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 operates at multiple sites in the San Bernardino Mountains. At an elevation of 6,500 - 7,000 feet, snow is common in winter. These facilities have comfortable accommodations for students and teachers with indoor bathrooms and central heating in the cabins. Large auditoriums serve as excellent meeting rooms during inclement weather, night time activities, other large group gatherings. ECOS dining halls provide 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!

Pam Johnson, Executive Director

Contact Information

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ECOS Mailing Address
ECOS Institute
P.O. Box 3048
Running Springs, CA 92382

Physical Address

Camp Cedar Crest
33325 Camp Cedar Crest Rd.
Running Springs, CA 92382

Camp Whittle
31701 Rim of the World Dr,
Fawnskin, CA 92333

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Preparation Checklist

Each school should appoint an ECOS Institute Trip Coordinator. The Trip Coordinator is responsible for scheduling buses, organizing a parent orientation, emailing checklists to ECOS Institute, monitoring student registration, and collecting and checking medications.

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

- Read the *ECOS Parent Guide* for a general overview of the program and policies.
- List students and teachers with special needs on the Pre-Trip Checklist. **This is sent to ECOS Institute four weeks in advance.**
- Fill out the Cabin Partners sheets (part of the Pre-Trip Checklist) at least two weeks in advance.
- Prepare the students. See pages 10 - 14.
- Prepare yourself !

Frequently Asked Questions

Can I drive my own car to ECOS?

Your district will require at least one adult to ride with each bus of students. Additional teachers are welcome to drive their personal vehicles. Be aware that weather conditions could require tire chains.

What's the weather going to be like?

Check the forecast at www.weather.gov, with a specific search for Green Valley Lake, CA, 92341.

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

Yes. Even if physical mobility is limited, a teacher can still take an active role in the ECOS program. Responsibilities can be adjusted to provide sufficient time for personal care.

What if I feel under the weather, and need to rest?

Life in the mountains can be tough. If you feel ill, just let an ECOS Director know, and take some time to recuperate. Our Health Care team is always available to help, and they carry most OTC medications.

Do I need to bring my own sleeping bag and/or linens?

Pillows/linens are provided by the site. We recommend you also bring your own pillows, sleeping bag, etc.

How's the food?

You will receive a copy of the menu prior to your trip. The food is generally kid-friendly, but still plenty of healthy options for adults. If you require a special diet from our kitchen, there are options available when you register online.

Can I bring my own food?

Go ahead and bring up some food and snacks for the Teacher Lounge. A refrigerator and microwave are available. Personal food and snacks should not be in view of the students.

What do I do if students or parents come to me with questions about special diets?

Direct them to submit the request in the online registration portal, at least 2 weeks prior to attendance. If they do not find a sufficient option, your school may authorize them to send supplemental food. For more information, contact your trip coordinator for our menu and the ECOS Supplemental Food Guidelines.

How many teachers should attend from each school?

There should be one certificated district employee for every class of 25-35 students. It is preferred, but not required, that the students' own teachers attend. If more teachers wish to attend, please call our office directly. We will need to assess the availability of accommodations for additional teachers.

What does a teacher's ECOS schedule look like?

Consult the following weekly schedules on page 6. Visiting teachers are not primary supervisors, so there is a lot of opportunity to freely mingle with students, or take personal time to accomplish other tasks. Please let an ECOS Director know if you need additional time to attend to personal business.

Teachers attend meals in order to touch base with students, and to meet after the meal with ECOS leadership for any updates on medical or behavioral issues. Teachers also attend most trails and activities, to encourage students, promote student accountability, and to assist ECOS staff with any unusual issues that arise.

Locations

Camp Cedar Crest is located outside the town of Running Springs. Camp Whittle is located outside of the town of Fawnskin, CA, in the Big Bear area. Both sites are in a Yellow Pine Forest at an elevation of 6,500 -7,000 feet. These camps are surrounded by the San Bernardino National Forest, and seasonal streams run through the sites. Snow is common and lingers most winters. Wildlife is abundant, though generally wary of humans. Beautiful vistas can be enjoyed from many of the hiking trails.

Camp Cedar Crest is approximately 40 minutes from Highland, CA ("down the hill"), 30 minutes from Mountain Communities Hospital in Lake Arrowhead, 30 minutes from Big Bear, and 10 minutes from Running Springs. Camp Whittle is approximately 20 minutes from Bear Valley Community Hospital and Big Bear Lake, CA, and 60 minutes from Highland, CA. Camp Whittle can be approached from 3 different highways, depending on the location of your school: Generally, the quickest is Highway 18 through Running Springs (from southwest); alternate options are Highway 38 through Redlands/Mentone, and Highway 18 through Lucerne Valley (from the north).

Winter weather can be harsh, and can often lead to chain requirements for vehicles. If there is snow in the forecast, be sure to call CalTrans for updates on road conditions, at 1-800-427-7623.

Accommodations

At Camp Cedar Crest or Camp Whittle, you will be assigned a private room, with a private bathroom. Bedding is provided by the camp, but your own pillow and sleeping bag are recommended. There is a common area within teacher housing.

You have access to a microwave, small refrigerator, and coffee maker. Cellular service varies, according to precise location and carrier. Wi-Fi is available in teacher housing and throughout the central campus.

The Dining Hall is generally open from 7am to 7pm, and you can stop in anytime for coffee/tea and fresh fruit.

Please let us know if you are missing anything during your stay at ECOS. We want you to have everything you need to be comfortable and happy!

5-Day Teacher Schedule

Monday	Tuesday	Wednesday	Thursday	Friday
	8:00 – 8:45 Breakfast	8:00 – 8:45 Breakfast	8:00 – 8:45 Breakfast	Move out of room 8:00 – 8:45 Breakfast
11:00 – 12:00 Arrive at ECOS, move into your room, and meet with leadership	9:15-11:30 Science Hike 11:30 – 12:00 Check-in w/ students	9:15-11:30 Science Hike	8:45-12:30 OFF	9:15 Debrief w/ ECOS leadership 10:00 Snack @ DH 10:30 End of Week Movie! 11:00 Departure
12:30-1:15 Lunch	12:30-1:15 Lunch	12:30-1:15 Lunch	12:30-1:15 Lunch	
2:15 – 3:00 Meet with ECOS Staff	2:15 – 4:30 Afternoon Activity	2:15 – 4:30 Afternoon Activity	1:45 Site Photo 2:00- 3:00 Meet w/students 3:00-4:30 Line Dance	
5:30 - 6:15 Dinner	5:30 - 6:15 Dinner	5:30 - 6:15 Dinner	5:30 - 6:15 Dinner	
6:45 – 8:30 Optional Night Activity	6:45 – 8:30 Optional Night Activity	6:45 – 8:30 Optional Night Activity	7:00 – 8:15 Skit Night	

4-Day Teacher Schedule

Tuesday	Wednesday	Thursday	Friday
	8:00 – 8:45 Breakfast	8:00 – 8:45 Breakfast	Move out of room 8:00 – 8:45 Breakfast
11:00 – 12:00 Arrive at ECOS, move into your room, and meet with leadership	9:15-11:30 Science Hike 11:30 – 12:00 Check-in w/ students	8:45-12:30 OFF	9:15 Debrief w/ ECOS leadership 10:00 Snack @ DH 10:30 End of Week Movie! 11:00 Departure
12:30-1:15 Lunch	12:30-1:15 Lunch	12:30-1:15 Lunch	
2:15 – 3:00 Meet with ECOS Staff	2:15 – 4:30 Activity Hike	1:45 Site Photo 2:00- 3:00 Meet w/students 3:00-4:15 Survival Skills	
5:30 - 6:15 Dinner	5:30 - 6:15 Dinner	5:30 - 6:15 Dinner	
6:45 – 8:30 Optional Night Activity	6:45 – 8:30 Optional Night Activity	7:00 – 8:15 Line Dance	

3-Day Teacher Schedule

Day 1	Day 2	Day 3
	8:00 – 8:45 Breakfast	Move out of room 8:00 – 8:45 Breakfast
11:00 – 12:00 Arrive at ECOS, move into your room, and meet with leadership	9:15-11:30 Science Hike 11:30 – 12:00 Check-in w/ students	9:15 Debrief w/ ECOS leadership 10:00 Snack @ DH 10:30 Departure
12:30-1:15 Lunch	12:30-1:15 Lunch	
2:00 – 2:45 Meet with ECOS Staff	2:15 – 4:30 Science Hike	
5:30 - 6:15 Dinner	5:30 - 6:15 Dinner	
6:45 – 8:30 Optional Night Activity	6:45 – 8:30 Line Dance	

The Teacher's Role at ECOS Institute

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, provide support on trail, and help to supervise other activities. Your visible presence will allow your students to feel comfortable and supported in a new and challenging environment, and help them to positively engage the ECOS staff, the program activities, and each other.

1. Remain on site all week, including overnight

You are a district representative responsible for your students during the trip to ECOS. You provide valuable input to ECOS Staff as we work together to meet challenges, including behavior issues, separation anxiety, medical concerns, and emergencies.

Should you need to leave site during the week, please consult with ECOS Director staff.

2. Assist with supervision 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.

If there is a student with supplemental food sent from home, visiting teachers will assist the student with these items at meals.

If ECOS staff can provide primary supervision at all tables, feel free to mingle and touch base with all of your students.

3. Assist with academic hikes and special activities

ECOS Institute staff members plan and lead the hikes and special activities, while teachers participate in the activities and help to supervise students.

If there is an unusual behavioral or medical concern, you may be asked to provide support to a particular group. If not, please enjoy bouncing from group to group, and seeing as many of your students as you'd like.

If you need to take time away from your scheduled activities at ECOS, simply let an ECOS Director know, and you can get some rest or attend to other responsibilities.

4. Learn and observe on-site policies

The Program Director will meet with the visiting teachers on the first day to review policies and procedures. It is important that the students see all adults at ECOS as a unified faculty with a consistent voice.

The Teacher's Role at ECOS (cont'd)

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. Please feel free to ask questions throughout the week.

Model Expectations

- Teachers should support our safety expectations by wearing long pants and closed shoes on all trails, avoiding the use of walking sticks, refraining from snowball fights, etc.
- During meals, it is important that teachers encourage students to try new foods, to eat a sufficient amount of food, and to drink water. If a student is not eating well, please let us know. Students are not allowed to have snacks and soda. Teachers should be discreet about personal snacks and sodas, and should not share them with students.
- Cell phone communication (calls, messaging, social media) is a distraction and should not occur around students. Of course, using your phone to take pictures and videos is a great idea, and you can share media with parents while you are away from students. Your personal cell phone should not be available for student use. Please notify an ECOS Director if you feel there is a compelling reason for a student to call home.

Student Support

- If a student communicates a concern to you, please notify ECOS staff. Encourage the student to communicate basic concerns to their Instructor. ECOS staff can take the primary role with: Counseling for separation anxiety, conflict resolution, health issues, etc.
- Your assistance can be very helpful with unusual or serious issues, and we will seek your guidance. You will be consulted before ECOS Director staff speak with parents or your school administration about any issue. In some cases, it will be more appropriate for you to communicate with parents and/or Principal.
- Teachers and ECOS Directors will meet regularly, usually after meals, to discuss any medical or behavioral concerns, and to provide updates on schedule and activities.

Standard School Policies

- The possession and/or use of any illegal or controlled substance or alcoholic beverage is prohibited.
- Use of tobacco is prohibited in all buildings at ECOS Institute. Contact the Program Director for designated smoking areas.
- If you ever need to take time away from your scheduled activities, just let an ECOS Director know, so that you can attend to other responsibilities.

Preparing Your Students

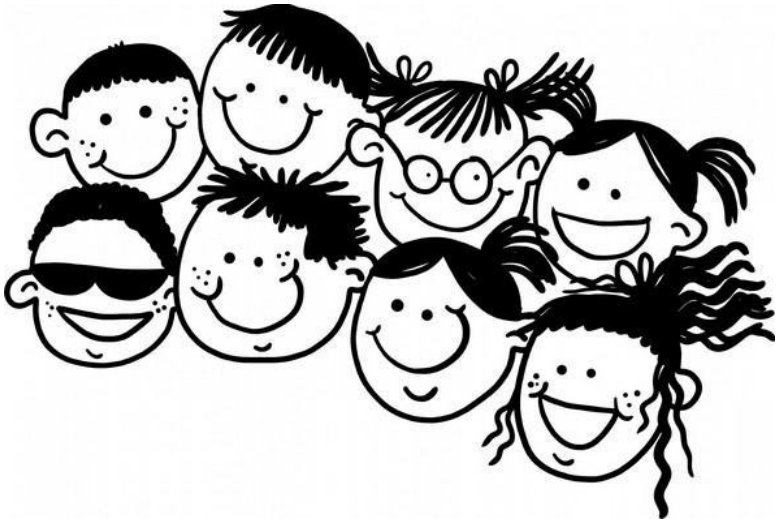
The classroom teacher is instrumental in setting the tone for the students' success at ECOS Institute. Academics are stressed on trails, science sessions, and evening activities. Reminding students that ECOS Institute is a school, not a summer recreation camp, will help students meet expectations when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



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. Respect others' space and be considerate of others' belongings **(do not invade others' privacy)**
   B. Do not harass others, fight, or use inappropriate language **(bullying of any kind is not tolerated)**
   C. Be a good team member; share and take turns
   D. Be a good listener; follow directions
   E. Share in the work; show good sportsmanship
   F. Be a steward of the environment: Do not pick plants; stay on the trails; respect wildlife

2. Be committed
   A. Plan to stay for the entire trip
   B. Participate in the lessons and activities

3. Follow ECOS Institute safety rules
   A. Walk, don't run
   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. Food, gum, candy
   B. Money and valuables
   C. Cell phones, smart watches, radios, electronic games, earbuds, etc.
   D. Curling irons and makeup
   E. Anything which could cause injury to you or another person (e.g., knives, razors, or drugs)
   F. Any items not allowed at your school

Recommended

1. The behavior contract (found online at ecosinstitute.com) is one tool to help students and parents understand the expectations at ECOS Institute. The contract can be reviewed with the students, then sent home to be signed by the parents. While optional, this is recommended, to improve the experience for all students and adults.

Implementation of Standards

1. Students review standards with their parents and teacher before the trip, and with ECOS staff upon arrival
2. Failure to follow standards set at ECOS Institute will result in the following :
    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 ECOS director, classroom teacher, and the parent or guardian.
    d. If the problem is still not resolved, the parent will be required to take the student home.
    e. Extreme behavior that presents a high risk to physical or emotional safety may result in immediate dismissal.

* *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

SUGGESTED ACTIVITIES (CONT'D):

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

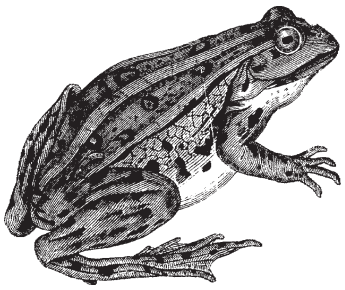
Your cabin comes to the dining hall early to set the tables.
1C Share in the work

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

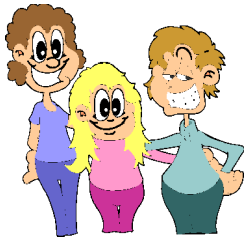
Practice Makes Perfect

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 a list of character traits and behaviors on the board:

cooperates	follows directions	polite
brags	thinks they're better	caring
likes to laugh	friendly	gossips
positive	bossy	respects others
kind	truthful	considerate
teases	whines a lot	selfish
complains	understanding	helping
listens	interrupts	encouraging

Students should:

Draw a large cabin on a piece of paper.

1. Choose words on the list that would best describe the ideal person to share a cabin with.
2. 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.

1. 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.
2. 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 supports the *Next Generation Science Standards* integrated model for grades 6 – 8, through observation, hands-on investigation, and student questioning. Content covered reflects concepts that are best taught outdoors. Although the emphasis is science, standards from other content areas are also covered, and students are encouraged to make connections between multiple subjects.

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.

Perhaps the most important way to prepare students for their trip to ECOS is to get them into the habit of asking questions. ECOS Instructors will not expect students to simply repeat information; they will ask students to take the information they learn and create *new questions* to share with the group.

Student questioning will be a central theme throughout the week at ECOS Institute.

DESCRIPTION OF SCIENCE HIKES

Forest Ecology

Ecology is the study of relationships between the living and 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.

Geosphere

This is a steeper trail leading up to a ridge with beautiful views, and students are encouraged to identify the effects of the shape of terrain on ecosystems. Groups will analyze soil composition, observe the effects of weathering and erosion, and investigate natural sources of water and minerals. Students use safety goggles and rock hammers to examine and identify local rocks, and can even try their luck at panning for gold in the seasonal streams.

Wildlife Biology

This trail travels through forest and riparian areas along seasonal streams to visit a variety of habitats, as well as an indoor Nature Center. 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 use binoculars to identify wildlife.

Astronomy & Night Hike

Students travel with their Instructor and cabin group along established trails, exploring the forest at night while conducting sensory experiments to help them to understand nocturnal adaptations. Clear mountain skies allow for excellent visibility, as students observe constellations and view celestial objects through large reflecting telescopes.

SAN MATEO COUNTY OFFICE OF EDUCATION

NEXT GENERATION SCIENCE STANDARDS

SCIENCE & ENGINEERING PRACTICES

Investigating Practices

Asking questions and defining problems
A practice of science is to ask and refine questions that lead to descriptions and explanations of how the natural and designed world(s) works and which can be empirically tested.

Planning and carrying out investigations
Scientists and engineers plan and carry out investigations in the field or laboratory, working collaboratively as well as individually. Their investigations are systematic and require clarifying what counts as data and identifying variables or parameters.

Using mathematical and computational thinking
In both science and engineering, mathematics and computation are fundamental tools for representing physical variables and their relationships. They are used for a range of tasks such as constructing simulations; solving equations exactly or approximately; and recognizing, expressing, and applying quantitative relationships.

Sensemaking Practices

Developing and using models
A practice of both science and engineering is to use and construct models as helpful tools for representing ideas and explanations. These tools include diagrams, drawings, physical replicas, mathematical representations, analogies, and computer simulations.

Analyzing and interpreting data
Scientific investigations produce data that must be analyzed in order to derive meaning. Because data patterns and trends are not always obvious, scientists use a range of tools—including tabulation, graphical interpretation, visualization, and statistical analysis—to identify the significant features and patterns in the data. Scientists identify sources of error in the investigations and calculate the degree of certainty in the results.

Constructing explanations and designing solutions
The end-products of science are explanations and the end-products of engineering are solutions. The goal of science is the construction of theories that provide explanatory accounts of the world. A theory becomes accepted when it has multiple lines of empirical evidence and greater explanatory power of phenomena than previous theories.

Critiquing Practices

Engaging in argument from evidence
Argumentation is the process by which evidence-based conclusions and solutions are reached. In science and engineering, reasoning and argumentbased on evidence are essential to identifying the best explanation for a natural phenomenon or the best solution to a design problem.

Obtaining, evaluating, and communicating information
Scientists and engineers must be able to communicate clearly and persuasively the ideas and methods they generate. Critiquing and communicating ideas individually and in groups is a critical professional activity.

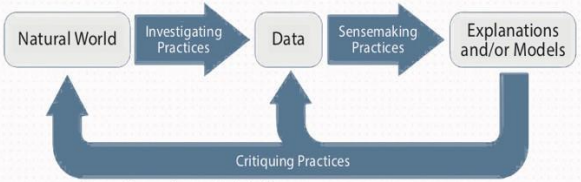


Image credit: www.sciencepracticesleadership.com

DISCIPLINARY CORE IDEAS (DCI's)

Life Science	Earth & Space Science	Physical Science
From molecules to organisms: Structures and processes LS1.A: Structure and function LS1.B: Growth and development of organisms LS1.C: Organization for matter & flow in organisms LS1.D: Information processing	**Earth's place in the universe** ESS1.A: The universe and its stars ESS1.B: Earth and the solar system ESS1.C: The history of planet Earth	**Matter and its interactions** PS1.A: Structure and properties of matter PS1.B: Chemical reactions PS1.C: Nuclear processes
Ecosystems: Interactions, energy, and dynamics LS2.A: Interdependent relationships in ecosystems LS2.B: Cycles of matter and energy transfer in ecosystems LS2.C: Ecosystem dynamics, functioning, and resilience LS2.D: Social interactions and group behavior	**Earth's systems** ESS2.A: Earth materials and systems ESS2.B: Plate tectonics and large-scale system interactions ESS2.C: The roles of water in Earth's surface processes ESS2.D: Weather and climate ESS2.E: Biogeology	**Motion and stability: Forces and interactions** PS2.A: Forces and motion PS2.B: Types of interactions PS2.C: Stability and instability in physical systems
Heredity: Inheritance and variation of traits LS3.A: Inheritance of traits LS3.B: Variation of traits	**Earth and human activity** ESS3.A: Natural resources ESS3.B: Natural hazards ESS3.C: Human impacts on Earth systems ESS3.D: Global climate change	**Energy** PS3.A: Definitions of energy PS3.B: Conservation of energy & energy transfer PS3.C: Relationship between energy & forces PS3.D: Energy in chemical processes & everyday life
Biological evolution: Unity and diversity LS4.A: Evidence of common ancestry and diversity LS4.B: Natural selection LS4.C: Adaptation LS4.D: Biodiversity and humans		**Waves and their applications in technologies for information transfer** PS4.A: Wave properties PS4.B: Electromagnetic radiation PS4.C: Information technologies & instrumentation

Engineering, Technology, and the Application of Science

ETS1.A: Defining and delimiting engineering problems
ETS1.B: Developing possible solutions
ETS1.C: Optimizing the design solution

CROSSCUTTING CONCEPTS

Patterns
Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.

Cause and effect
Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering.

Scale, proportion, and quantity
In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional relationships between different quantities as scales change.

Systems and system models
A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems.

Energy and matter
Tracking energy and matter flows, into, out of, and within systems helps one understand their system's behavior.

Structure and function
The way an object is shaped or structured determines many of its properties and functions.

Stability and change
For both designed and natural systems, conditions that affect stability and factors that control rates of change are critical elements to consider and understand.

ENVIRONMENTAL PRINCIPLES & CONCEPTS (EP&C's)

PRINCIPLE I
The continuation and health of individual human lives and of human communities and societies depend on the health of the natural systems that provide the essential goods and ecosystem.

PRINCIPLE II
The long-term functioning and health of terrestrial, freshwater, coastal and marine ecosystems are influenced by their relationships with human societies.

PRINCIPLE III
Natural systems proceed through cycles that humans depend upon, benefit from and can alter.

PRINCIPLE IV
The exchange of matter between natural systems and human societies affects the long-term functioning of both.

PRINCIPLE VI
Decisions affecting resources and natural systems are based on a wide range of considerations and decision-making.

Common Scientific Language

Familiarity with scientific language can enrich your students' experience and provide deeper comprehension of the concepts taught at ECOS Institute.

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 (optional)

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 flashcards 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.

Background Information

HISTORY

The first people in the San Bernardino Mountains were the Yuhaaviatam, or “People of the Pines”. Spanish explorers arrived and used the name “Serrano”. It is estimated that they arrived in the San Bernardinos about 2,000 years ago. The Yuhaaviatam 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 Yuhaaviatam 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 Yuhaaviatam 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 activities like logging and mining are not allowed.

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. The recently established Sand to Snow National Monument connects the San Bernardino Mountains to other conservation areas in the Mojave Desert to the east, and serves to protect the headwaters of the Whitewater River.

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.

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:

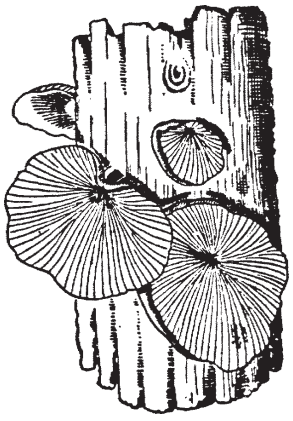
Producers are organisms capable of producing their own food. Green plants, that produce their own food in a process called photosynthesis, are the most common examples.

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



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.

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.

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 Moncia 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.

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.

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

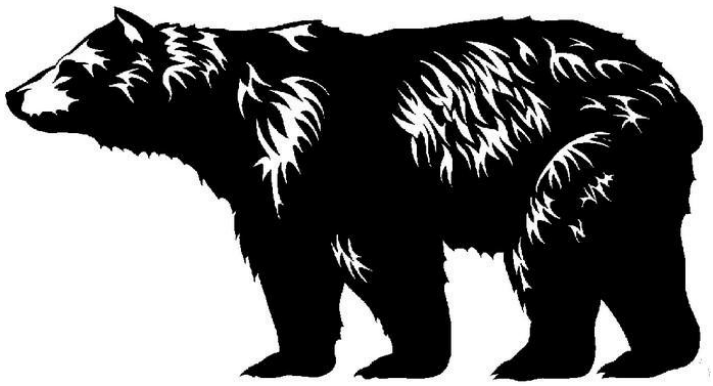
Vocal, bold and aggressive, this jay is a common and well-known mountain resident. Because it is blue overall with a black head and crest, it is often mistakenly called a Blue Jay. The real Blue Jay is found east of the Rocky Mountains and has distinctly different markings. Steller's Jays have powerful, 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.



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 & Resources

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

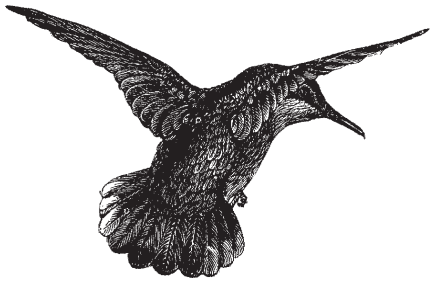
Students visually depict hikes and activities, including science concepts.

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.