugars and starches for yourself just like all plants. Animals may come and eat you too, those squirrels really like your cones!

Send some of the food to your branches so they can grow bigger, to your trunk so it can grow wide, and to your roots so they can grow longer. Feel yourself growing greener and larger with the sun's help. (pause)

With all the sunlight and water that you collected, what size of sequoia would you be?

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Station 3: Ranger Walk to Giant Sequoia Grove
(45 minute walk with stops, to the edge of the North Grove)
Led by: Education Park Ranger
Location: North Grove Loop Trail (right fork, out and back)
Duration: 45 minutes

Objectives:
- Students will be able to **describe** and **compare** Giant Sequoias (using bark, cones, leaves, size) with other conifers in the montane life zone. (2nd and 3rd)
- Students will be able to name at least one animal that lives among the giant sequoia trees.
- The students will be able to **interpret** the **life cycle** of the giant sequoia using body movement.

Station 3 Instructions and Info:

1. **Trail Hiking Rules**: Attach any/all of these rules to Leave No Trace Ethics
   A. Stay with the group, between ranger and sweeper (adult at end of group).
   B. Stay on the trail (except for stops with the ranger).
   C. Respect other visitors: make room on the trail, voices within our group.
   D. Respect wildlife: plants and animals.
   D. Ranger's choice of focus technique.
   E. Look around, enjoy the place, and notice what is different and special here.

2. **Intro** (or review for second group) to a giant sequoia:
   A. Hike to a giant! Introduce the group to the sequoias, these unique trees that only grow in 75 groves in the California.
   B. Have them **explore and observe**, get to know the tree, touch, smell, estimate the age of this tree, note fire scar (talk about fire later/review now), **measure** size with number of kids around the trunk.
   C. If it is the second group, review briefly Sequoia's adaptations to live here.

3. **Intro to Sequoia Life Cycle:**
   A. How do new Sequoias grow? (Montane Life Zone/Sierra Nevada) Where do they start? (on the ground) What do they need? (Water, Sun, Soil, Air, Space, Fire, Special Adaptations)
   B. Search for cones, seeds, and seedlings on the ground near the giant.
   C. Compare to size of sugar pine cone, look up to where they come from on sequoias.
   D. Cones can stay up there on the tree for up to 22 years! (average 8 years, like your age!)
   E. Ask kids where they can find the sequoia's seeds? Where might they be hiding?
   F. Look for seeds as we move to our next stop…

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4. **Seeds and Seedlings:**
    A. Stop at smaller sequoias (tiny seedlings to taller still-skinny trees)
    B. Knock some seeds out of cones (have spares with the magnifiers), pass around.
    C. Look for seedlings around the area.
    D. Make sure all kids get to see seeds and young sequoias.
    E. **Act out Life Cycle– parts A-C** (see full life cycle instructions below)
    F. Transition to next stop: these seedlings grow, grow, grow, let's look around for some older Sequoia trees…

5. **Round-Tops and Spire-Tops (D and E):**
    A. Stop at a spot with VIEW of round-tops and spire-tops
    B. Discuss round/spire-tops, discuss ages, can compare to teenager vs. adults
    C. **Act out Life Cycle:** Seeds thru Round top (see full life cycle instructions below)
    D. Transition: Watch for round-tops, spire-tops, and other tops along the way…

6. **Fire's Role in the Sequoia's Life Cycle (F):**
    A. Stop at large Sequoia with fire scar (and hopefully view of snag top)
    B. How can fire harm forests?
    C. How can fire help forests?
    D. How do sequoias survive forest fires?
    E. How do sequoia trees benefit from fires?

7. **Completing the Cycle (G-I)**: Death of giant sequoias
    A. Stop at fallen/decomposing tree or stump, or view of grove part way up the hill
    B. Discuss two ways Sequoias die (past: logging, past and current: mainly toppling, from storms, wind, flooding, or other severe weather events)
    C. What can fallen sequoias provide for the forest?

***<u>Acting out the Life Cycle of the Giant Sequoia:</u>**

A. Seed: Students crouch down on ground with hands over head….little tiny seed on the ground.
B. Seed begins to sprout: Students dig their roots (toes) down into the ground, and send up leaves (fingers, then arms) towards the sky…they are still small.
C. Seedling: Students grow taller, extend branches, spread out roots.
D. Spire-top: Students stand up and make the pointed spire-top shape with their arms.
E. Round-top: Students change their arms to a rounded shape, widen trunk and crown.
F. Fire: Kids make sounds of thunder, and ranger acts out a fire coming through the forest…burning low on the ground, sequoias (kids) protecting themselves with thick bark (arms)
G. Snag-top: Some students are not successful in keeping the fire away, use pointed arms to symbolize broken top and irregular branches on a still-living tree.
H. Seeds falling: After fire, students make fists to symbolize cones, then make falling or scattering motions with fingers to symbolize seeds falling.
I. Toppling at an old age: All fall down! …Decompose and help feed the seedlings that are sprouting on the forest floor!

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***Along the way: Things to see along the trail:**

Check out a sugar pine for comparison...what are the other conifers like? **(White, Cedar, Sequoia, Manzita, Sugar Pine**...**look at the size and color or different trees)**
Observe some other plants in the forest...what other plants live among the trees? **(Poppies, Sunflowers, Dandelions**...**)**
Observe animals/animal signs as possible (**scat or tracks**)...what animals live out here? (**Yellow Bellied-Marmot, Mule Deer, Black Bear, Coyote, Chipmunk, Squirrel, Bushytail Woodrat, Bighorn Sheep, Pika**...**)**
As time allows, include review of animals that live in the sequoias. (puppets or scat and tracks)

Closing:
Location: Whole group regroups on trail or near parking area
Led by: Education Park Ranger

Review Activity:
1. Keep students in the 4 groups they had for the stations.
2. Ask each group to assign one member to be the buzzer for the group.
3. Ask the review questions and let groups buzz-in to answer.
4. Give teachers a list of questions (repeat questions that have multiple answers).
5. When a group gets a correct answer, they get to run up to the ranger (incrementally climbing the hill toward the parking area.)
6. Review Questions:
   - **What do giant sequoia trees need to survive? (adaptations, photosynthesis, fire, and life cycle)**
   - **What do all plants need to survive? (**Water, Sun, Soil, Air, Space, Fire)
   - **Plants photosynthesize in order to make their own _____. (Food)**
   - **What is one way fire can help giant sequoias grow? (clear/open canopy, kill fungus on ground in order for seeds to grow)**
   - **What part of the adult giant sequoia protects it from fires? (bark)**
   - **What is one adaptation that giant sequoias have to help them survive? (bark, needle, trunk, seedlings, cones, branches)**
   - **Can you name 3 animals that live in this forest? (mule deer, bear, coyote, squirrel, chipmunk**...**)**
   - **Can your whole group act out the life cycle of the giant sequoia trees? See page 9**
   - **Can you name an animal that helps sequoia seeds spread throughout the forest? Chickaree Squirrel**
   - **What was your favorite part about today?**
7. Thanks for visiting! Fee waivers for your family...share what you learned!
8. What is next? (Info from teachers: Bus, Visitor Center, etc.)

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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, and background information on the plants and animals that live in the parks.

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.

Dilsaver, Larry M. and William C. Tweed. *Challenge of the Big Trees.* Three Rivers, CA: Sequoia Natural History Association, (1990). This study describes the natural world of the southern Sierra and native people of the region, concluding with a discussion of current management policies.

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.

United States National Park Service, Division of Publications. *Sequoia and Kings Canyon: A Guide to Sequoia and Kings Canyon National Parks. Handbook 145.* Washington, DC: Government Printing Office, (1992). Full of park information, this makes an excellent guide book. Includes maps and more than 100 color photographs.

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.

De Golia, Jack. *Fire, A Force of Nature: The Story behind the Scenery*. Las Vegas, NV: KC Publications, (1993).** Explores the process of living with fire and management goals of national parks.

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.

Ohanian, Susan. *California's Giant Sequoias*. Columbus, OH: SRA/McGraw-Hill, (1996). Part of the Math Cross Sections series, this book contains fun facts and figures about the world's largest living thing, the Giant Sequoia.

Palmer, John J. *In Pictures, Sequoia and Kings Canyon: The Continuing Story*. Las Vegas, NV: KC Publications, (1997).** This book of photography features spectacular landscapes found in the parks.

Robinson, Sandra Chrisholm. *The Last Bit Bear - A Fable*. Niwot, CO: Roberts Rinehart Publishing Company, (1984).* The story of Clover, the last bear of his kind, and his travels in search of tender leaves to survive.

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.