



Emerald Cove
OUTDOOR SCIENCE INSTITUTE

Teacher's Guide

Welcome to ECOS Institute! This manual will help you plan and organize your school's unique educational experience in the beautiful San Bernardino Mountains. Our mission is to grow the knowledge, skills, character and relationships of our participants through purposeful, hands-on outdoor science education - all set within a unique outdoor classroom environment.

Students learn the interdependence of all living things and the importance of caring for the Earth. They will have the opportunity to hike established trails, investigate geological features, observe wildlife and compare plant adaptations. During the evenings, students study the night sky through telescopes, and enjoy skits, songs and stories. Students will spend just a few days in the mountains but the experiences shared leave memories that will last a lifetime!

ECOS Institute is located at Camp Cedar Crest near Running Springs in the San Bernardino Mountains. At an elevation of 6,500 feet, snow is common in winter. This facility has comfortable accommodations for students and teachers with indoor bathrooms and central heating in the cabins. Two large auditoriums serve as excellent meeting rooms for night time activities and group gatherings. Camp Cedar Crest's Dining Hall provides excellent meals for breakfast, lunch and dinner.

This manual is a valuable aid for preparation to ensure a successful week for you and your students at ECOS Institute. We look forward to seeing you!

Steve Benz, Program Director

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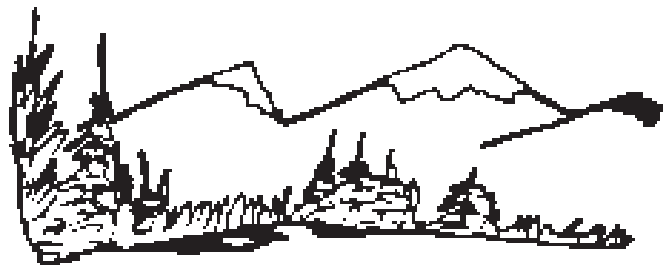


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PREPARATION CHECKLIST

Each school should appoint an ECOS Institute coordinator. The coordinator is responsible for scheduling buses, organizing a parent orientation, emailing checklists to ECOS Institute, distributing and collecting student forms, and collecting and checking medications.

The teachers prepare the students and assist the coordinator. This is a checklist for teachers:

- Read the *Parent Guide* packet for a general overview of the program and policies.
- List students and teachers with special needs on the Six Week Checklist. **This is sent to ECOS Institute six weeks in advance.**
- Fill out the Cabin Partner's list at least two weeks in advance.
- Select a trail to teach. Indicate a first and second choice on the Two Week Checklist. This information is needed two weeks in advance.
- Prepare the students. See pages 10 - 15.
- Prepare yourself.



FREQUENTLY ASKED QUESTIONS

May a teacher with a special health condition attend ECOS Institute?

Although some accommodations can be made, the teacher is expected to take an active role in teaching and supervising students. Teachers should be able to walk at least a mile on uneven terrain in all types of weather. Teachers with special health conditions (e.g., pregnancy, diabetes, heart condition) that wish to attend need to fill out a Release for a Teacher with Special Needs form (obtain from the coordinator). This consent form must be signed by the teacher's physician, ECOS Institute may require an alternate staff member for the health and safety of the teacher.

What if I have a special diet?

A vegetarian option is offered at meals when meat is the main dish. Fresh fruit and salad bar are available. Teachers may bring their own food to supplement the menu (snacks and sodas must be consumed away from the students). A refrigerator and microwave are available for use. Contact ECOS directly for specific questions regarding a special diet.

How many teachers should attend from each school?

There should be one certificated district employee for every class 25-35 students. It is preferred, but not required, that the students' own teachers attend. If your school cannot provide the required number of teachers, **one** classified employee can serve as a substitute. The designated substitute would have the same on site responsibilities as a teacher (see page 8). If you would like to send more staff than the required ratio please call the site to make sure accommodations are available. A nominal room and board fee may be charged for each additional staff member.

ECOS INSTITUTE AT CAMP CEDAR CREST

MAILING ADDRESS

ECOS Institute
P.O. Box 8517
Green Valley, CA 92341

PHYSICAL ADDRESS

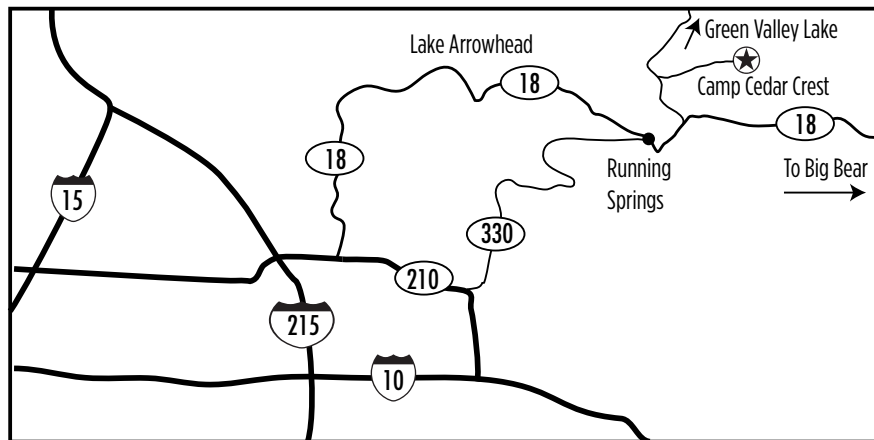
ECOS Institute at Camp Cedar Crest
33325 Camp Cedar Crest Road
Green Valley Lake, CA 92341

TELEPHONE NUMBERS

Phone: 949-298-ECOS
Fax: 949-369-9819
Email: info@ecosinstitute.com
Hours: 9am Monday - 12pm Friday

Directions *(use Google Maps for most accurate route):*

From 210 Freeway
Take 330 North
In Running Springs,
continue on Hwy 18 East
towards Big Bear
Left on Green Valley Lake Rd
(After Blondie's Grille & Bar)
Right at Camp Cedar Crest on
Camp Cedar Crest Road



Camp Cedar Crest is located outside of Running Springs in the Yellow Pine Forest at an elevation of 6,500 feet. It is surrounded by national forest and a seasonal stream runs through the site. Snow is common and lingers most winters.

Teacher accommodations are hotel style with bathrooms and a comfortable lounge nearby. **Cedar Crest provides linens and towels for teachers.** Teachers have access to a microwave and small refrigerator. Snacks should be stored in mouseproof containers. There is some cellular service and internet access.

ACADEMIC TRAILS

Ecology (moderate, 1 mile)

Ecology studies the relationship of plants to the nonliving components of an ecosystem. Students use various tools to collect data in two different areas. After collecting and recording their data, they use charts to analyze the information and make conclusions about similarities and differences in the two areas. This trail is moderate in length but has some steep areas.

Geology (most difficult)

This is a steep trail leading up to a ridge with beautiful views. Students will learn plate tectonics, mountain building processes, observe the effects of weathering and erosion, and study rock classifications. Students use safety goggles and rock hammers to examine and identify local rocks and minerals.

Wildlife Biology (moderate, short)

This trail travels through forest and riparian areas along Deer Creek to visit a variety of habitats and the site museum. It can be shortened, if needed. Local wildlife, their characteristics and needs, and how changes in habitat affect wildlife populations are some of the concepts covered. Students develop their observational skills searching for evidence of animals and using binoculars to identify any animals encountered.

5-Day Sample Schedule

Monday	Tuesday	Wednesday	Thursday	Friday
	8:00 Breakfast Clean Cabin	8:00 Breakfast Clean Cabin	8:00 Breakfast Clean Cabin	Move out 8:00 Breakfast
11:00 Students Arrive Meet cabin instructors	9:15-11:30 Geology Hike	9:15-11:30 Ecology Hike	9:15-11:30 Wildlife Biology Hike	Review Hike Review game Snack
12:30 Lunch	12:30 Lunch Rest	12:30 Lunch Rest	12:30 Lunch Rest	11:00 Students depart
2:15 – 4:30 Orientation Discovery Hike	2:15 – 4:30 Science Sessions	2:15 – 4:30 Activity Hike Snow Play or field games	2:15 – 4:30 Line Dance	
5:30 Dinner	5:30 Dinner	5:30 Dinner	5:30 Dinner	
7:00 – 8:15 Astronomy or Night Hike	7:00 – 8:15 Astronomy or Night Hike	7:00 – 8:15 Evening Science Program	7:00 – 8:15 Skit Night	
9:00 Lights out Bedtime story or song	9:00 Lights out Bedtime story or song	9:00 Lights out Bedtime story or song	9:00 Lights out Bedtime story or song	

4-Day Sample Schedule

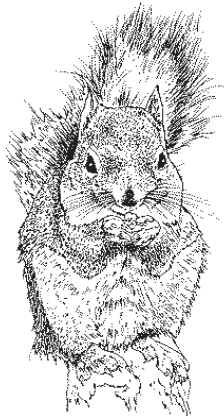
Tuesday	Wednesday	Thursday	Friday
	8:00 Breakfast Clean Cabin	8:00 Breakfast Clean Cabin	Move out 8:00 Breakfast
11:00 Students Arrive Meet cabin instructors	9:15-11:30 Geology Hike	9:15-11:30 Wildlife Biology Hike	Review Hike Review game Snack
12:30 Lunch	12:30 Lunch Rest	12:30 Lunch Rest	11:00 Students depart
2:15 – 4:30 Orientation Discovery Hike	2:15 – 4:30 Ecology Hike	2:15 – 4:30 Line Dance or Field Games	
5:30 Dinner	5:30 Dinner	5:30 Dinner	
7:00 – 8:15 Astronomy or Night Hike	7:00 – 8:15 Astronomy or Night Hike	7:00 – 8:15 Skit Night or Line Dance	
9:00 Lights out Bedtime story or song	9:00 Lights out Bedtime story or song	9:00 Lights out Bedtime story or song	

3-Day Sample Schedule

Wednesday	Thursday	Friday
	8:00 Breakfast Clean Cabin	Move out 8:00 Breakfast
11:00 Students Arrive Meet cabin instructors	9:15-11:30 Science Curriculum Hike	Review Hike Dance Snack
12:30 Lunch	12:30 Lunch	11:00 Students depart
2:15 – 4:30 Orientation Discovery Hike	2:15 – 4:30 Science Curriculum Hike	
5:30 Dinner	5:30 Dinner	
7:00 – 8:15 Astronomy or Night Hike	7:00 – 8:15 Astronomy or Night Hike	
9:00 Lights out Bedtime story or song	9:00 Lights out Bedtime story or song	

TEACHER RESPONSIBILITIES

The experience at ECOS Institute provides a unique opportunity for teachers and their students to interact outside of the classroom. Teachers will live on site, share meals with students, learn and teach a trail, and help supervise other activities. Participating teachers should be able to hike at least one mile each day on uneven terrain in all types of weather.



1. **Remain on site all week, including overnight**

Teachers are the district representatives responsible for their students during the entire week. They provide expertise and valuable input to the program director to help meet challenges, including discipline problems, homesickness, medical concerns, and emergencies.

2. **Participate in Academic Trails**

Option 1: Teach a Trail

On the afternoon of the first day, teachers will receive an orientation on the trail lesson they selected to teach. The choices are: Ecology, Geology, or Wildlife Biology. A staff member will provide one-on-one instruction to ensure that each teacher is prepared to teach the trail. There will be an opportunity to walk the route, try out each planned activity, and clarify science information. The teacher will teach his/her trail to groups of 12-15 students, two or three times during the week. Trail groups are a mix of students from the different cabins and schools.

Option 2: Assist in Trail Supervision

Teachers will provide additional supervision on trails as needed.

3. **Supervise a table at each meal**

All meals are served in the formal dining hall. Students are expected to use their best table manners and have polite conversation during the meals. An adult at each table, called the guest, monitors behavior, facilitates conversation, and guides the student hopper (server for that meal) through his/her duties.

4. **Assist with science sessions and special activities**

ECOS Institute staff members plan and lead the science sessions and special activities while teachers participate in the activities and help supervise students. Hikes are planned with the teachers' physical abilities in mind.

5. **Learn and observe on-site policies**

The Program Director will meet with the visiting teachers on the first day to review policies and procedures.

TEACHER INFORMATION AND EXPECTATIONS

Teachers are considered part of the staff during their stay at ECOS Institute. The program director will meet with the teachers on the first day to review policies and procedures, go over the schedule for the week, and clarify responsibilities.

- Teachers are expected to remain on site for the entire period of the program. If there are unavoidable conflicts (e.g., attending a class) teachers must contact the program director.
- Accommodations for family members are not available.
- Teachers have free time every evening after dinner and have breaks during the day between meals and activities.
- Teachers are welcome to attend the evening activities and may be invited to participate in Skit Night (optional). ECOS Institute staff can help with ideas, props, etc.
- Teachers who leave the site must check out and in with the program director or assistant program director.
- Teachers must wear long pants and closed shoes on all trails and during most activities.
- Students are not allowed to have snacks and soda. Teachers should be discreet about personal snacks and sodas and must not share them with students.
- Office phones are available for business calls. Use a cell phone for personal calls. Phones are not available for student use.
- Teachers can drive their own vehicles to ECOS Institute if the students on the buses are adequately supervised (one teacher on every bus with students). Be aware that weather conditions could change at any time and that chains may be required.
- Teachers may also be given the opportunity to use a daytime block to observe another trail or activity, or just relax and enjoy the beauty of the mountains. This will depend on our staffing that week.
- ECOS Institute, like all educational sites and facilities, is tobacco free. Use of tobacco is prohibited in all buildings and vehicles at ECOS Institute. Contact the program director for designated smoking areas.
- The possession and/or use of any illegal or controlled substance or alcoholic beverage is prohibited.

PRE-TRIP PREPARATION

The classroom teacher is instrumental in setting the tone for the students' success at ECOS Institute. Academics are stressed on trails, science sessions, and evening activities. Reminding students that ECOS Institute is a school, not a summer recreation camp, will help students meet expectations when they attend.

Academic preparation will reinforce the idea that the students are attending a school. It will also allow the ECOS Institute staff to build upon the students' knowledge and enrich their experience. Students who arrive knowing the vocabulary and some of the basic concepts become more confident and relaxed as they share their knowledge with the staff.

ECOS Institute is an outstanding opportunity for students to increase their sense of self-worth, to learn responsibility and cooperation through group living, as well as to study science. Students who come with a positive attitude, ready to share, cooperate, and work in a group will have a successful and enjoyable week. Students are expected to observe the safety rules; be on their very best behavior; and show respect to the staff, other students, and the environment.

Students should be prepared to live in a group with one adult and 12 - 15 students. In this group setting, rules will be established that may be different from their home routine. For example, "lights out" (bedtime) is at 9 p.m.; students are asked to limit their shower time to three minutes; and there are shared chores, such as setting and clearing the tables and cleaning the cabin.

Other adjustments include meeting new people, trying new foods, group living, and being asked to follow expectations 24 hours a day. Preparing ahead of time for these adjustments will help the students make a smooth transition between home and ECOS Institute.

The following lessons are strongly recommended for all students prior to attending the program:

VOCABULARY- page 10

Students should be able to define and use the basic vocabulary. Knowledge of the vocabulary will enrich their experience and provide deeper comprehension of the concepts taught at ECOS Institute.

BEHAVIOR EXPECTATIONS - page 12

The behavior contract is one tool to help students and parents understand the expectations at ECOS Institute. The contract should be reviewed with the students, then sent home to be signed by the parents.

VOCABULARY

Adaptation	A behavior or characteristic that helps a plant or animal survive.
Carnivore	An animal that primarily eats other animals.
Consumer	An organism that obtains its energy by eating other organisms.
Deciduous	A plant that sheds its leaves seasonally.
Decomposer	An organism that obtains its energy by breaking down waste products and dead organisms.
Diurnal	Primarily awake and active during the day (e.g., lizard, hawk, squirrel).
Ecosystem	An area with living and nonliving things that interact. All components are linked together through energy flow and nutrient cycling.
Erosion	The transport of rock by forces such as wind and water.
Evergreen	A plant that retains some of its leaves throughout the year.
Geology	The study of the Earth, its structure, history, and the forces that affect it.
Habitat	The area where an animal naturally lives. It must include food, water, shelter, and space suitable to the animal's needs.
Herbivore	An animal that primarily eats plants.
Hypothesis	A testable educated guess, explanation, or answer to a question.
Igneous Rock	Rock formed by the cooling and hardening of magma.
Interdependence	The concept that everything in an ecosystem is related to everything else.
Metamorphic Rock	Rock changed by heat and pressure.
Nocturnal	Primarily awake and active during the night (e.g., owl, bobcat).
Photosynthesis	The process by which organisms, including green plants, utilize sunlight, carbon dioxide, and water to produce their own food.
Plate Tectonics	The theory that the Earth's crust is divided into plates that move.
Producer	An organism (usually a green plant) that produces its own food.
Sedimentary Rock	Sediment that is transported, deposited in water, then compressed into rock.
Weathering	The process of breaking down rock by mechanical and chemical forces such as water, oxidation, and growing plants.

VOCABULARY ACTIVITIES

Fill in the Blank

Students make up sentences, leaving blanks for vocabulary words. They exchange papers with another student and fill in each other's blanks.

Flash Cards

Students make flash cards with an illustration on one side and the word on the back. They use the cards to give other students a mini lesson.

Interview an Animal, Tree, Rock, etc.

Students write interview questions using the vocabulary words. They research the things to be interviewed then interview each other.

Jingle or Poem

Students write a jingle or poem alone or with a partner using as many vocabulary words as possible. The final product is presented to the class.

Matching

Students create a worksheet, scrambling the words and their definitions. They exchange papers and match the words to the correct definitions.

Pantomime

Using only motions and gestures, students act out definitions. This can be used in a game format with team against team.

Rap Song

Students create a rap song, alone or with a partner. They include a designated number of vocabulary words and their definitions. The song is presented to the class.

Story

Students create a cooperative story with a partner, using selected vocabulary words.

Stylize

Students write each vocabulary word artistically, such as painting or decorating each word with symbols and appropriate colors.



BEHAVIOR EXPECTATIONS

A student at ECOS Institute is expected to be a good listener, follow directions, and be considerate of others. Students who come with a positive attitude, ready to share, cooperate, and work in a group will have a successful and enjoyable week. Although the classes take place outdoors, the students live in cabins, and many fun activities are planned. ECOS Institute is a school and not a summer camp. Keeping this in mind will help the students meet the standards.

Discuss the expectations and the steps that will be taken if a student fails to follow the standards set at ECOS Institute.

Behavior Standards

1. Be courteous and polite
 - A. Be a good team member; share and take turns
 - B. Be a good listener; follow directions
 - C. Share in the work; show good sportsmanship
 - D. Respect others and be considerate of others' belongings
 - E. Do not pick plants; stay on the trails, respect wildlife
 - F. Do not fight or use inappropriate language
2. Be committed
 - A. Plan to stay on site the entire time
 - B. Participate in the lessons and activities
3. Follow ECOS Institute safety rules
 - A. Walk
 - B. Stay on established trails
 - C. Stay with your supervising adult and the group
 - D. Do not throw objects (rocks, snow, sticks, etc.)
 - E. Do not carry walking sticks on trails
4. Leave these items at home
 - A. Electronics (Cell Phones, MP3/iPods, Games, Radios, etc.)
 - B. Money or valuables
 - C. Food, candy, or gum
 - D. Curling irons, make-up, hair spray, body spray, or cologne/perfume.
 - E. Potentially harmful items (e.g., knives, razors, sharp tools, drugs, etc.)
 - F. Any items not allowed at your school

BEHAVIOR EXPECTATIONS

Consequences

A formal warning may be given to students who commit minor infractions or for a general problem with a cabin or trail group. More serious problems or repeated problems with an individual will move a student through the following steps*:

- A. A conference will be held with the student.
- B. If problems continue, the student will be removed from an activity.
- C. If the problem is not resolved, a phone conference will be held with the program director and the parent or guardian.
- D. If the problem is still not resolved, the parent will be required to take the student home.

The consequences can be compared to the baseball rule, "three strikes and you're out."

* *The steps may be modified at the teacher's and/or program director's discretion.*

SUGGESTED ACTIVITIES:

Give each student a copy of the behavior contract. The following activities can be used or modified to review the behavior contract. The contract should be sent home with the students for the parents to read and sign.

Brainstorm

In small groups or as a class, list the possible reasons behind each standard on the contract. Discuss the reasons why it might be challenging to follow the standards for the entire stay at ECOS Institute and come up with some strategies for success.

Thumbs Up/Thumbs Down

Read the following items to students. Instruct them to put their thumbs up if they can bring the item to ECOS Institute, thumbs down if it is to be left at home.

Flashlight	Up
Cell Phone	Down
Hair Dryer	Up
Water Bottle	Up
Pillow	Up
Stuffed Animal	Up
Money	Down
Video Game	Down
Book	Up
Gum	Down
Candy	Down
Breath mints	Down
Makeup	Down
Stationary and stamps	Up

BEHAVIOR EXPECTATIONS

Match the statement to the standard:

(More than one correct answer is possible)

You are asked to limit your shower to three minutes.

1A Share and take turns

Your trail leader asks you to respect the environment.

1E Do not pick plants; stay on the trail

Your cabin comes to the dining hall early to set the tables.

1C Share in the work

Your instructor asks you to sit in a circle for the next activity.

2B Participate in the lessons and activities

Someone makes you angry and you feel like pushing him/her.

1F Do not fight or use inappropriate language

The person on the top bunk leaves his/her jacket on your bed.

1D Be considerate of others' belongings

Your instructor gives directions for cabin clean up.

1B Be a good listener; follow directions



Match the reason to the safety standard:

Someone might get hit or be tripped.

Do not carry walking sticks on trails

The ground is uneven and often icy.

Walk

The adult knows the route and any possible dangers.

Stay with your group or stay on the trail

Someone might get hurt.

Do not throw objects

Practice Makes Perfect

Many of the challenges of the ECOS Institute experience are less daunting if the students have the opportunity to practice them first. Have students try the following at home:

Take a three minute shower

Lights out and quiet at 9 p.m. Quiet time lasts until 6:30 a.m.

Try new food

Set and clear the table

SOCIAL SKILLS

One of the goals of ECOS Institute is for students to learn responsibility and cooperation through group living. Making new friends and getting along with others is part of the experience at ECOS Institute.

SUGGESTED ACTIVITIES:

Personal Goals

Write the list of character traits on the board

cooperates
brags
likes to laugh
positive
kind
teases
complains

follows directions
thinks they're better
friendly
bossy
truthful
whines a lot
understanding

listens
polite
caring
gossips
respects others
considerate
selfish



Students should:

Draw a large cabin on a piece of paper.

Choose words on the list that would best describe the ideal person to share a cabin with.

Write the good traits inside the cabin and the traits they don't want outside the cabin.

Have the students draw a large mirror on a piece of paper.

They should repeat the exercise choosing words that describe how they will act at ECOS Institute.

Write the traits that would best describe them inside the mirror.

Write the words that they hope would never describe them outside the mirror.

Situations

The following situations can be made into a role play or put on to cards and discussed in small groups.

1. Your best friend is homesick and misses his/her family. What can you do to help your friend?
2. Someone in your group started a rumor about your best friend. What could you do to stop the rumor? How could you help your friend feel better?
3. There is a student in your cabin who annoys you and you don't like it. You are getting very angry. What can you do to make the situation better? What could you do that might make matters worse? How could you solve the problem?
4. You notice that everyone at your lunch table knows each other except one person. How might he/she feel? What can you do to help make him/her feel more comfortable?

CURRICULUM OVERVIEW

ECOS Institute curriculum is aligned with the *California Science Content Standards* for fifth and sixth grade, with emphasis on the select *Next Generation Science Standards Disciplinary Core Ideas*. Standards covered reflect concepts that are best taught outdoors. Although the emphasis is science, standards from other content areas are also covered.

The background information (pages 18-25) is intended to help teachers prepare for the trails they will be teaching. It is not necessary to memorize or study the background information to be successful teaching at ECOS Institute. You will receive individualized instruction at site on the trail you selected.

The background information can also be used to teach the vocabulary and give students an idea of the concepts that will be covered. The information is also useful for reviewing or extending the concepts covered at ECOS Institute. Please do not teach all of the background information to the students before they attend. The concepts will be covered thoroughly at site.



SCIENCE CONTENT STANDARDS

ECOS Institute curriculum is aligned with *California Science Content Standards*. Although the emphasis is science, standards in other content areas are also covered. The standards covered at ECOS Institute reflect concepts best taught outdoors.

5th Grade Standards

Life Science

- 2.e. How sugar, water, and minerals are transported in a vascular plant.
- 2.f,g Photosynthesis and respiration

Earth Science

- 3. a-e Water Cycle, availability of fresh water
- 4.a,b,c,e Weather
- 5.a-c Solar System

Investigation and Experimentation

- 6.a. Classify objects
- 6.b,g,h How to develop a testable question, record data, make inferences, and draw conclusions.

6th Grade Standards

Earth Science

- 1.a-f Plate Tectonics
- 2.a,b,d Reshaping of land by weathering, erosion, and deposition

Physical Science

- 4.a,b The sun is the major source of energy for phenomena on Earth's surface
- 4.e Differences in pressure, heat, air movement, and humidity result in changes of weather

Life Science (Ecology)

- 5.a,b,c,e Organisms in ecosystems exchange energy and nutrients among themselves and with the environment.
- 6.b,c Renewable and nonrenewable resources

Investigation and Experimentation

- 7.a,d,e How to develop a hypothesis, communicate the steps and results, and recognize whether evidence is consistent with a proposed explanation.
- 7.g Interpret natural events by sequence and time.
- 7.h How to identify changes in natural phenomena over time.

BACKGROUND INFORMATION

HISTORY

The first people in the San Bernardino Mountains were the Serrano. It is estimated that they arrived in the San Bernardinos about 2,000 years ago. The Serrano are known to have lived in Big Bear, Arrowhead Springs, north of Cajon Pass, and along the Santa Ana River and Mill Creek. They were hunter-gatherers and made forays into the valleys and desert for food and trade or to escape winter. The trails used by the Serrano are some of the first traces of human presence.

The first Spanish settlement was built in 1819 near Redlands. The Spanish built the missions and ranches where many of the Serrano went to learn farming and ranching. From 1821 to 1846, Mexico became independent from Spain and large amounts of land were granted to Mexican, European, and American settlers. This resulted in large cattle ranches in the valleys. Water and lumber from the mountains supported the growing valley communities. In 1845, a cavalry troop chasing cattle rustlers into the mountains discovered a large valley with a small lake, extensive marshes, and grizzly bears. They named it Bear Valley.

The logging industry, combined with the discovery of gold in Holcomb Valley, brought more people and roads into the mountains. The remains of one of the original roads can be seen near Mountain Home Village. Rapid development and unchecked timber cutting in the mountains made it evident that protection was needed. In 1893, the San Bernardino Forest Reserve was created. It was expanded and renamed the San Bernardino National Forest in 1925. National Forests are public lands managed for multiple uses. Logging, mining, and recreation are all permitted, but the areas and levels are set by the Forest Service.

As more people moved to the mountains, the area was changing drastically. By the 1920's, a dam at the end of Bear Valley created Big Bear Lake, the Grizzly Bears were hunted to extinction, and a ski resort was planned for the slopes of San Gorgonio. After much controversy, the remaining unaffected areas of the San Bernardinos were set aside to be preserved in their natural state, becoming the San Gorgonio Wilderness. In a designated wilderness, roads and permanent structures are not permitted and most activities like logging and mining are not allowed. It is the highest form of protection for federal lands.

Today the San Gorgonio Wilderness is one of the most heavily used wilderness areas in the United States. Big Bear is a large, rapidly growing town and a popular tourist destination. The valley containing the town has a wintering population of Bald Eagles and supports an unusually high number of rare and endangered species. Preserves have been set aside or are being considered to protect the plants and the eagles. ECOS Institute is surrounded by National Forest. It is because of the continuing efforts to preserve these public lands that ECOS Institute is able to offer an opportunity for students to experience a natural environment.

BACKGROUND INFORMATION

ECOLOGY

Ecology is the study of relationships between organisms and their environment. An ecosystem is an area with living and nonliving things that interact.

The environment, comprised of nonliving things, are summarized by the acronym LAWS.

- L - Land (soil and rock type, slope, elevation, land formations)
- A - Atmosphere or Air (climate, weather, wind)
- W - Water (precipitation, lakes, rivers and streams, oceans)
- S - Sunlight (energy source, temperature, solar radiation)

In any given location, the type, quantity, and availability of the LAWS determine which plants and animals might live there. Plants and animals are adapted to function successfully in a particular set of conditions.

The living things are divided into three components based on their role in the ecosystem:

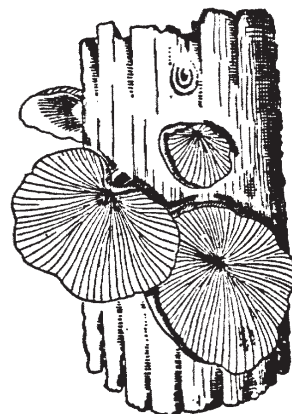
Producers are organisms capable of producing their own food. Green plants, that produce their own food in a process called photosynthesis, are the most common examples.

Consumers derive their energy from other organisms. They cannot make their own food, so they eat plants or other animals. The consumers can be further classified by the type of food they eat.

- Herbivores primarily consume plants.
- Carnivores primarily consume animals.
- Omnivores consume plants and animals.
- Scavengers are animals that eat carrion (dead animals).

Decomposers are specialized consumers that eat dead plants and animals. They cause the breakdown and decomposition of the living things, releasing nutrients to be cycled and used again. The decomposers can be remembered by the acronym FBI.

- F - Fungus
- B - Bacteria
- I - Invertebrates



BACKGROUND INFORMATION

The living and nonliving things interact in specific ways. These processes allow the ecosystem to function.

Cycles

All cycles are powered by the sun. Cycles do not have a beginning or an end. They provide a way to reuse resources, permitting a continuing supply at all stages of the cycle. Without the cycling of water and nutrients, ecosystems could not function.

Water Cycle

The water cycle follows the collection and distribution of water over the earth. It happens on a global and local scale. The sun provides the energy to lift water into the atmosphere through evaporation, while gravity pulls the water down from the sky and sends it down rivers and streams.

Nutrient Cycle

Several different nutrients cycle through ecosystems. In general, nutrients move through the food chain until an organism dies and the decomposers break it down, returning the nutrients to the soil. Plants take up the nutrients, continuing the cycle.

Photosynthesis and Respiration

Photosynthesis is the remarkable process by which green plants convert sunlight into food. Energy from the sun is used to convert carbon dioxide, and water into carbohydrates, mainly sugar, and oxygen. Plants use the sugar to live and grow. Animals obtain their energy from eating plants or other animals that eat plants. Photosynthesis is the pathway for energy to enter the ecosystem.

Plants and animals release the energy from food through the process of cellular respiration. Oxygen reacts with sugar to release energy. Water and carbon dioxide are given off in the process. When we breathe in oxygen and breathe out water and carbon dioxide it is because of cellular respiration.

Food Chain

A food chain traces the flow of energy through an ecosystem from one organism to another. This is a one way process; the energy comes from the sun, flows through the food chain, and dissipates into space. Most food chains are very short since only about 10% of the energy taken in by an organism is transferred to another organism. The rest is used for living, growing, and moving.

Interdependence

Interdependence, the concept that everything relates to everything else in an ecosystem, is the glue that holds an ecosystem together. The interactions that comprise interdependence can be between nonliving things (e.g., the amount of water in the air determines the relative humidity), living things (e.g., a bird builds its nest in a tree) or both (e.g., the frog lives in the water). The interactions in an ecosystem are complex because almost every part of an ecosystem affects the others. This complexity allows the ecosystem to respond to and survive change. Interdependence can be thought of as the web of life. Just as a spider's web functions better if all of its strands are intact, an ecosystem is stronger and healthier if it has many components and interactions. In most ecosystems, stability is a function of complexity.

BACKGROUND INFORMATION

LOCAL MOUNTAIN ECOSYSTEMS

Many different factors combine to determine which ecosystems will be found in an area. These include the amount of water, sunlight, temperature, soil type, etc. (the LAWS). The living things will be those that are adapted to the conditions found there. On the other hand, the living things affect and alter the conditions. For instance, on a sunny, dry mountain slope ponderosa pines may grow initially, but the mature trees create shade. Shade-tolerant species such as white fir may slowly replace the sun-loving Ponderosas.

Chaparral

Chaparral is found on mainly south facing slopes from about 1,000 to 5,000 feet. The plants tend to be medium to large drought-adapted evergreen shrubs with tough, small leaves. Although it is often hot and dry, the chaparral is not a desert but a distinctly different ecosystem.

Oak Woodland

Oak woodland is found on gentle slopes and valleys from 1,000 to 5,000 feet. The oaks found in our mountains either have small, tough evergreen leaves or large, soft deciduous leaves. There is usually an understory of shrubs and grasses.

Riparian Woodland

Riparian woodland is found along rivers and streams at all elevations. The plants at our sites tend to be deciduous, or winter dormant, but form a thick tangle of vegetation in the summer. Riparian areas provide water, food and shelter for animals from surrounding ecosystems as well as strictly riparian species, thus increasing the diversity of an area.

Yellow Pine Forest

The yellow pine forest occurs from 5,000 to 8,000 feet. It consists of a variety of pines as well as other conifers and broad-leaved trees such as the oaks, growing on mostly acidic soils. The climate is cool, with snow in winter. Trees are the dominant plants and there is very little understory.



BACKGROUND INFORMATION

GEOLOGY

The geology of the San Bernardino Mountains provides a perfect setting to teach concepts such as plate tectonics, mountain building, weathering, and erosion. The San Bernardino Mountains along with the San Gabriel and Santa Monica Mountains make up the Transverse Ranges of southern California. These mountains are mainly composed of different granites which are plutonic, igneous rocks formed about 65 million years ago. There are also some gneisses, a type of metamorphic rock, thought to be over one billion years old.

Unlike most mountain ranges in North America, the Transverse Ranges are oriented east to west. At this latitude, slopes that face south receive considerably more direct sunlight than north-facing slopes. This *slope effect* creates hot, dry conditions on the south-facing slopes resulting in different ecosystems than on the cooler north-facing slopes.

Plate Tectonics

Plate tectonics is the theory that the Earth's crust is divided into plates that are in motion. Earthquakes, mountain building, and volcanic activity are results of plate movement and occur primarily along plate boundaries. Most of Baja and southern California is on the Pacific Plate. The rest of North America is on the North American Plate. The San Andreas Fault system forms part of the boundary between the Pacific and North American Plates. These plates generally slide past each other, causing earthquakes but very little else. However, north and east of Los Angeles, the fault system takes a bend. This "big bend" in the plate boundary creates a lot of compression forces as the plates move and has resulted in the creation of the Transverse Ranges. Uplift of these ranges through folding and faulting has taken place in the last 3 million years and is still occurring today. Most of the students travel from their homes on the Pacific Plate to the ECOS Institute on the North American Plate.

Mountain Building Processes

Mountains form in several different ways, but the forces that cause mountain building are usually associated with plate boundaries. When two plates collide, the force can be great enough to crumple and uplift the land. When one plate slides beneath another (subduction), friction can melt the rock.

Folding - Tectonic forces can cause rock to deform and bend without breaking. Folding, which probably occurs deep underground, requires tremendous pressure and heat. Large-scale folding can result in mountain formation.

Faulting - If the rock is brittle or the forces move faster than it can bend, the rock cracks. If there is movement along this weakness, it is called a fault. Vertical movement along a fault can result in mountains.

Volcanoes - Magma, molten rock, rises to the surface along weakened areas of the crust. If the magma breaks through, it is a volcano. If the magma does not break through, the crust may still be uplifted to form a dome. Subduction of one plate beneath another or a plate boundary where two plates are pulling apart can cause volcanic activity.

Weathering and Erosion

Two forces, weathering and erosion, are constantly at work wearing away the rock. Weathering works to break a rock down once it is at or near the surface. Erosion loosens and removes the weathered material. Over time these two forces can change the shape of the land. For example, weathered rock from the San Bernardino Mountains is one of the sources of sand for southern California beaches.

BACKGROUND INFORMATION

COMMON TREES

Ponderosa Pine *Pinus ponderosa*

Ponderosa Pine is the most widely distributed pine in North America. It is an important tree for lumber, in part because it grows straight and tall with a wide girth. It has needles in bundles of three, "jigsaw puzzle" bark, and small prickly cones. It is also called yellow pine due to the yellowish cast to the bark. Ponderosa Pines hybridize with Jeffrey Pines *Pinus jeffreyi* in areas of overlap. Jeffrey Pines are three-needle pines with larger cones and reddish, ridged bark that smells like vanilla. Hybrids have intermediate characteristics.

Coulter Pine *Pinus coulterii*

Coulter Pines are three-needle pines that are more common at lower elevations and drier sites. They have the most massive cones in North America and their size, combined with the sharp curved hooks on the scales, has given rise to the nickname "widowmaker." One characteristic of large cones is that they tend to roll after they fall from the tree and this aids in seed dispersal.

White Fir *Abies concolor*

Small firs have a tidy appearance with short needles distributed evenly along the branches. The branches emerge from the trunk in layers, called whorls, which resemble spokes on a wheel. The white lines on each needle and the smooth white young bark give this fir its name. White Fir needles were boiled for tea and have a citrus flavor when tasted. The cones grow upright on the branches and disintegrate before reaching the ground. This adaptation aids in seed dispersal by enabling the lightweight scales to be carried by the wind. White Fir is shade-tolerant and will slowly replace the sun-loving pines in areas where natural processes, such as fires, do not occur.

Incense Cedar *Calocedrus decurrens*

Incense Cedar is a conifer with flattened, scalelike leaves. The cones are small, resembling a *fleur-de-lis* when open. The cones mature and open on the branches, releasing small winged seeds. Large, mature cedars are often confused with redwoods, due to the red fibrous bark. The bark is rich in tannic acid and is insect resistant. Incense Cedar is shade-tolerant and requires more moisture than the pines. Cedar wood is popular for pencils.

Black Oak *Quercus kelloggii*

Black Oak is a deciduous oak with lobed leaves and rough dark bark. The acorns are an important food source for wildlife, especially squirrels. The Gray Squirrels gather and bury the acorns throughout the fall, then dig them up in the spring using a combination of odor and memory to find them. Unrecovered acorns will germinate. This association with squirrels may explain the upslope distribution of black oaks and the tendency to find the oaks growing in clumps. Native Americans preferred Black Oak acorns over any other kind. The acorns contain bitter tannins, which must be leached out before humans can eat them.

Canyon Live Oak *Quercus chrysolepis*

The most widely distributed species of oak in California, Canyon Live Oak is an evergreen oak with dark green leaves that are shiny on top and dull and lighter underneath. Its acorns have large lumpy caps that are fuzzy and golden yellow on the underside. Canyon Live Oaks are often host to a variety of galls, which are growths caused by insects, usually small, parasitic wasps.

BACKGROUND INFORMATION

LOCAL WILDLIFE

This is just a sampling of the wildlife common at ECOS Institute. More complete lists and information are available on site.

Birds

Acorn Woodpecker

This woodpecker has a black back and breast, white belly, and red cap. The white rump and white wing patches are conspicuous in flight. Acorn Woodpeckers eat primarily acorns, but also eat other nuts, seeds, sap, and insects. Acorn Woodpeckers live in communal family groups. They have a unique behavior of drilling holes in selected trees in their territory and filling these holes with acorns. There may be as many as 50,000 acorns in one storage tree. The woodpeckers will defend these trees from other woodpeckers as well as jays, squirrels, etc.

Steller's Jay

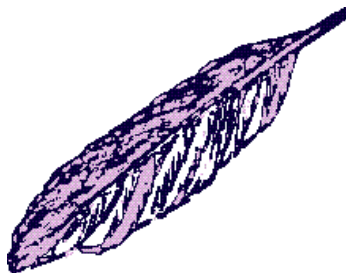
Vocal, bold and aggressive, this jay is a common and well-known mountain resident. Because it is blue overall with a black head and crest, it is often mistakenly called a Blue Jay. The real Blue Jay is found east of the Rocky Mountains and has distinctly different markings. Steller's Jays have powerful, all-purpose bills that deftly handle a varied diet of acorns, seeds, fruit, insects, small reptiles, eggs, and small birds.

Mountain Chickadee

Mountain Chickadees are small gray birds with black caps and bibs and a white line over the eyes. Chickadees are very vocal; they are named for their *chick-a-dee-dee* call, the most common of the variety of calls they make. They are active and agile, foraging at all heights in trees shrubs and even on the ground. Mountain Chickadees search leaves, branches and bark crevices for insects, spiders, pollen, and seeds.

Dark-eyed Junco

Dark-eyed Juncos are small sparrows with pale, cone-shaped bills, dark brown or black hoods, brown backs and white bellies. Their white outer tail feathers are conspicuous in flight. Their bill is adapted for seed cracking and they do eat a lot of seeds. Like most songbirds, in spring they switch to a high protein insect diet.



BACKGROUND INFORMATION

Mammals

Black Bear

- Stands 2 - 3 feet at the shoulder, weighs 200 - 400 pounds
- Dens in rock crevices, hollow logs, etc.

Black Bears are black to cinnamon brown with a brown face and many have a patch of white on the chest. They are omnivores, eating mainly vegetable matter such as grass and berries. Their protein comes from termites and ants, although they will occasionally eat carrion. Black Bears are nocturnal with poor eyesight, good hearing, and an excellent sense of smell. In winter, Black Bears go into a seasonal dormancy.

Raccoon

- Stands about 1 foot at the shoulder, weighs 12 - 35 pounds
- Dens in hollow trees but may use hollow logs or rock crevices

Raccoons are distinctive with a salt and pepper body, black mask over the eyes, and tail ringed with white. They are chiefly nocturnal and are most common near riparian areas. Raccoons are omnivores, eating almost anything: small vertebrates and invertebrates, eggs, fruit, nuts, and berries. If water is available, Raccoons will dunk their food, although the reason for this behavior is unclear. Raccoons do not hibernate and families are commonly seen foraging in winter.

Coyote

- Stands 2 feet at the shoulder, weighs 20 - 50 pounds
- Digs own den in the ground or alters other types of shelter

Coyotes are sandy brown or grayish with a long pointed snout and a bushy tail. They are year round residents but may move farther down the mountain in winter. Coyotes are chiefly nocturnal, but are often seen during the day. They are opportunistic feeders, eating whatever is abundant: rabbits, squirrels, mice, carrion, berries, insects, even garbage from dumpsters. Coyotes howl, yip, and bark; all forms of communication that help the family group reinforce cohesion, maintain territories, and warn of danger.

Western Gray Squirrel

- Head and body 9 - 12 inches, weighs 1 - 1 1/2 pounds
- Nests in cavities in trees or builds a nest of leaves and sticks

Gray Squirrels are gray with white bellies and a long bushy tail. They are arboreal, diurnal, active all year, vocal, and conspicuous; making them one of the most familiar forest animals. Sharp claws help the squirrel grasp tree branches and scamper across all but the smoothest surfaces. The bushy tail, which stretches as long as its body, aids in balance as the squirrel leaps from branch to branch. Gray Squirrels eat mainly acorns, seeds of conifers, and underground fungi.

Merriam's Chipmunk

- Head and body 4 2/3 - 6 1/2 inches, weighs 2 1/2 - 4 ounces
- Lives in burrows and stores food in nest chambers

Chipmunks are small ground dwelling squirrels, reddish brown overall with darker stripes from nose to tail. They are diurnal, active, and easily recognized. Chipmunks eat nuts, conifer seeds, berries, and underground fungi. Chipmunks hibernate, but store food in their burrows and wake up periodically to defecate and feed.

REVIEW ACTIVITIES AND EXTENSIONS

The following activities are suggested to review and extend the ECOS Institute experience. The materials can be displayed at open house, parent conferences, next year's parent orientation, etc.

Assembly

Give students an opportunity to share their experiences or lead songs they learned at ECOS Institute in an assembly for next year's class.

Create a Newsletter

Include interviews from staff and teachers, comics, highlights of the week, menus, weather reports, and other newsworthy events.

Draw a Mural

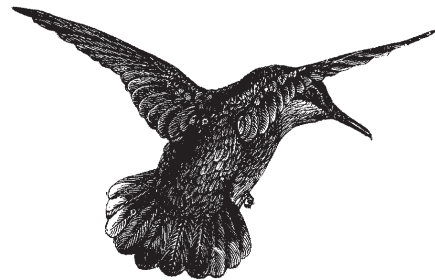
Students visually depict hikes and activities, including science concepts.

Make a Bulletin Board/Create a Scrapbook

Use photos, poems, hike descriptions, and short stories.

Read and Discuss Related Books

Hawk I'm Your Brother by Byrd Baylor
The Great Kapok Tree by Lynne Cherry
Dear Children of the Earth by Schim Schimmel
The Lorax by Dr. Seuss
The Whale's Song by Dyan Sheldon
Sierra by Diane Siebert
Just a Dream by Chris Van Allsburg
Old Turtle by Douglas Wood
Owl Moon by Jane Yolen



Write Letters

Select a new friend from the other school or cabin group to be a pen pal, write advice to next year's class, or write thank you notes to the ECOS Institute staff.