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INSTRUCTOR FIELD MANUAL FOR CAMP HIGHLAND
OUTDOOR SCIENCE SCHOOL

A Project
Presented to the
Faculty of
California State University,
San Bernardino

In Partial Fulfillment
of the Requirements for the Degree
Master of Arts
in
Education:
Environmental Education

by
Maleah Lynne McPherson
March 2005

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OUTDOOR SCIENCE SCHOOL

A Project
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March 2005

Approved by:



Dr. Darleen Stoner, First Reader

March 16, 2005
Date



Dr. Gary Negin, Second Reader

ABSTRACT

This paper includes a literature review which takes an in-depth look at environmental, outdoor, and experimental education, as well as the constructivist theory.

The project itself is a field manual for Camp Highland Outdoor Science School staff, located in Cherry Valley, California. The manual includes background information about the natural history of the area, as well as flora, fauna, lesson planning ideas, California State Standards in science and history and ideas to meet the standards, as well as journaling ideas and information.

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I would like to thank Dr. Darleen Stoner for all of her insight and advice on my project. She was always available and her support and help were invaluable. Thank you to Jeff Baierlein who also spent time and valuable energy on my project and for the help of Dr. Gary Negin.

I would also like to thank my husband, Kyle McPherson, Site Director at Camp Highland Outdoor Science School, for his motivational efforts, as well as for advice and information that made my project what it is.

Thanks to all of the Camp Highland Staff who gave me their input on the project and were excited about using the finished project. Thank you as well to Brett Tillman, Program Director of Camp Highland, for his help on flora and fauna, as well as the use of his pictures.

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CHAPTER ONE

INTRODUCTION

As a former instructor at Camp Highland Outdoor Science School, I realize that, although there are many field guides to answer natural history questions, there just simply is not time to look through all the books available to double check all facts that I was not confident about. Also, there was information that I believed to be true until I heard or read differently. Had I been able to use an instructor field manual with specific information pertinent to what I was teaching in the outdoors, I would have been able to avoid some of that misinformation to begin with.

This project has been designed to help other instructors at Camp Highland Outdoor Science School located in Cherry Valley, California. This field manual contains helpful suggestions and invaluable science information, including natural history such as geology, flora and fauna and local Native American information, as well as teaching suggestions and lesson planning ideas. It is designed to make the life of Camp Highland instructors more productive by giving them easy access to

accurate information and the tools they need to tailor their lessons to the needs of their students.

Purpose of the Project

The purpose of the project was to develop a field manual for instructors at Camp Highland Outdoor Science School to use in their lesson planning. This manual would be a useful tool for instructors to reference information, to assist in their lesson planning, and to help familiarize them with the local natural history. Most of the instructors are from other regions of the nation and for many working at Camp Highland is their first exposure to Southern California. There is an extensive two-week training when the staff arrive, but throughout the season, the plants change, and students notice phenomena in nature that are not discussed in training. This guide would be especially helpful to those instructors in giving students accurate information. With this guide, instructors will be better able to be dynamic in lesson planning and tailor learning to fit the needs of their trail group.

This field manual is designed for instructors at Camp Highland Outdoor Science School who are teaching groups of 10 to 20 fifth or sixth grade students while hiking on

trails during a week of outdoor school. The manual will contain information on chaparral and riparian flora and fauna identification; applicable California state learning standards and ideas for teaching standards; an activity guide with ideas for activities covering standards and topics; journaling tips; and local natural history including geology, climate, and Native American history. It is envisioned that this manual would be small enough to carry easily on day hikes and will be organized using different colors for different sections for easier use. It is intended to be used for reference in the field as well as study material while lesson planning. With this manual, instructors should be better able to tailor their lessons to their students by taking into account different learning styles. Also, this manual will help instructors give accurate information to their students.

Significance of the Project

This project is significant because most instructors at Camp Highland are new to Southern California and are fairly new at teaching environmental concepts to students. Once the two weeks of staff training are over, they do not have much of a chance to get feedback on their lesson planning skills or on the accuracy of their content. This

manual will help narrow that gap between perceived performance and expected performance. By having a guide they can easily refer to, they will have an easier time planning lessons to fit the curriculum and they will have a greater confidence in the accuracy of their lessons and statements. As a result, it is expected that their students will learn more by having lessons tailored to their needs and by being taught correct information.

the school should there be learned" (in Adkins & Simmons, 2002, p. 1).

Outdoor programs began in different areas that taught about nature through camping and hiking. Over time, these programs became broader as did the definition of outdoor education. Now, instead of a specific learning subject, outdoor education has begun to be more of a type of learning. For example, not all outdoor education programs teach the exact same subjects, and for some programs, the subjects change weekly. Each of these programs does, however, teach in a similar way: with children outdoors, learning hands-on, and, at the same time, interacting with their peers and building social skills. Outdoor education can have a social skills component. Some programs focus more on the social development than nature, and that "approach provides structured, group-based adventurous challenges, using involving living and expeditioning in the outdoors" (Neill, 2001).

A recent trend in the broad field of outdoor education has been a focus on place-based education. Place-based education "recaptures the ancient idea of 'listening to the land' and living and learning in harmony with the earth and with each other" (Woodhouse & Knapp, 2000, p. 2). Place-based education usually includes

conventional outdoor education methodologies to help students connect with their particular place in the world. It is hoped by proponents of this type of learning that place-based education would help achieve local ecological and cultural sustainability (Woodhouse & Knapp, 2000).

Although each program is different, there are some generally accepted goals for outdoor education as a whole. Hopkins and Putnam (1993) described three goals for outdoor education that they recognized as most important. These are to heighten awareness of and foster respect for self, through meeting challenges; others, through group process and decision-making; and the natural environment, through direct experience.

According to the American Camping Association, two other goals of outdoor education, specifically in a residential setting, are (1) getting to know each other better, by gaining a greater sense of independence and confidence, and having practiced and improved interpersonal skills; and (2) getting to know nature better, by gaining a greater awareness of ecological relationships and processes and the identities of local flora and fauna (in Perry, 1998). Students are also given some positive sense of their role as part of the solution to environmental problems. This is done through a

sustained group-living setting, including sharing of work projects, group problem-solving, time for personal interaction, and simple fun (Perry, 1998).

Stoner, Clymire, and Helgeson (1990) identified several goals for resident outdoor schools teaching outdoor education. They include the following: develop a comprehensive understanding of ecological concepts and their relationships, promote positive attitudes towards nature, simulate critical thinking, facilitate intergroup respect and understanding, improve peer socialization, promote positive self-concept, and improve relationships between teacher and student. Another current goal of many outdoor education programs is to create responsible environmental behavior.

Environmental Education

Environmental education can be traced back, in part, to outdoor education (Adkins & Simmons, 2002). It has evolved into something distinctly different than outdoor education, although many programs blur the boundaries of outdoor and environmental education. There are many different definitions of environmental education as it has been defined and redefined over the last 25 years. The definitions

are inherently broad and encompassing. An early definition which is the definition most commonly used today, was created by William Stapp through a graduate seminar in the Department of Resource Conservation and Planning of the University of Michigan's School of Natural Resources in 1969. This definition declares that "environmental education is aimed at producing a citizenry that is knowledgeable concerning the biophysical environment and its associated problems, aware of how to solve these problems, and motivated to work towards their solution" (in Disinger, 1983, p. 1).

In the 1970s, several others built upon the idea by Stapp and came up with their own definitions. In 1970, Roth defined environmental education as

...the process of developing a citizenry that is: knowledgeable of the interrelated biophysical and socio-cultural of which [man] is a part; aware of the associated environmental problems and management alternatives of use in solving these problems; and motivated to work towards the maintenance and development of diverse environments that are optimum for living. (in Disinger, 1983, p.1)

Also in 1970, the U.S. Office of Education, through the Environmental Quality Education Act, commonly called the Environmental Education Act offered this definition of environmental education:

...the term 'environmental education' means the educational process dealing with [man's] relationship with [his] natural and manmade surroundings, and includes the relationship of population, conservation, transportation, technology, and urban and regional planning to the total human environment. (in Disinger, 1983, p. 1-2)

Another common and well accepted declaration of the goals of environmental education was created in October 1975 by the United Nations Educational, Scientific, and Cultural Organization and has been titled the Belgrade Charter. The Belgrade Charter stated:

...the goal of environmental education is to develop a world population that is aware of, and concerned about, the environment and its associated problems, and which has the knowledge, skills, attitudes, motivations, and commitment to work individually and collectively

toward solutions of current problems and the prevention of new ones. (in Disinger, 1983, p.2)

Another powerful document in defining environmental education was created two years after the Belgrade Charter at the world's first intergovernmental conference on environmental education (Adkins & Simmons, 2002). At this conference, the Tbilisi Declaration was adopted. This declaration, built on the Belgrade Charter, suggested that the basic aim of environmental education is to help

...individuals and communities understand the complex nature of the natural and the built environments resulting from the interaction of their biological, physical, social, economic, and cultural aspects, and acquire the knowledge, values, attitudes, and practical skills to participate in a responsible and effective way in anticipating and solving environmental problems, and in the management of the quality of the environment. (in Disinger, 1983, p. 2).

As with outdoor education, a current trend in environmental education is to create responsible environmental behavior in participants. There are several recent theories on how to achieve this outcome. Matthews and Riley (1995, p. 21) concluded that "lectures,

excessive moralizing, externally derived codes of ethics/conduct, adults setting the ethics agenda, and teachers/leaders as authoritarian figures" have not worked in bringing about ethical, behavioral change in students. In their studies, these authors also found that the programs most likely to change behavior involve concrete, environmentally positive, action-oriented experiences; a relevant context; and long-term involvement, support, follow-up, and reinforcement by role models.

Many programs, as a result of these findings, have adopted the "two hats" theory. Environmental educators need to separate their own opinions and biases and present their students with all the facts, helping them examine and illuminate all the viewpoints, so that students may form their own opinions. Not only do educators have to let students form their own opinions, but they also must be able to accept these opinions. Educators must take off their environmentalist hat and put on an environmental educator hat, keeping their environmentalist ideas and opinions completely separate from their teaching as an environmental educator. "Environmental educators have the right and duty to be environmentalists, but the dual roles must adhere to the original premise—to keep each hat on its proper head, while utilizing to the fullest the

professional skills of the environmental educators”
(Engleson & Yockers, 1994, p. 167).

Experiential Education

The history of experiential education is much longer than that of environmental or outdoor education.

Experiential education, or learning by doing, has been a theory in education for a long time. Early on, outdoor education focused on learning by doing, or learning experientially (Adkins & Simmons, 2002). Experiential education is tied closely to constructivism as a learning theory.

Experiential education is not about active teaching, but rather about active learning (Hovelynck, 2003). Experiential education is often seen as an alternative to didactic, or systematic, learning. Hovelynck identified three sub-processes of learning through experiential education: recognizing, acknowledging, and reconnoitering.

Recognizing involves frustration, acknowledgement involves owning up, and reconnoitering involves exploring alternative options (Hovelynck, 2003). Recognition is the first step. Recognition involves recognizing patterns of behavior and recognizing frustration in those patterns. Recognition plays an important role in setting a learning

agenda and frustration. It helps make the pattern more visible, and generates the energy for change.

After these patterns have been recognized, learners become aware of their own share in these events. Learners acknowledge that they are, at least to some extent, the "maker" of the events that they further experience and they make a change (Hovelynck, 2003).

Reconnoitering is an open-ended process that is difficult to explain, but unavoidable for the learner after they experience recognition and acknowledgement. In this process learners decide how to act in the future: exploring alternative ways to change the pattern, or repeating the pattern and getting frustrated and being more acutely aware of it—which is also a change (Hovelynck, 2003).

In order for this type of learning to take place, the student needs space for learning which would involve appropriate limits so that they can experience their own patterns, permission for frustration so they may recognize these patterns and begin to deal with them, and challenge by choice so that they may set their own learning agenda (Hovelynck, 2003).

Kolb (1984), who had insightful work into the meaning of experiential learning, described some characteristics

of experiential learning. He included that learning should be conceived as a process, not measured in terms of outcomes, that process is continual, grounded in experience, and that learning results from resolving conflicts between opposing modes of adapting to the world. Kolb also believed that in experiential education the learning process involves holistic adaptation to the world, that it must involve interactions between the learners and their environment, and that learning occurs when students are creating knowledge.

Constructivism

The constructivist learning theory is an idea that knowledge is constructed, not discovered (Engleson & Yockers, 1994). Piaget was an early promoter of the idea, and the most important and revolutionary implication of his theory is that children construct knowledge from their actions on the environment.

Important elements of the constructivist theory are that learners construct knowledge and do not discover it; knowledge construction begins with observations of objects or events; knowledge construction is an individual event for which the learner must accept responsibility that cannot be shared; and the knowledge that is constructed is

dependent upon what the learner already knows and the belief in one's ability to learn (Engleson & Yockers, 1994).

Phillips (1995) identified three distinctive dimensions of constructivism: the active process, where the activity is social, physical, individual, or mental; the social process, where the concern is for the difference between individual knowledge construction and general human knowledge; and the creative process, where the focus is on whether knowledge is constructed by the creative individual mind or imposed from the outside. Each puts emphasis on the learning environment, although all argue that learning takes place in a social setting. Knowledge of the world comes to us in conversation, in argument, and in the way people talk about and share their interpretations and understandings. Such social interactions are key to cognitive growth, as it recognizes the significance of the role that language plays in learning (Graffam, 2003).

Summary

Combining information on constructivist theory with outdoor, experiential, and environmental education is what many residential outdoor science schools are attempting to

do. Although outdoor, experiential, and environmental education all have unique niches in the education field, defining each separate of each other is difficult, and the lines between them often blur in practice (Adkins & Simmons, 2002). Environmental education often takes place outdoors, combining with outdoor education. Lessons in outdoor education often utilize experiential learning for students to fully grasp subjects. "Strong and lasting lessons take shape when at least two of these practices are combined, but especially when outdoor, experiential, and environmental education are combined to support one another" (Adkins & Simmons, 2003, p. 2).

CHAPTER THREE

METHODOLOGY

Program Plan

Needs Assessment

After my first evaluation as an instructor at Camp Highland Outdoor Science School, I found that I was teaching some incorrect information to my students. I misidentified insect galls as fruit, and I misidentified a few flowers and parasitic plants. This evaluation was in the late spring, and my training had been in January. Obviously some plants and natural occurrences had changed during the spring.

This has happened to several other instructors, and after watching a few teach, I came to see a pattern in the slight misinformation that was given as a result of simply not knowing all the answers and not having the time to look them all up. This gave me my idea for this project. If instructors had a simple-to-use, concise field guide that was specifically designed for their site, they would be able to easily look up information and their lessons would be more accurate. Furthermore, if this guide also contained information on planning lessons, including an activity guide, California state standards and ideas for

including the standards in lessons, a glossary of useful terms, and a journaling guide, then instructors would use this manual on a more consistent basis and feel comfortable using it for its intended purpose as well: to aid in giving children correct information. Students deserve to have the best instruction possible, to learn correct information, and to feel important.

Goal

The mission of Camp Highland Outdoor Science School is to provide innovative educational opportunities that will awaken individual potential, cultivate a consciousness of community, while inspiring wonder and encouraging compassion for the diversity of our world. The goal of this project is to develop a manual that will carry out this mission.

Objectives, Strategies, and Measures

Objective 1: Compile information on chaparral and riparian flora and fauna, and local natural history including geology, climate, Native American history, and important terms.

Strategy 1: Read information from books, journals, and web sites.

Strategy 2: Visit the Malki Museum, located on the Morongo Indian Reservation on Fields Road near the

town of Banning, California which is run by the Cahuilla.

Strategy 3: Meet with Brett Tillman, Program Director of Camp Highland, and Kyle McPherson, Site Director of Camp Highland, to discuss local flora and fauna.

Measure: Are there at least five pages on each subtopic? Is there enough information that all reasonable questions regarding these subtopics could be addressed? Are there enough terms and definitions to form a glossary list that would have words from all subtopics?

Objective 2: Compile information on applicable California state standards, ideas for teaching these standards including activities, some which will involve journaling.

Strategy 1: Read California state standards and determine which are applicable to this program.

Strategy 2: Using California outdoor school curriculum guide (Stoner, Clymire, & Helgeson, 1990 as a guide, develop an activity guide that would meet each applicable California state standard.

Strategy 3: Meet with Maggie Wolfe, experienced outdoor teacher, for ideas on journaling with standards.

Measure: Are there standards for all subjects taught?
Are all standards addressed in at least one activity?
Is there a variety of journaling ideas that are each
tied to a standard?

Objective 3: Field test manual with several new and
returning instructors at Camp Highland Outdoor Science
School.

Strategy 1: Have at least three new and two returning
instructors use manual with a field group.

Strategy 2: Site Director and Program Director will
review manual and give feedback.

Strategy 3: Participating instructors will fill out a
short questionnaire.

Measure: Have at least five instructors used the
manual in the field? Have the directors reviewed it?
Are there at least seven completed questionnaires?

Objective 4: Revise manual based on questionnaire and
print manual.

Strategy 1: After reviewing questionnaire, meet with
the any participants who had a lot of constructive
criticism for clarification and further ideas.

Strategy 2: Using those ideas, modify lessons, or
information as necessary.

Strategy 3: Print copies for all instructors to use in the field and give continued feedback.

Measure: Were the ideas expressed in the questionnaire utilized in the revision? Are there enough copies for each instructor to use in the field?

Future Program Evaluation Plan

After field testing the manual, the feedback I received was overwhelmingly positive. There were a few constructive criticisms that I incorporated into the revised version, but it seems that this project will indeed fulfill the niche I intended.

In the future, the manual will be evaluated at the start of every fall season by returning instructors. The program director will periodically update the applicable California state standards as they change over time, and when new subjects are introduced and older subjects are phased out.

As this manual is meant to be helpful to the staff, it will be possible for each staff member to add to their manual as they see appropriate. Once a year, a duty manager will be assigned to look over the manual and see

if any revisions are necessary. These revisions would be made with the permission of the program director.

APPENDIX
FIELD MANUAL FOR CAMP HIGHLAND

SECTION I
INTRODUCTION

The foothills of the San Bernardino Mountains in the Camp Highland area are fascinating because of their unique combination of flora, fauna, geology, climate and history. This is a wonderful site for outdoor environmental education, as it offers excellent teaching opportunities for studying chaparral and riparian ecosystems, Native American history, and local geology along the San Andreas Fault. The location's climate is influenced not only by elevation and latitude, but also by its proximity to the mountains and desert and Banning Pass.

Chaparral Background

Most of the area is part of the chaparral ecosystem. Chaparral is found in a small area on the western part of the North American continent, as well as other continents. There are actually five climatic regions of the world with a chaparral ecosystem, i.e., California, Chile, the Cape region of South Africa, southwestern Australia, and the Mediterranean. Although the plant species differ, each region has similar climate with wildfires during the late summer and early fall (Armstrong, 1998). The chaparral has a Mediterranean climate, very hot and dry with mild winters and periods of long droughts in the summer. Some

have named the Chaparral the "Elfin" forest because the plants in the chaparral are mostly short woody shrubs. The chaparral is extensive in its coverage of Southern California, covering most of the mountainous region of the southern part of California, extending into Mexico, Nevada, and Arizona. The soil is rocky which discourages other plants to grow. The chaparral is mostly evergreen although the plants take on a brown, lifeless tone during the summer and during the winter they turn green rapidly. The elfin forest is diverse, with 150 different species found in the California chaparral. There are about 20 species that are dominant and about nine tenths of all growth are attributed to these 20 species. The chaparral in this region varies in elevation from 3,000 to 3,700 feet, although chaparral in Southern California can range from sea level to 8,000 feet at the upper edge.

The word "chaparral" comes from the Spanish "chaparro," or live oak. From chaparral, or perhaps directly from chaparro, comes the word "chaps," the leg garments that vaqueros wear to protect their legs from the scrub oaks. Scrub oaks, which are a type of live oak, are a common plant of the chaparral, growing larger than other plants in the area. Scrub oaks can be distinguished because they have acorns which grow an inch or two long.

By looking at the leaves alone, a new comer might not recognize the scrub oak as an oak at all. There are several types of scrub oak comprising 15 percent of the chaparral cover.

The winters in the San Bernardino foothills are short, moderate, and wet with long, arid, hot summers following. This causes plants to grow in the winter and rest in the summer, the reverse order of tree growth that other trees are accustomed to. The supply of rain in the winter is plentiful, but the season is very short lasting only a few months. The heat during the wet season is also lacking with Fahrenheit temperatures in the 50s. These two factors contribute to slow plant growth resulting in tough, hard plants with dwarfed stature (Gazis-Sax, 1999). The rain fall in the winter averages less than 14 inches, so root systems are "deep and widespread, anchoring plants while enabling them to gather both ground water and rain water efficiently" (Los Angeles Education Partnership [LAEP], 1999).

Although the majority of plants in the chaparral are short and elfin, there are also larger plants in the valleys and canyons, such as oak trees. The oaks are found between 3,000 and 3,400 feet in meadows and valleys.

In the upper elevations, 3,400 to 3,700 feet, the chaparral is different than the chaparral found in the lower elevations. The upper chaparral is adapted to colder winter weather and includes plants such as manzanita, chamise, our lord's candle, and scrub oak. The lower chaparral is frost, but not snow, resistant and includes plants such as chamise, scrub oak, and small canyon live oak (Sawyer & Keeler-Wolf, 1995). The plants in both the upper and lower chaparral have some similar adaptations to help them survive such harsh conditions. The leaves tend to be waxy and small with few pores, which reduces evapotranspiration. The leaves are light in color which helps keep the leaf temperature down, and many plants have hairs or fuzz on the lower sides of the leaves which help trap water vapor. In addition to the woody plants, there are several wildflowers in the chaparral, especially in the valleys and fields at Camp Highland.

Nutrients are recycled differently in the chaparral than in other areas. In most plant communities, fungus, bacteria, and invertebrates help break down dead material, returning organic compounds to the soil. In a Mediterranean climate, little decay takes place. The nutrients are used slowly by the plants, and the major soil rejuvenator is fire. The plants are very well

adapted to fire: they re-grow quickly after a fire; they have fire resistant wood; many have seeds that only sprout when heated by fire, and some actually spread fire with a natural grease (LAEP, 1999). In Southern California, the fire season is long, due to very dry plants and often fanned by the Santa Ana winds blowing towards the ocean. It only takes a few weeks after a fire for the chaparral to start to recover with a green velvety layer (Armstrong, 1998). It is estimated that an average stand of chaparral burned every 25 years before people started intervening.

Riparian Oak Woodlands Background

In addition to the chaparral, there is a small riparian zone around Smith Creek that drains the local foothills. This could be called a riparian zone as there is a perennial running water source, but it has also been called oak woodland, as the majority of plants in this area are oak trees. Both descriptions are correct and the area could be referred to as riparian oak woodland.

The riparian area here is important for several reasons. It provides diversity in plant life, which encourages diversity in animals. Riparian areas in arid environments can harbor 90 percent of the local biodiversity (Graham; 2004). Species composition and biodiversity can be used as indicators of disturbance in

forests. Although the plant diversity in the area is good, the amount of biodiversity needed for a sustainable use of the planet is unknown, and diversity in this region should be closely monitored (Onaindia, Dominguez, Albizu, & Garbisu, 2004). Another major role of the riparian zone is to disperse stream energies connected to high flows, permitting sediments to deposit and further the enlargement of the alluvial valley floor (Manci, 1989). These plant species surrounding the stream also reduce the "energy and quantity of floodwaters and regulate stream geomorphology, profoundly affecting local stream habitat and downstream water quality" (Dutcher, Finley, Luloff, & Johnson, 2004, p.334).

Riparian areas also act as shallow aquifers that recharge at high flows and drain at low flows (Manci, 1989). The plants and trees around the creek help polluted runoff from reaching the creek (Dutcher et al., 2004). Trees and plants around the creek act as a sponge, soaking water and nutrients from the soil. These plants also help hold the soil in place and reduce erosion along the downhill slopes due to rain which helps reduce surface runoff (Durham, 2004), and help regulate the temperature of the stream (Lyon & Gross, 2004), which affects the aquatic organisms living in the stream. In addition to

the importance of living plants, some dead plants play an important role in the ecosystem. In the riparian area, vegetation litter decomposes quickly, providing nutrient and humus rich soil (Manci, 1989). Dead trees, such as snags or cavities, are important to wildlife, as up to one-third of birds use them to nest or perch. Cavities in trees are also important to wildlife and are often used by smaller birds for nesting.

Although only a number of birds are common in the oak woodlands, there are about 110 species of birds that breed there. Another 60 or so species of birds use oak woodlands outside the breeding season, either as winter visitors or as migrants. In addition, 105 mammal species, 58 amphibians and reptiles, and an estimated 5,000 species of insects use the oak woodlands (Hopkins, 2001). There are also a variety of other trees, shrubs and flowering plants in the area. Around Smith Creek, many larger plant species grow, such as canyon live oak, maple, poison oak, mugwort, miner's lettuce, stinging nettle and some intrusive plants such as greater periwinkle.

Although this area gets as much rain and drought as the nearby chaparral, water runs in Smith Creek nearly all year long from snow melt in the upper foothills. This constant water source provides hydration for the thirsty

plants that live on the banks of the creek and for the animals that feed on the plants of the riparian and chaparral. This is a much smaller section of the foothills, consisting of much less area than the chaparral, but makes up for its lack of size with its extensive biodiversity, containing 90 percent of the local biodiversity (Graham, 2004).

Native American History

Camp Highland Outdoor Science School is located near Banning, California. Banning is between Mt. San Jacinto and the San Bernardino Mountains in the San Jacinto Pass. This pass is the lowest natural entrance into the fruitful section of Southern California, rising only 2500 feet compared to other natural passes rising 4500 feet or more. The climate is cooler than the nearby desert or San Bernardino valley, but hardy fruits are successfully grown in the wide, flat pass (Kroeber & Hooper, 1978). These factors made the pass area a desirable area for members of the Cahuilla tribe to inhabit.

The Cahuilla lived in an area of 2400 square miles in Southern California, moving there 2000 to 3000 years ago. They used plants and animals in the area for sustenance and natural disasters, such as flooding and earthquakes, could ruin their food supply. Most of their diet came

from Women and children gathered fruits, and men helped in the busiest harvest times. Acorns were the staple of the Cahuilla diet and were gathered every fall and ground or stored for later use. To be certain of a good harvest, oak groves were monitored each year so they could pick the acorns as soon as they were ripe, beginning with a three day harvest ceremony (Bean & Bourgeault, 1989). In addition to acorns, many other plants, perhaps as many as 300 different types, were used for food and other purposes. Men hunted animals such as mule deer, mountain sheep, and antelope. These were considered the most valuable game because they provided so much meat and tasted so good. Although large game were more valuable, Cahuilla ate much more meat from small animals, such as rabbits, squirrels, and chipmunks, because they were plentiful and easy to catch. They used bows and arrows to shoot animals, and they made their own arrow shafts from stems and branches of sagebrush and arrowweed.

In addition to gathering and preparing food, Cahuilla women busily made baskets. Baskets were the most important manufactured article to the Cahuilla. They made baskets in a variety of shapes and sizes, supplying many purposes. The baskets were of one type throughout, a variety of narrow coiled ware. Basket making was one of

the principal employments of the old women. The baskets varied in pattern, with a variety of formal decorations used to represent men, women, children, horses, deer, and other creatures. The baskets had flat bottoms for sitting upright on the ground, and they were exceedingly strong and durable (Barrows, 1967). In addition to woven baskets, women also made clay pots from clay found in the mountains. After adding water to the clay, women would shape it between a small smooth stone curved on one side and a wooden paddle on the outside. They also wove nets out of agave that were very strong and could carry 100 to 150 pounds when slung over the shoulder (Kroeber & Hooper, 1978).

Cahuilla children prepared for adulthood by playing games that taught them valuable skills. Some games were reserved for boys, such as tug of war, wrestling, racing, target shooting, and pretend battling. These games prepared them for hunting, fighting, and strengthened their muscles and skills. Girls played also, spinning tops, making string figures, juggling, and playing at jackstones. These games helped them develop nimble, strong fingers for collecting tiny seeds, grinding acorns, making baskets, and other daily tasks. There were also games that everyone, even adults, played, such as

kickball, shinny, and running races. These games helped keep them in shape and they entertained everyone. Adults also played gambling games, with baskets, tools, or other material items at stake. When boys and girls were older, they would participate in coming of age ceremonies. These ceremonies marked transition from childhood to a more adult status, with some responsibilities of full adults (Bean & Bourgeault, 1989). The male ceremony was known as *Hemvachlowin*, and initiated boys ten to eighteen years old. Before the ceremony, older men would chose which boys were ready for initiation. They would then go gather Jimsonweed, a toxic plant, and prepare a liquid from the plant. The ceremony lasted for five days, and on the fourth night the boys would drink the mixture of Jimsonweed, giving them a clearer mind and clearer blood. After the ceremony, they were taught how to dance and use the gourd rattle; they were also taught the enemy songs which were sang at special times. The female ceremonies were held at the time of each girl's first menstruation, during which she learned the social rules for women regarding menstruation and pregnancy. These rules, such as they may not eat salt, fruit, or meat during their menstruation, were in place to help girls avoid cramping (Kroeber & Hooper, 1978).

The Cahuilla lived in houses not grouped in a village, but scattered about as widely as the habitable portions allow. There are several types of common houses that Cahuilla build, the most typical being a *jacal*, a Mexican word derived from the Aztec *xa-calli*, meaning house of straw. The Cahuilla word for house is *kish*, but a *jacal* is commonly called a *samat*, a word meaning also the grass and brush from which a *jacal* is constructed. This is the most typical house to be found in the mountains and foothills. To accommodate most families, two or three buildings were needed, facing each other around a patio, or joined at the rear of one another (Barrows, 1967). Men were in charge of building the houses and most men knew several types of building styles in addition to the *jacal*, such as cave shelters, and cone shaped houses from cedar bark (Bean & Bourgeault, 1989). In addition to houses, other buildings were built in settlements, such as sweat lodges. The use of the sweat lodge was confined strictly to sweating, with ceremonies being held either under in a brush or a simple shade enclosure (Kroeber & Hooper, 1978).

Geology Background

The San Bernardino Mountains are part of the transverse ranges that run east to west. These mountains

are the only geological formation of significance in California to run east-west. Several mountain ranges make up the transverse ranges, and several high peaks are in the ranges, e.g. San Geronimo and San Jacinto. The San Andreas Fault obliquely transects the boundaries of this province and in this portion of its length, the San Andreas trends in a more east-west direction (Demouthe, 1994). These transverse ranges are caused by compression in the Big Bend of the San Andreas fault, with the Pacific plate pushing north, and the pressure on the North American plate heading south, relatively (Harden, 2004). The Big Bend is thought to result from westward movement of the Sierra Nevada relative to the Mojave Desert, along the Garlock fault (Wallace, 1991). As a result, the entire region is squeezed together. The mountains and many faults in the region are an expression of this squeezing. This squeezing has produced both uplifting to form mountains, and it has also caused other areas to be pushed down, creating basins. The transverse ranges are one of the earth's most rapidly uplifting areas, and the steep, rugged mountains along the Big Bend are evidence of this rapid uplift (Harden, 2004). The major faults in the Transverse Ranges trend roughly east-west, or are roughly parallel to the San Andreas (Demouthe, 1994).

Due to the compression, most of the faults in the region are those related to compression, such as reverse faults. When blocks of rocks are compressed, one block slides over the other, with the hanging wall sliding over the foot wall. The reverse fault is also known as a thrust fault if the fault is only slightly inclined. In many cases, these faults have not ruptured the ground at the surface, but the ground surface is buckled where the fault projects to the surface (Harden, 2004). There are some buried faults that have no surface expression. In the San Gorgonio Pass area, the San Andreas Fault interacts with other faults, including the San Jacinto fault zone, and becomes fractured from San Bernardino to Indio, about 110 km (Sieh, Yule, & Spotila, 1996). These faults, along with the San Andreas Fault in other regions, are right lateral strike slip faults, meaning the blocks appear to be moving to the right of each other. The closest major fault to Camp Highland Outdoor Science School is the Banning fault, running at least 40 km at the Southern base of the San Bernardino Mountains, with an inactive western segment extending all the way to San Bernardino. This fault is very well defined by the foothills to the north and the flat valley to the south. It is the Northern boundary of the San Gorgonio Pass area. The most recent

surface rupture has been during the Holocene period and the fault has an unknown slip rate, as it is part of a complex fault zone near the San Gorgonio Pass (Jennings, 1994). In 1986, the Banning fault east of Camp Highland ruptured in a 5.6 magnitude earthquake in the North Palm Springs Area rupturing from 200 mm to 20 km in some segments (Wallace, 1991). The faults dip to the North and the fault has a potential to rupture in magnitude of seven or eight along the San Andreas Fault system (Sieh, et al., 1996).

Most mountains have deep granite "roots" under them, supporting their weight (Blythe, Burbank, Farley, & Fielding, 2000). The San Bernardino Mountains have no such "roots," although some granite has intruded the basement rocks of the mountains, leading scientists to conclude that these mountains are large folded, faulted and uplifted sections of the earth's crust, caused by a growing bend in the San Andreas fault (Harden, 2004). The oldest exposed rocks in the San Bernardino Mountains are Proterozoic in age and include gneiss and amphibolite. During the Mesozoic period, the Precambrian rocks were intruded by granitic bodies, at least two distinct generations, one Triassic in age and the other Late Cretaceous (Blythe, et al., 2000). These intrusions are

similar to those of the Sierran batholith, but much smaller. The majority of the older rocks in the San Bernardino Mountains are similar to those of the Mojave Desert and Basin and Range Provinces. They include metasediment rocks that formed on the passive margin of western North America between 900 to 300 million years ago. The original sedimentary rocks were metamorphosed to marble, schist, gneiss, and quartzite during deep burial, faulting, and folding. The basement block also contains ancient igneous and metamorphic rocks, which are up to 1.7 billion years old and are similar to those found in the interior of the North American continent (Harden, 2004).

SECTION II
CALIFORNIA SCIENCE STANDARDS
AND THEIR IMPLICATIONS FOR RESIDENTIAL
OUTDOOR SCIENCE SCHOOLS

While classroom teachers are pushed to cover standards, these are just suggestions for you. Use it as a jumping off point, as a tool in lesson planning for where the students might be, depending upon their grade level. The ideas for each standard are brief and meant to help you come up with more, detailed ideas. These standards for grades four, five, and six, are all for science unless otherwise indicated. The first number is the grade level, the second is the section of science, and the letter is the subsection.

Investigation and Experimentation

(These may be applicable to any of the environmental curriculum.)

4.6b. Measure and estimate the weight, length, or volume of objects.

4.6c. Formulate and justify predictions based on cause-and-effect relationships.

4.6d. Conduct multiple trials to test a prediction and draw conclusions about the relationships between predictions and results.

4.6e. Construct and interpret graphs from measurements.

4.6f. Follow a set of written instructions for a scientific investigation.

5.6a. Classify objects (e.g., rocks, plants, leaves) in accordance with appropriate criteria.

5.6b. Develop a testable question.

5.6c. Plan and conduct a simple investigation based on a student-developed question and write instructions others can follow to carry out the procedure.

5.6d. Identify the dependent and controlled variables in an investigation.

5.6e. Identify a single independent variable in a scientific investigation and explain how this variable can be used to collect information to answer a question about the results of the experiment.

5.6f. Select appropriate tools (e.g., thermometers, meter sticks, balances, and graduated cylinders) and make quantitative observations.

5.6g. Record data by using appropriate graphic representations (including charts, graphs, and labeled diagrams) and make inferences based on those data.

5.6h. Draw conclusions from scientific evidence and indicate whether further information is needed to support a specific conclusion.

- 6.7a. Develop a hypothesis.
- 6.7b. Select and use appropriate tools and technology (including calculators, computers, balances, spring scales, microscopes, and binoculars) to perform tests, collect data, and display data.
- 6.7c. Construct appropriate graphs from data and develop qualitative statements about the relationships between variables.
- 6.7d. Communicate the steps and results from an investigation in written reports and oral presentations.
- 6.7e. Recognize whether evidence is consistent with a proposed explanation.
- 6.7g. Interpret events by sequence and time from natural phenomena (e.g., the relative ages of rocks and intrusions).

Geology

4.4a. *Students know* how to differentiate among igneous, sedimentary, and metamorphic rocks by referring to their properties and methods of formation (the rock cycle).

Students may find examples of different types of rocks and have to figure out the method of formation with clues from the instructor.

4.4b. *Students know* how to identify common rock-forming minerals (including quartz, calcite, feldspar, mica, and

hornblende) and ore minerals by using a table of diagnostic properties.

Using properties such as color, luster, and hardness, students may identify common minerals found at camp.

4.5b. *Students know natural processes, including freezing and thawing and the growth of roots, cause rocks to break down into smaller pieces.*

Students may see evidence of larger rocks breaking down, or they may participate in an experiment to see how easy it is to break rocks.

6.1c. *Students know lithospheric plates the size of continents and oceans move at rates of centimeters per year in response to movements in the mantle.*

Using examples of plate tectonics visible from camp, students may see how slowly the plates are moving relative to each other through pictures or explanations.

6.1d. *Students know that earthquakes are sudden motions along breaks in the crust called faults and that volcanoes and fissures are locations where magma reaches the surface.*

Students may see evidence of faults from camp, and may create their own faults, using props such as silly putty or play dough.

6.1e. *Students know major geologic events, such as earthquakes, volcanic eruptions, and mountain building, result from plate motions.*

While hiking, students will see mountains formed by plate tectonics and earthquakes. Instructors should take advantage of this teaching opportunity to explain briefly why the mountains are there.

6.1f. *Students know how to explain major features of California geology (including mountains, faults, volcanoes) in terms of plate tectonics.*

Instructors explain the existence of the local mountains, with visual aids, such as students dancing plate tectonics and faults.

Native Skills

(History) 4.2.1. *Discuss the major nations of California Indians, including their geographic distribution, economic activities, legends, and religious beliefs; and describe how they depended on, adapted to, and modified the physical environment by cultivation of land and use of sea resources.*

Students may hear or act out legends, and may learn, through lecture or example, how local tribes used the hills to survive.

(History) 5.1.1. Describe how geography and climate influenced the way various nations lived and adjusted to the natural environment, including locations of villages, the distinct structures that they built, and how they obtained food, clothing, tools, and utensils.

Students may learn about how Cahuilla used the local plants in everyday life for food, clothing, tools, and housing by seeing these plants, or by using these plants in a similar manner.

(History) 5.1.2. Describe their varied customs and folklore traditions.

Students may play native games or participate in other activities, such as crafts, that are similar to native customs.

Plant Study

4.2a. *Students know plants are the primary source of matter and energy entering most food chains.*

Students may play a food chain game, or participate in a skit or other interpretation.

5.2e. *Students know how sugar, water, and minerals are transported in a vascular plant.*

Students may "build a tree" to discover how materials are transported, or they may dissect a plant and learn about each part they find.

5.2f. *Students know plants use carbon dioxide (CO₂ molecules of sugar and release oxygen.) and energy from sunlight to build molecules of sugar and release oxygen.*

Students may participate in a photosynthesis skit, or they may participate in another photosynthesis explanation.

6.5a. *Students know energy entering ecosystems as sunlight is transferred by producers into chemical energy through photosynthesis and then from organism to organism through food webs.*

Students may participate in a food chain game, or a web of life.

Birding

6.5c. *Students know populations of organisms can be categorized by the functions they serve in an ecosystem.*

Using bird adaptations, students may categorize local birds by their niche in their ecosystem.

6.5d. *Students know different kinds of organisms may play similar ecological roles in similar biomes.*

After watching birds, students may be asked to name birds in another ecosystem that fill the same role.

6.5e. *Students know the number and types of organisms an ecosystem can support depends on the resources available and on abiotic factors, such as quantities of light and water, a range of temperatures, and soil composition.*

Students may conduct an experiment regarding what birds they observe, and consider variables that influence the bird population.

Aquatic Study

4.3a. *Students know ecosystems can be characterized by their living and nonliving components.*

Students may study the invertebrates in the stream, as well as the water and air contents.

4.3b. *Students know that in any particular environment, some kinds of plants and animals survive well, some survive less well, and some cannot survive at all.*

Students may study the invertebrates in the stream and discover if they are pollution tolerant or intolerant, and relate their findings to other animals in that environment.

4.6c. *Formulate and justify predictions based on cause-and-effect relationships.*

Students may conduct experiments on the water quality and predict effects on the ecosystem based on their results.

4.6d. Conduct multiple trials to test a prediction and draw conclusions about the relationships between predictions and results.

Students may be asked to predict how polluted the stream is, and conduct an experiment with multiple trials to draw results that will be compared to their prediction.

Orienteering

4.1b. *Students know* how to build a simple compass and use it to detect magnetic effects, including Earth's magnetic field.

Students may, after using traditional compasses, build their own simple compass out of a magnetized needle and paper.

6.7f. Read a topographic map and a geologic map for evidence provided on the maps and construct and interpret a simple scale map.

Students may read a topographic map of the area, and locate landmarks based on the map and their observations.

Watershed

4.5c. *Students know* moving water erodes landforms, reshaping the land by taking it away from some places and depositing it as pebbles, sand, silt, and mud in other places (weathering, transport, and deposition).

Students may see signs of erosion and discuss how it has changed the land, what the land was like before and what it may be like in the future.

6.2a. *Students know* water running downhill is the dominant process in shaping the landscape, including California's landscape.

Students will see examples of how water running downhill has shaped the local landscape.

6.2b. *Students know* rivers and streams are dynamic systems that erode, transport sediment, change course, and flood their banks in natural and recurring patterns.

Students may see examples of how streams change over time, how they change course, erode banks, and transport sediment.

Environmental Action

5.3d. *Students know* that the amount of fresh water located in rivers, lakes, underground sources, and glaciers is

limited and that its availability can be extended by recycling and decreasing the use of water.

By participating in water cycle games, students may learn that the water is limited and they will experience ways to decrease their water use throughout the week.

5.3e. *Students know the origin of the water used by their local communities.*

While hiking, students may see the lack of fresh local water. They may then look at maps depicting where their water comes from.

6.6b. *Students know different natural energy and material resources, including air, soil, rocks, minerals, petroleum, fresh water, wildlife, and forests, and know how to classify them as renewable or nonrenewable.*

Students may play a renewable resources game, and be asked to relate resources as renewable or nonrenewable.

6.6c. *Students know the natural origin of the materials used to make common objects.*

Students may dissect items to find their origins and classify their origins as renewable or nonrenewable.

Wildlife Ecology

4.2a. *Students know plants are the primary source of matter and energy entering most food chains.*

Students may create food chains through games or skits.

4.2b. *Students know producers and consumers (herbivores, carnivores, omnivores, and decomposers) are related in food chains and food webs and may compete with each other for resources in an ecosystem.*

Students may make a web of life, or play a game that involves food chains and food webs.

4.2c. *Students know decomposers, including many fungi, insects, and microorganisms, recycle matter from dead plants and animals.*

Students may explore the compost area, meet decomposers, and see the compost that they produce.

4.3a. *Students know ecosystems can be characterized by their living and nonliving components.*

Students may go on a scavenger hunt for biotic or abiotic items in a local ecosystem.

4.3b. *Students know that in any particular environment, some kinds of plants and animals survive well, some survive less well, and some cannot survive at all.*

Students may explore the differences between the oak woodlands and the chaparral and discover why certain plants thrive in their environment.

4.3c. *Students know many plants depend on animals for pollination and seed dispersal, and animals depend on plants for food and shelter.*

Students may play an interdependence game, or may see examples of how plants and animals depend on each other.

5.2g. *Students know plant and animal cells break down sugar to obtain energy, a process resulting in carbon dioxide and water.*

Students may play food chain games that demonstrate how energy flows, and that this energy is in the form of sugar.

6.5b. *Students know matter is transferred over time from one organism to others in the food web and between organisms and the physical environment.*

Students may learn how matter cycles by playing cycle games and activities.

6.5c. *Students know populations of organisms can be categorized by the functions they serve in an ecosystem.*

Students may categorize organisms they find outdoors by their function.

6.5d. *Students know different kinds of organisms may play similar ecological roles in similar biomes.*

Students may be asked, after observing organisms, to name organisms that might play the same role.

6.5e. *Students know the number and types of organisms an ecosystem can support depends on the resources available and on abiotic factors, such as quantities of light and water, a range of temperatures, and soil composition.*

Students may compare two ecosystems and relate the differences between them to certain abiotic factors.

Tracking

6.5c. *Students know populations of organisms can be categorized by the functions they serve in an ecosystem.*

Students may categorize animals that they track in terms of their niche.

6.5d. *Students know different kinds of organisms may play similar ecological roles in similar biomes.*

Students may learn animal gates and determine how each gate could help define an animal's role.

6.5e. *Students know the number and types of organisms an ecosystem can support depends on the resources available and on abiotic factors, such as quantities of light and water, a range of temperatures, and soil composition.*

Students may extrapolate information from the animals they track and the amount of animals found. They may use abiotic factors to help explain some of this information.

Weather

5.3a. *Students know most of Earth's water is present as salt water in the oceans, which cover most of Earth's surface.*

Students may play water cycle games during which the water is mostly in the ocean.

5.3b. *Students know when liquid water evaporates, it turns into water vapor in the air and can reappear as a liquid when cooled or as a solid if cooled below the freezing point of water.*

Students may conduct a water cycle experiment to make water evaporate and reappear as a liquid.

5.3c. *Students know water vapor in the air moves from one place to another and can form fog or clouds, which are tiny droplets of water or ice, and can fall to Earth as rain, hail, sleet, or snow.*

Students may experience the water cycle, or participate in water cycle games, during which the clouds will release precipitation.

5.4a. *Students know uneven heating of Earth causes air movements (convection currents).*

Students may observe birds soaring in the air currents.

5.4b. *Students know the influence that the ocean has on the weather and the role that the water cycle plays in weather patterns.*

Students may predict the weather using different instruments and relate their predictions to the effect that the ocean has on weather.

5.4c. *Students know the causes and effects of different types of severe weather.*

Students will see the effects of heavy rains and droughts and may discuss the causes of these weather.

5.4d. *Students know how to use weather maps and data to predict local weather and know that weather forecasts depend on many variables.*

Students will predict weather using different instruments, as well as weather maps.

5.4d. *Students know earthquakes, volcanic eruptions, landslides, and floods change human and wildlife habitats.*

Students may see the effects of minor landslides and floods, and may discuss how those changes have effect wildlife and human activity.

6.4a. *Students know the sun is the major source of energy for phenomena on Earth's surface; it powers winds, ocean currents, and the water cycle.*

Students may play games or participate in activities that reinforce the sun as the source of energy for wind, and the water cycle.

Invertebrates

4.2c. *Students know decomposers, including many fungi, insects, and microorganisms, recycle matter from dead plants and animals.*

Students may examine compost or a worm bin, and see matter recycled. They may also go on a scavenger hunt for other decomposers.

4.3d. *Students know that most microorganisms do not cause disease and that many are beneficial.*

Students may study beneficial microorganisms under a microscope and may play games and activities that reinforce microorganisms as beneficial.

SECTION III
USING STORIES WITH STUDENTS
AND JOURNALING TIPS

Story Telling

Students generally like being read too. If you are worried that your students will feel like you are treating them like little kids by reading them stories that are for a younger audience, here are some helpful hints.

Tell them that these stories are not at their reading level, because if you read a story that was at their level, you would be reading aloud for days! However, reassure the students that these stories have excellent illustrations and deal with the topics they are learning very well. These stories are a good introduction.

If you can get them to buy into the story, and that you're not trying to treat them like a little kid, they will get into it. After explaining that this story is not at their age level, I have them pretend that they're little kids and say something cheesy like "Goody!" At that age level, they never want to be talked down to or treated like little kids, but they actually enjoy pretending to be little kids.

I have them get comfortable, telling them they can even lie down if they want, but they must be at least

sitting. I also let them know my expectations for how they should behave while I am reading. I tell them I am easily distracted, and I'm a much better storyteller with a good audience, so during the story, no talking, hold questions for the end. If there are any disruptions, I pause and look at the student and wait.

Story Telling And Journaling

Using stories as a journaling topic is a very successful idea. I love reading stories to my students with a journaling topic in mind for a magic spot afterwards. It gives students more of a reason to be actively listening, and, depending upon the group, I get great pleasure reading their thoughts of my story. It helps me see where I am at as an instructor by what they write; I can tell how well my directions were written and worded and how well I emphasized certain points in the story. It works well with any book that you might read on trail.

One idea for magic spots with purpose that has really helped my students is to give each student a sheet with the directions for both magic spots in general and for the particular assignment. I have made a series on half sheets for various subjects and stories. When I'm planning my day in the morning, I pick up a packet with

the book and 20 directions inside and head off. Make sure to remind the students not to write on the paper, and make sure to get them back. I try to tell the students that if they would like to share when they come back, there will be an opportunity, and if they don't want to share that I will still read them to myself. If there are exceptional writing examples, I ask the students if I may copy their work and use it as an example later. The examples can really help children who are struggling, but be careful in how you introduce the examples otherwise all the writing could be just like it.

In my directions I try to encourage creativity and let the students express themselves anyway they wish: poem, story, list, etc. They may write in another language if they are English as a Second Language (ESL) students and if they get done I try to encourage them to draw illustrations or just enjoy themselves. In true magic spot fashion, if a student doesn't finish or doesn't even start the assignment, it doesn't really bother me. As long as they follow the cardinal "rules" of a magic spot (being quiet, staying in one spot, and enjoying nature), I'm happy.

Almost any story can be used in for a magic spot assignment. Here are a few of my favorite books to read on trail and a few prompts to give for them.

- *The Giving Tree* by Shel Silverstein

I know, many call this book the worst children's environmental book ever. I use it as an example of how people misuse the environment and how people honestly think that it makes everyone happy. I use a prompt asking if the boy loved the tree or if he was just using it and why or why not. It's better to use this story with sixth graders or high fifth graders who can realize why the boy goes to the tree (when he wants something).

- *What Good is a Cactus* by Peter Marchand

After reading this, a good prompt is for the students to rewrite the story with a plant at their house or a plant they met this week.

- *The Great Kapok Tree* by Lynne Cherry

A prompt I like is to have the students rewrite the story with another prominent plant in the ecosystem you're sitting in, such as Scrub Oak or Live Oak.

- *Just a Dream* by Chris Van Allsburg

This is a great environmental action book... Like *The Lorax* by Dr. Seuss but shorter and without rhyming.

A prompt I use is how are you similar to the boy (both positive and negative)? What are some actions that you will do differently after you get home from camp?

- *I'm in Charge of Celebrations* by Byrd Baylor

What things did you experience or see this week that are worth celebrating? Describe in detail, name the event, how will you remember it in the future.

There are so many more books to read and discover, and there are so many things you can do with each book. Please add to this list!

Journaling Without Books

In addition to using the journals with magic spots, there are so many other things you can do with them. Here are just a few ideas:

Definitions. Have students write down important words that you will be using regarding your subject.

Geology. Have students find a pet rock and draw it, name it, describe its scent and texture. You could have them decide what type of rock it is (almost all of the rocks here are metamorphic) and why, or what minerals are

in the rock (this works great if you have a sheet of common minerals, the hardness, color, and a description of each... for testers they can use their fingernail, a penny, and a nail to narrow down the hardness). *Everybody Needs a Rock* by Byrd Baylor is a good story for this subject.

Native Skills. Have students come up with a legend to explain something that happens in nature (it might be a good idea to tell a legend first as an example). Or they could make up their own written language (use hieroglyphics as an example), make a key and write a phrase or sentence. Then switch with a friend and have them translate their writings. This also works good if you have extra time at archaeology.

Plant Study. Have them draw their favorite plant and label its adaptations. Or, after talking about plant adaptation, have them make up a plant and use at least 3 adaptations to help it survive. If you have a plant key or two, you could also do a plant key lesson where students collectively identify plants and some of their adaptations. Leaf rubbings would also be a great addition to a journal.

Birding. Before going birding, have students hypothesize what they think they will see birds doing

(flying, eating, etc). Break students into groups and have each group tally a different behavior, while all groups try to identify birds (if books and binoculars are available it makes this much easier). At the end, read the tallies and conclude things (Is this true of all birds at all times? What are some of the variables? Do you think we saw all the birds that were outside?).

Aquatic Study. Have students record (and tally) what type of biotic things they found in the water and whether they are pollution tolerant, intolerant, or intermediate. If testing the stream for quality, test a few different areas (of the stream and maybe some standing water around camp) and record the results to compare them.

Orienteering. Have students record their stride length. Use the map with them and have them record lengths of trails in feet based on their strides. This would work great if you had a pedometer or two that recorded steps. You could also have them draw a sound map (of things they hear sitting quietly), or a detailed map of one area in camp (the grove, the aviary, etc).

Watershed. Find a blank page in their journals, and draw a stream ahead of time that goes across everyone's page when all the journals are put together (like a puzzle). Keep track of what order they go in by writing a

number on the page. Then have students develop their land any way they see fit. Put them together and decide which way the stream goes. Assign pollution points as a group (in the form of poker chips if available) to each property (one for farm, five for mall, etc). Explain how the pollution flows downstream when it gets in the water, and have the people upstream give their chips to the bottom person (who could have oceanfront property).

Environmental Action. If you do earth pledges on the Environmental Action Center with paint, they can also put their painted hand on their journal (because there will be paint left over) and write their pledge there as well. Even if you don't use paint, on Friday you could trace your hands and write a pledge (something small and specific that you don't do now that you really could do... using less energy is too broad).

Wildlife Ecology. You could keep track of numbers in games with populations, such as Jays and Juncos, Oh Deer, Quick Frozen Critters, any Coyote/Deer games and have students predict future populations. Students could also do adaptation here (like the plant activity). You could have students compare ecosystems (riparian and chaparral) by answering questions and recording data (plant

descriptions, soil and air temperature, soil description, etc).

Tracking. Students could keep track of animal signs they see each day by listing or drawing. They could categorize animals as bounders, gallopers, diagonal, or bipedal.

Weather. Have them keep track of the weather each day, maybe even at the beginning and end of each day. Do a temperature reading, barometer reading, wind speed and direction, rain gauge (if applicable) or anything else that you have the equipment for. You could also have them decide what types of clouds were out (looking at a chart) and record that as well. At the end of the week, you could draw conclusions from all of the data.

Invertebrates. Similar to the watershed activity, students could create a fictional invertebrate and build it a habitat (remembering a food source, shelter, and restroom) along a stream (or without a stream). If you use the stream, you can talk about how the invertebrates affect each other.

Team Building. Students can define team work (without using the words team or work) and read definitions aloud, writing phrases on a white board to refer to later. Students can write down goals for

themselves to help them be a better team member. After each activity, they can rate themselves on how well they are filling their goals. If things aren't going well, have students write down what they need to do differently as a team and read them (yourself) aloud (make sure to omit any names, especially in a blaming context).

Other Adventure Activities: Have students create goals for themselves and write them down. Or you can have students draw and label all the important equipment for their activity. You could also have them write down any important terms used. This is great for kids who don't have cameras to help them remember their adventure day.

SECTION IV

LESSON IDEAS

These lessons are meant to supplement your lessons, at a time when you wish you had a quick lesson to cover that topic. They are meant to be used as part of a complete lesson, with an introduction, and conclusion, and are in no way full lessons on their own.

Geology

Rock Cycle Game. Similar to the game evolution, after explaining the rock cycle, make up symbols or actions for each type. Metamorphic could be smushing hands together with pressure, igneous could be a volcano action, sedimentary could be making "layers" with arms or hands. Come up with a short story that would explain one way a rock could change from one type to another type to the third type and back to the first (metamorphic, igneous, sedimentary, metamorphic for example). Have all students start as the first type and play ro-sham-bo (rock-paper-scissors or RPS) with each other. The winner goes on to the next rock type, doing the motion and finding someone else doing the same motion to challenge to RPS again. The loser does not change rock types until the loser wins and does the same motion until winning. When the students become the first type again, give them a

high-five and have them hang out in the winner's circle until others have finished. (There will be a few players who never quite reach the goal.)

Erosion Explosion. After discussing how plants help hold the soil in place, have students help you brainstorm some factors that cause erosion, such as ice, rain, and wind. Pick students to represent each of these "eroders." Then, have them help you think of some plants that hold the soil in place that you've seen that week. Pick some students to be the plants. The rest are dirt balls. Their job is to get from one line to the plants without being tagged by the eroders. The eroders are in a line parallel to the dirt balls and cannot move forward or backward, only side to side. The plants are on the other side of this line. Dirt balls have two attempts to get to a plant. Otherwise, they are eroded. After the dirt balls have all found a plant or are eroded, start the next round with new eroders and plants. You could also change some variables and see how it affects the dirt balls: more eroders, less plants for example.

Plate Tectonics Dance. After explaining how plates can move in relationship to each other (over or under - convergent, next to - transform, or away from - divergent), make up dance moves for each (Divergent -

stand next to each other and back away, convergent - go under one's arm, transform - stand next to each other and slide by). Practice these moves with students (in pairs). Then start humming a random song (I like the theme song to "Doug"). Shout out the words in a random order and watch the students try to do the motions. Get faster (gradually) until it is hard to follow along.

Rock Experiment. Put some clean rocks together in a jar (plastic or something that won't scratch or break if possible) with water. Have students take turns shaking it. Eventually some "dirt" will appear. Talk about where the dirt came from (the rocks) and how rocks break down over time.

Moh's Scale. After discussing how minerals are part of rocks, have students find rocks that have big sections of the same mineral (or color). Each group will have a test kit and a key. The test kit should include a nail, a penny, and their fingernail. Demonstrate how to use the test kit (first try scratching the rock with the fingernail, then penny, then nail), and how you know if the object has been scratched or the rock has been scratched. By using those three things in addition to mineral color and description, students should be able to identify the minerals using a key which has common

minerals, such as mica, epidote, feldspar, quartz with their hardness, color, and a brief description.

Native Skills

Rock Chess. This is a fun game to play that is a variation of a game played by local native tribes. Have each pair of students gather ten rocks and arrange them in a triangle (row of four, three, two, and then one). Each player takes a turn and takes away one to four rocks. The rocks need to be in the same row (in any direction). The object is to not take the last rock.

Hula Hoop Throw. This is similar to a game that Native American children would play to practice hunting. Divide into groups of three to five students. Two players roll a hula hoop back and forth between them while other players try to throw a stick through the hoop. The players rotate and every player should get to throw at least three attempts and roll. After the groups have practiced, you could hold a competition between the groups with each team getting the same number of attempts.

Indian Soccer. This game helped children improve on their speed, as well as team work and mobility. Divide the group into two teams. Set up two hula hoops on opposite sides of the playing area. Each team starts behind one of the hoops and has a tennis ball. Each team

is trying to get their tennis ball into the opposite hula hoop. They can not touch the ball with their hands, and whichever team gets their ball into their hoop first wins.

Plant Study

Every Plant for Themselves. Have each student think of a plant. While they are thinking, spread out numerous blue, brown, and yellow cards at their feet while they are in a tight blob. Explain that they are about to be that plant for a few minutes and as that plant they cannot move. They need to use their roots to suck up as many resources as possible. They may move either their left or right foot for this job but not both. Once you say the magic word, the students will gather the cards with their root foot (like pivoting in basketball). Have them count how many of each resource they got. Ask if plants need the same amount of resources and brainstorm plants or ecosystems in which plants need more of one or another resource. Before playing another round, have each plant (student) decide how much of each resource they need (you could set an expectation that they will need at least x amount of one resource). Play another round and see if they met their goal.

Photosynthesis Experiment. This is a good experiment to set up before you leave for your hike to illustrate

that plants make oxygen. Get a large, clear container full of water. Put a jar with leaves in the container upside down, making sure to get rid of all air bubbles. For a more convincing experiment, use a control jar with nothing but water in it. Come back later and there should be an air bubble in the jar with the leaves. This is a good experiment to talk about jumping to conclusions, as it is difficult to say that the air bubble is indeed oxygen without further study, although your students will assume that it is.

Each One Teach One. This activity works great with specific subjects, such as plant adaptations. Without another adult, I would arrange half of the students in pairs in a circle. That half will teach first. The second half will each start at a different teaching pair and learn what the pair has to teach them. You could give each pair cards, or choose a simple phrase for each to remember. When doing plant adaptations, I have each partner say half of a sentence like: this tree has thick bark to protect itself from insects, or this plant has smelly leaves so animals won't eat it. After each learning pair ends up where they started, the learners and teacher switch and the new learners rotate around the

circle. When you are finished, every pair should have learned everything and taught one thing.

Birding

Birding Watching Experiment. I like to set up bird watching as an experiment. I ask students what they think birds do all day, when we know they're not shopping, playing video games, and going to school. Together we make a list of what we think birds are doing. Then, we go bird watching. While we are watching birds, in addition to identifying what birds we see, we keep a tally of what they are doing. Most of the tally marks will be in the flying, vocalizing, and feeding (if you are watching active bird feeders) categories. As a conclusion, after announcing the results of the tally, discuss what variables would change this study. (Most sedentary birds are difficult to see because of camouflage, and the weather has a lot of impact on bird activity.)

Jays and Juncos. This is a fun game for interdependence and to reinforce the food pyramid concept. In this game, the juncos (or another small bird) eat seeds from the giving tree (played by you or a responsible student). They get one to three seeds per visit depending upon how sweetly they sing. There are three songs they can sing. My three songs are "junco, junco, junco, junco,

jun-coooo," "cheeseburger, cheeseburger," and "I'm so hungry, I'm so hungry, I'm so hun-greeee." They may sing one song or all three. After getting some seeds, they must put them in their nest before coming back for more seeds. They cannot move their nests. It takes three seeds to make a baby and their entire life is making as many babies as possible (for an added incentive, I tell them that the juncos with the most babies will get to be something more exciting in the following round). There are two jay birds in the game as well. In the real world, this doesn't often happen, but in a pinch, jays will eat baby juncos. In this game, baby juncos are the only thing jays eat. They cannot take from the giving tree, but must find junco nests and take their seeds. They need five seeds for a baby (I tell students that I'm going to choose people who are paying attention to my directions to be the jays). If you have some identifiers for the jays like bandanas or hats, the students would be able to easily spot them. After the directions and you've chosen two jays, give the juncos a nest (a cup works well) and have them hide the nest while the jays aren't looking. After that, the game begins and the juncos sing sweetly (I let students crowd, because birds wouldn't wait in line) for seeds. After five to seven minutes, the round is over and

students tally their babies. It's good to keep track of the final baby count for each round. After one round with jays and juncos, you could introduce another bird, like a hawk or eagle that could only eat jay babies by tagging the jays. After each round, ask the successful bird what they did to have so many babies. Some students might complain that someone is cheating (either by "puppy guarding" or cutting in line or some other way). Use this as an opportunity to discuss real bird habits, and whether or not those rules of play are the same rules that birds use.

Aquatic Study

Stream Quality Monitoring. In the nature center, there is a stream monitoring kit. In the kit are very specific, easy-to-follow directions for each test. The important thing in stream monitoring is that students understand the qualities of water, and the importance of each test. It would be better to do fewer tests that students really understood than do all the test.

Macro-Invertebrate Study. In the nature center, there is a large tub with the supplies for a macro-invertebrate study in the stream. Find a spot near the stream where there is a clear opening for your supplies, where students could safely get near the stream without

compromising the streams structural integrity, and where there is little stinging nettle. Divide your group into small groups of three to four students, and distribute a net and bug boxes for each group. Most of the invertebrates they find should be indexed on the sheets in the box as pollution sensitive, moderate, or tolerant. Have them find their invertebrates on the sheets using the pictures and note which sheet they find it on (the pollution tolerant, moderate, or intolerant sheet). After about 20 minutes or when your group's attention seems to be waning, call your group back together, and decide based on their data if the stream is polluted.

Orienteering

Course. After teaching about pace and bearings and finding pace length, your students may be ready to try a course as a group. Ask a director for the bearings and lengths, and begin the course in front of Bobcat. Take turns shooting bearings, for far bearings, have a student sent out as a marker so that they can stand where the bearing is shot at and the students can walk towards him. There should be a stone in the ground that is color coded with the bearing and length for the next destination.

Making a Simple Course. For students who really understand bearing and length, break them into small

groups and have them make a short course (with three or four destinations) for another group. At each destination, there could be a piece of a word puzzle and the first group to complete their puzzle wins.

Making a Compass. After using real compasses and explaining how they work, have students make their own. Give each group of four to five students a magnetized needle or nail, and a variety of other objects, such as: a cork, thread or string, modeling clay, a plastic deli container, water, a ping pong ball, paper, and scissors. Explain that there is not one correct way to make a compass, and have them try to create a compass using any of the materials they wish. When they have finished, have them check their validity with a real compass. Share the finished products with the other groups.

Watershed

Tarp. This activity is great for a sunny day. Find a tarp that will fit over all of your group's legs while sitting in a square. Once the tarp is placed over the group, have students create mountains by bending their knees. Explain that they have just made a watershed. Ask for some examples of pollutants in a watershed. For each pollutant mentioned, put something that might represent it

on the tarp (dirt, cooking oil, sugar, food coloring, etc). After a variety of pollutants are represented on the tarp (you can also talk about point and non-point sources of pollution), talk about where it all ends up. Have someone be (or take turns being) the rain, and spray water all over the watershed. The water should, ideally, drain to one spot on the tarp. You can also use this opportunity to mention that most watersheds drain to the ocean, so the pollutants end up there ultimately.

Nature Watershed Trail Activity. Similar to the journal activity, draw a stream or river along the trail. Section it off into lots and have each student or pair develop their lot however they see fit, using items in nature to represent their development. Afterwards, choose which way the stream is flowing, and go down the stream with each student explaining their site. For an extension, assign pollution points to each site and have them flow downstream, with the last person ending up with all the pollution. For an even higher gross-out factor, you can let the students know beforehand that their drinking water comes from the stream.

Environmental Action

Garbage Collection. One of the easiest and fastest (depending upon the area) ways to include environmental

action is to pick up garbage. This can be incorporated on any trail, and at the end of the week, you could categorize the garbage scientifically. If there is enough paper garbage you could make new paper out of it. You could also take the students to the Environmental Action Center and have them separate the recyclables.

Compost. This could have an environmental focus, a soil cycle/decomposition focus, or another focus altogether. For an environmental focus, look at how much organic material is in garbage (as a percentage). Show compost in various stages and how it's recycling the nutrients into soil. For a decomposition focus, look for fungus, bacteria, and invertebrates, in the compost. Look at various stages and how the cycle is completing itself.

Earth Pledge. On the wall of the Environmental Action Center are examples of earth pledges. You can make new pledges on top of these, another place, or in your journals. When I created the wall, it was my intention that eventually you could see no metal and only painted hands. I like to have paint hands and stick them on the wall, and then with the extra paint on the hands, help them make a hand print in their journal. Have students think of something specific that they can do, that they don't do now, that they will do in the future. Using less

energy is much too general. Have them write their pledge on their hand, both on the wall and in their journal.

Paper Making. Have students rip paper into small pieces (this could be garbage you found, or reuse paper in the box, or paper from the recycling bin). Blend paper with a lot of water and then dump the mixture in a shallow bin. With the screen face up, put a paper screen into the bin. Slowly pull the screen up and out of the water. There should be a thin layer of paper pulp on the screen. Quickly flip the screen upside down onto newspaper. With a sponge, blot off the excess water from the paper. Slowly pull off the screen. The paper should be left on the newspaper. Let it dry overnight and carefully peel the paper off the next day. If you are having a hard time peeling the paper, a butter knife can be very helpful.

Wildlife Ecology

Pit. This is a game that is best played with two to three trail groups, and is a great indoor activity for rainy days. It does take a little preparation. Beforehand, make three sets of cards, with three different food chains. In each chain, there should be seven things, such as: sun, flower, aphid, lady bug, lizard, roadrunner, fungus, or sun, plankton, fish, squid, seal, orca, sea gull, for example. Make seven cards of each thing, so

each set has 49 cards. Explain food chains, making sure that students understand that all chains begin with the sun, then producers, consumers, and end with a decomposer or scavenger. Split the students into seven equal groups and have each group go on the outside of the circle or room so that each group is together and there is a large open spot in the middle. Each group will get one set of cards (7) that all say the same thing. Their goal is to trade with the other groups to create a food chain. To trade, each group will send one member into the trading pit (in the middle of all the groups), with a card. They cannot show their card and all trades should happen in secret. The traders should walk in the pit and say "trade, trade, trade" until they find someone else also saying trade. When they exchange cards, they must go back to their group and another member can trade. Only one group member should be up at a time. When a group has seven different cards, they yell "Food Chain" and trading stops. Everyone makes the best chain they can with what they have. The groups' chain will be given a number score, with 10 points for each energy transfer (up to 70 points). After each round, review the food chain that was just put together before moving on to the next round (with

different producers, consumers, and decomposers or scavengers).

Skulls. In the nature center are some skulls. With your group, discuss how to figure out what animal belonged to a skull. First, measure the skull. Multiply by five and you have a good estimation of the body length. By looking at the eye placement, you can figure out if the animal was a predator, prey, or both (eyes on the side is prey, eyes in front is predator). By looking at the teeth, you can figure out if the animal was an herbivore, omnivore, or carnivore. If the teeth have no canines (usually a large space instead), the animal was an herbivore. If the teeth have canines, and the back teeth are flat or indent a little (like human teeth) the animal was an omnivore. If the teeth have canines and the back teeth are pointy, the animal was a carnivore. There are also other adaptations that help distinguish animals from each other. Animals with ridges on their head have a strong jaw, animals with large eyes may be nocturnal, animals with aerodynamic heads may be good swimmers or runners. Looking at all of these factors, have your students come up with a hypothesis. You can divide them into groups of five or six and work on other skulls using the same process and wait until the end to tell them the

correct answers, or you could work in one large group and tell them the correct answer at the end of each one.

Web of Life. Have students decide on a plant or animal that they can be, or have plant and animal cards that they can hold. If possible, have a sun as well, and include a human in your group. Start a ball of string with the sun (if available), and from there have the group help you figure out what affects the sun, or whatever is holding the string ball. When receiving the ball, that person needs to hold on to a piece of the string before passing the ball, so when everyone has had the ball there is a complex web of string. You can reinforce the web of life concept by having someone tug on the string and see who feels it. When you're done talking about the web of life concept, pick an animal to "kill" that people are afraid of (bear or mountain lion work well). Have that animal drop their string. When their string is loose, instruct students to drop their string as well. Eventually only the sun will have the string. End this activity by talking about what would happen if all the bears were gone (there would be more of what they ate, and in turn, less of what that animal ate).

Herbivore, Omnivore, Carnivore. Chose students to be herbivores, omnivores, and carnivores. You could start

with realistic ratios or even numbers of each. This is a tag game in which herbivores can't tag anyone, omnivores can tag herbivores, and carnivores can tag herbivores and omnivores. If an animal get tagged, they're out for the rest of the round. Make sure to have some way to tell the three groups apart. Set clear boundaries for the game. Stop the round after about half of the animals are out. Keep track of animals dead by category (maybe in percentages since the numbers may not be equal), and play using different variables (more of one type of animal, less of another).

Tracking

Gate Game. After explaining the four major gate types (galloping—walking with your hands and feet together while putting your hands behind your feet while walking, like a rabbit, diagonal—walking with your hands and feet one at a time with opposite hand going with opposite foot, like dogs and cats, bounding—walking with your feet and hands together while putting your hands in front of your feet, like a weasel, and XXX—walking with your hands and feet one at a time with left foot going with left hand and right foot going with right hand), demonstrate each type. Have students practice walking all four ways. Have a race where students have to walk a certain way. You could

divide into four groups and have each group be one style, or it could be a relay with each team member walking a different way.

Weather

Weather Station. Have students keep track of the weather each day, maybe even at the beginning and end of each day. Do a temperature reading, barometer reading, wind speed and direction, rain gauge (if applicable) or anything else that you have the equipment for. You could also have them decide what types of clouds were out (looking at a chart) and record that as well. At the end of the week, you could draw conclusions from all of the data.

Invertebrates

Metamorphosis Game. This game is based on the game evolution and is the same as the rock game with the players starting off as eggs, then larvae, then pupas, then adults. Obviously you would need to have motions for the egg, larvae, and pupa. The egg could be squatting and walking around holding your knees, the larvae would pretend to be fat, and the pupa could pretend to sleep. After most players are adults, start over again.

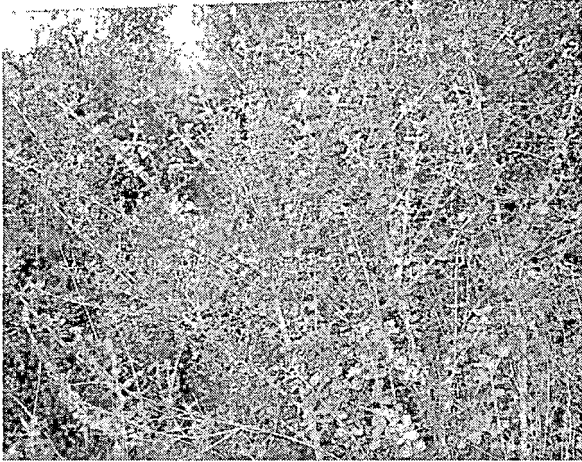
Create a Bug. This can be done with objects in nature or items that you bring with you. Have students

create a bug and a small habitat for the bug. Have students create special adaptations for their bug, and share their creation at the end of the activity. You could also do this activity with a camouflaged twist, having the students hide their bug in a certain area and you as the instructor would have to find it.

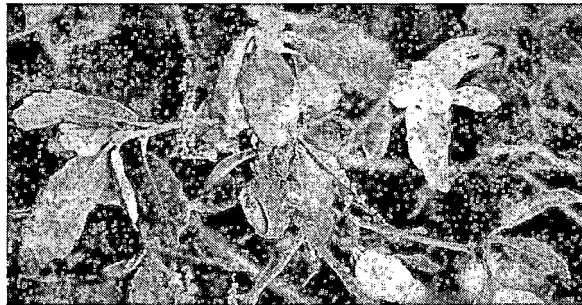
SECTION V

PLANT IDENTIFICATION

Chaparral



California Scrub Oak (*Quercus turbinella*) is easily mistaken for holly. It usually grows as a spreading shrub and has small leaves one inch long tipped with sharp spines.

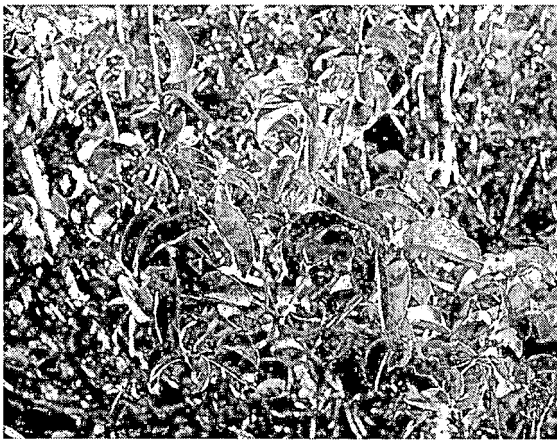


It produces small acorns, but the leaf shapes and acorns are variable, making identification tricky at times. The leaves are shiny, small, and lobed (Kricher & Morrison, 1998).



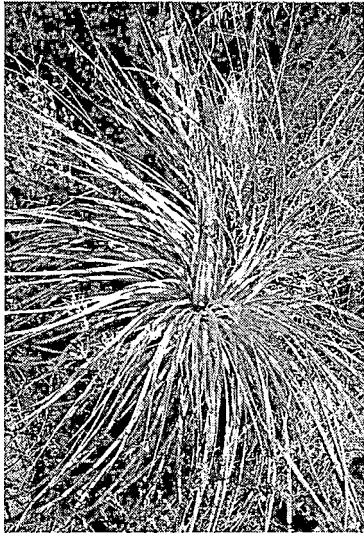
Blue Elderberry (*Sambucus mexicana*) is a shrub or small tree that is common in California. It can be identified by

its opposite, pinnate compound leaves with five to nine long, dark green leaflets. Leaves can be evergreen, and the bark is brown and furrowed (Kricher & Morrison, 1998). The flowers are creamy white and form an umbrella shape in late spring. This plant was highly prized by the Cahuilla and the elderberries, which are blue or white, were gathered in large quantities and cooked in a sweet sauce (Barrows, 1967).



Sugarbush (*Rhus ovata*) is a stout evergreen with rounded leathery dark leaves that appear trough-like and are very pointy at the apex. The shrub can grow five to fifteen feet tall. In the spring, pinkish white flowers give way to red berries (Collins, 1972). Sugarbush berries grow in full clusters and were cooked in water and eaten by Cahuilla. A tea was also made from Sugarbush and was drunk for coughs and pains in the chest (Barrows, 1967).

Our Lord's Candle (*Yucca whipplei*) is the common yucca to the chaparral. It grows sharp, dagger-like leaves in a basal rosette, producing one large flowering stalk four to eight feet tall. The stalk produces creamy



white flowers
(Collins,
1972).
Cahuilla would
cut the stalk
before
flowering when
full of sap

and roast it in section in a fire pit for one night. The seed bags were also eaten, as well as the flowers, which when in bloom are picked and cooled in water (Barrows, 1967).



Prickly Pear cactus
(*Opuntia spp.*) has a series of flat, jointed stems. The flowers vary from yellow to pink appearing early spring. The fruits, called tunas, are

purple when mature. They can be eaten raw or made into a syrup or jam (Barrows, 1967).

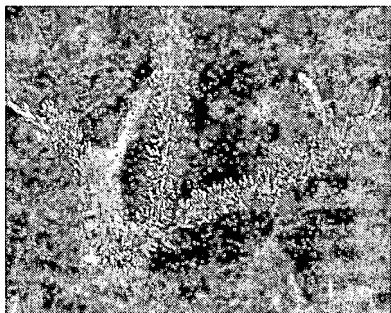
Manzanita (*Arctostaphylos sp.*) have leaves that are oval, shiny, thick, and leathery and the bark is reddish with the outer part peeling off in thin strips. The leaves are usually pointing up, towards the sun to

minimize surface area for sunlight. There are nearly 60

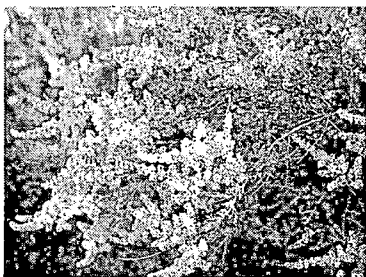


manzanita species in the genus *Arctostaphylos*, and most are associated with the chaparral. They are difficult to distinguish from each other and many hybridize (Kricher & Morrison, 1998). Manzanita berries were

enjoyed by the Cahuilla, being eaten raw or pounded into a flour (Barrows, 1967).



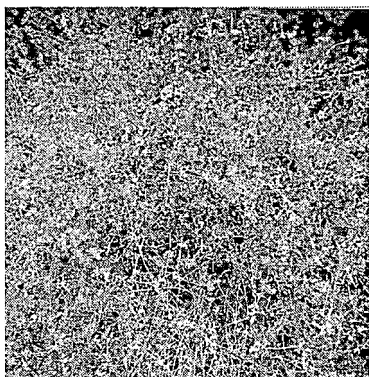
Chamise (*Adenostoma fasciculatum*) is also called Greasewood, and is the archetypal chaparral shrub. This plant with needlelike leaves and small, white,



5-petaled flowers, produces many seeds that germinate only after exposure to heat from fires (Kricher & Morrison, 1998). Cahuilla made a drink from Chamise that was given to sick cows

(Barrows, 1967).

Deerweed (*Lotus scaparius*) is a rounded shrub often two to three feet tall with slender green branchlets. It



is slightly woody at the base and has yellow flowers with a reddish tinge that can be seen almost any time of year, but are most common during spring and summer (Raven, 1966).



Tree Tobacco (*Nicotiana glauca*) is native to Southern America and has become a familiar shrub in southwestern California. The gray-green leaves are two to five inches wide on a stalk one to two inches long. When in bloom, the plant produces yellow flowers which are borne in loose terminal bunches about one and a half inches long (Raven, 1966).



Although this plant is non-native, several other tobacco plants grow in Southern California and were used by Cahuilla for smoking and ceremonies

(Barrows, 1967).



Jimson Weed (*Datura metelodies*) is a large groundcover plant producing large white flowers (Forey & Fitzsimons, 1986). The leaves smell nutty, and are extremely poisonous. The plant produces prickly, spiny fruits in the late summer and fall (Collins, 1972). This plant was used by Cahuilla in ceremonies for initiating boys, and was also frequently used to produce death (Barrows, 1967).



Stinking Gourd (*Cucurbita foetidissima*) has large velvety yellow trumpet flowers lure you closer for a better look. Stinking gourd fruits mature in the fall. They are about the size of a softball and are a needed winter food source for mammals on the preserve. The plant has a very pungent smell, especially in the leaves.

Wild Buckwheat (*Eriogonum fasciculatum*) grows in dry areas and its flowers are tinged green, when they are not brown. The long stalks are in loose clusters and



terminate with the erect flowering stalks. They are closely related to the Cultivated Buckwheat (Forey & Fitzsimons, 1986). The leaves from

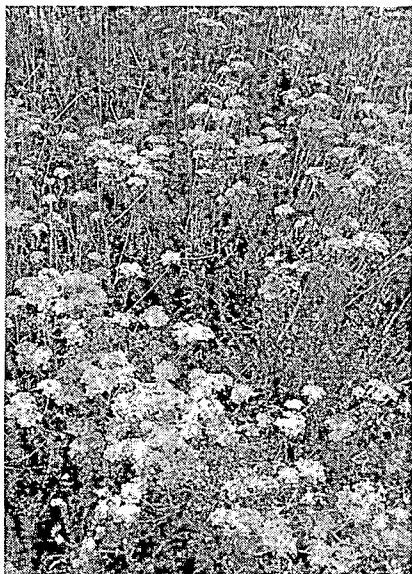
this plant were used to make a decoction which was drunk

by Cahuilla for pain in the stomach and in the head (Barrows, 1967).



Wild Mustard (*Brassica* sp.) have yellow flowers with four petals. The plant is hairy and tastes slightly like

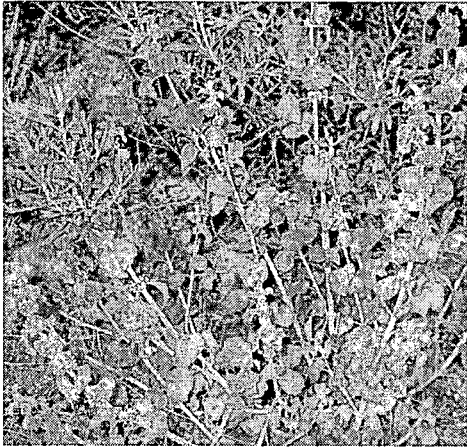
traditional mustard if eaten in small amounts. The stems grow 6 inches to 3 feet tall. The base leaves are broad and deeply lobed while the upper leaves are smaller.



Golden Yarrow (*Eriophyllum confertiflorum*) has flowers borne in large flat clusters on top of erect slightly woody stems. Each

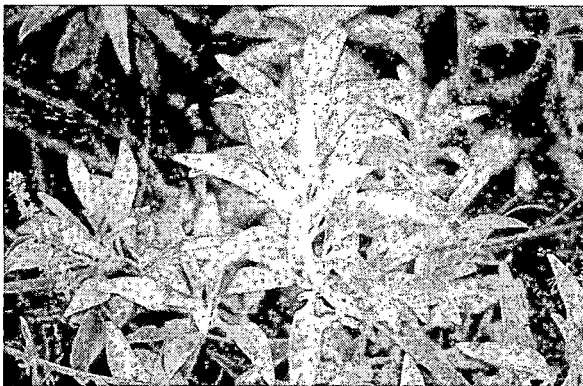
flower head has four to six outer ray florets and a

central disk of tubular florets. These plants can grow two feet tall and are distinguishable by their green feathery pinnate or bipinnate leaves (Forey & Fitzsimons, 1986).



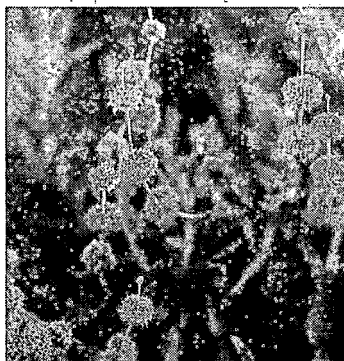
Horehound (*Marrubium vulgare*) is in the mint family, with a square stem, but has no mint odor. The plant has round, wrinkled leaves and is common in fields (Collins, 1972). It has small, white flowers in the

spring that produce a spiny, burr-type fruit. The sap is bitter but when sweetened is used to make candy.



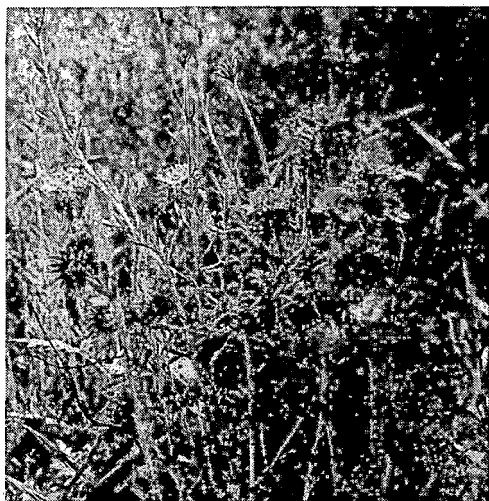
White Sage (*Salvia apiana*) can reach over six feet in height. The leaves have a whitish tint and can be four inches long with shallow teeth

along the margins and short appressed hairs. The flowers are lavender-white and are loosely grouped in full bunches (Raven, 1966). The plant is very aromatic, especially when rubbed. Sage plants had an exceedingly wide range of uses, including food (Barrows, 1967).



Black Sage
(*Salvia
mellifera*) has
smaller leaves,
mostly one to
two inches long

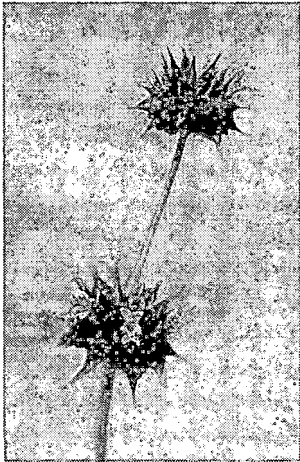
and is the most abundant sage in
the grassy hillsides. It can grow
six feet in ideal conditions. The leaves are elliptical,
dark green above, slightly wooly and lighter beneath
(Raven, 1966). Flowers are found in compact whorls
similar to Chia and are usually pale blue to white. The
plant is very aromatic, especially when rubbed. Sage
plants had an exceedingly wide range of uses, including



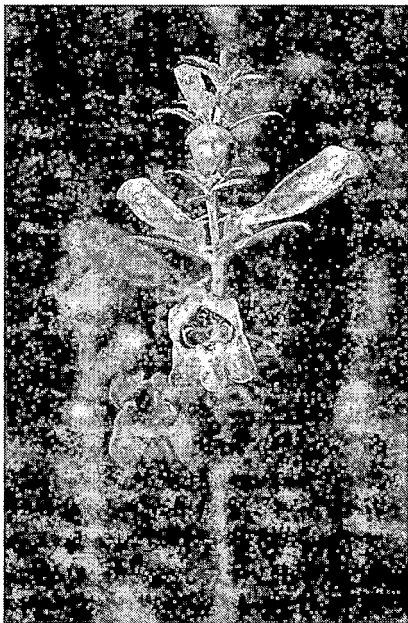
food. They are also an
excellent source of honey
(Barrows, 1967).

Wild Heliotrope (*Phacelia
distans*) is a hairy plant up to
three feet tall with a fiddle-
neck shaped terminus containing
purple to blue flowers on the

erect stems. The leaves alternate and are pinnate or deeply divided (Forey & Fitzsimons, 1986). The stem is spiny and fuzzy, and the leaves look like ferns.



Chia (*Salvia columbariae*) is a very recognizable plant, look for the ball like flower clusters and the square stems typical of the mint family. It grows 4 to 20 inches tall and has flower clusters at intervals (Collins, 1972). Cahuilla used the seed, parched and ground into a meal called pinole. When steeped in water the seeds also made a thick drink (Barrows, 1967).



Foothill Penstemon (*Penstemon heterophyllus*) has hundreds of one inch violet flowers on three foot spikes in the spring and summer. It's native to dry hills in the coast ranges. It likes full sun, is drought tolerant, and needs good drainage. The flaring, tubular flowers are densely held on 20 inch spikes. The glossy, bluish-green

foliage is evergreen and the plant will spread to 2 feet wide (Collins, 1972). It attracts hummingbirds & butterflies.



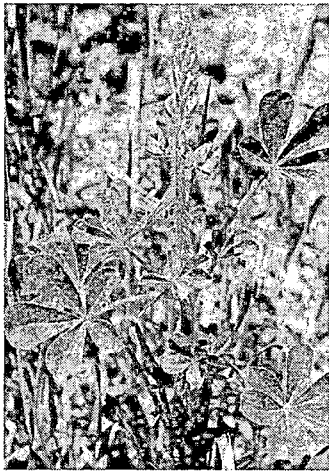
Mariposa Lily (*Calochortus macrocarpus*) has a single light blue-green leaf appears before the stem rises a foot or so to produce one or several of these lovely cup-like flowers. It is in flower from April to June. The flowers are hermaphrodite and are pollinated by insects. The plant requires well-drained soil. It cannot grow in the shade (Collins, 1972). A poultice of



the mashed bulbs has been used to treat poison ivy rash (Barrows, 1967).

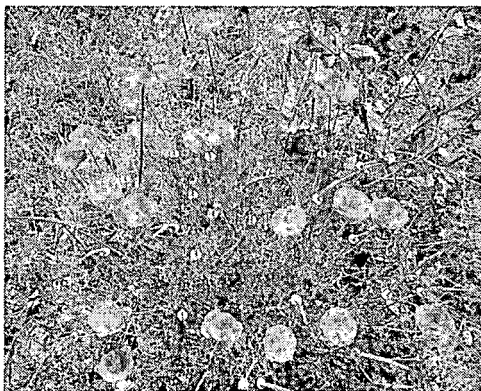
Blue larkspur (*Delphinium parryi*) is a delicate little flower that was once used to heal wounds and in the field, to kill parasites, which prey especially on those living under difficult conditions. It is said to keep away scorpions and

venomous snakes as well as more ethereal threats, like ghosts. It is a member of the buttercup family, which is very poisonous, and should not be ingested (Collins, 1972). It is distinguishable by its single stalk with several blueish purple flowers.



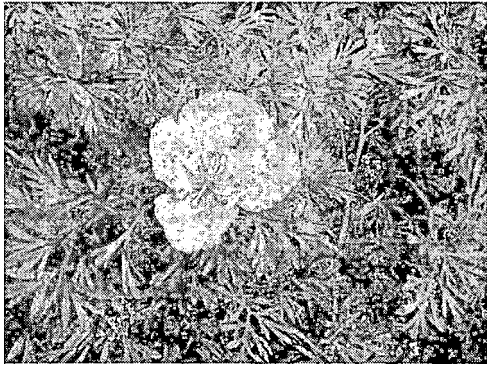
Prickly lupine (*Lupinus sp.*) is characterized by deeply cut leaves with lanceolate leaflets radiating from the tip of the leaf stalk. The flowers are predominantly blue or purple in color and are borne on long-stemmed spikes in May and June (Collins, 1972). The stalk has several flowers above the

leaf stems.

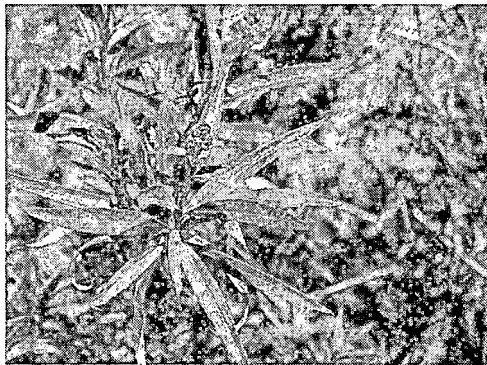


California Poppy

(*Eschscholzia californica*) is an upright, compact annual or tender perennial native to California, and the state flower. It is extremely drought tolerant. The brilliant orange, cup-shaped flowers, are 2-4 inches in diameter, borne individually on long stalks. The blooms close each night at sunset or on dull days. The



finely divided foliage is bluish-green in color making identification easy prior to flowering (Collins, 1972).



Yerba Santa (*Eriodictyon californicum*) is an evergreen shrub native to the western United States. Yerba Santa is an evergreen aromatic shrub with woody rhizomes, typically growing to a height of 3 to 4

feet. The dark green, leathery leaves are oblong to lanceolate and covered with shiny resin. They grow in an alternate arrangement and are pinnately veined and usually serrate (Raven, 1966). The taste of the leaves is balsamic and the flowers and leaves smell pleasantly aromatic on a warm day. Yerba Santa is an expectorant used to treat coughs and congestion, as well as aiding in loosening and expelling phlegm. It works to dilate bronchial tubes, so it is useful to drink a cup of the tea to ease asthma and allergy attacks. A poultice of the mashed leaves is used for sores and wounds.

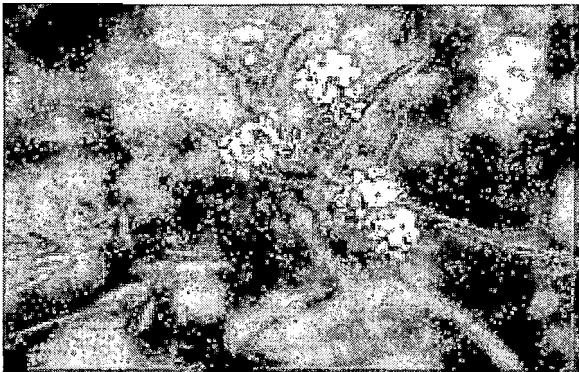


Intermediate Fiddleneck

(*Amsinckia menziessi* var. *intermedia*)

have bristly hairs on the foliage and stems. The flower clusters are often one sided on the stem and at least slightly coiled, and at times during development resemble the scroll of a

violin. Flowers have 5 yellow petals with orange and red marks (Raven, 1966). It has many small, straight trumpet-like flowers along upper edge of a fiddleneck or shepard's crook.



Popcorn flower

(*Plagiobothrys*

nothofulvus) are so-called because the coiled stems and tiny, open flowers of both genera are white and

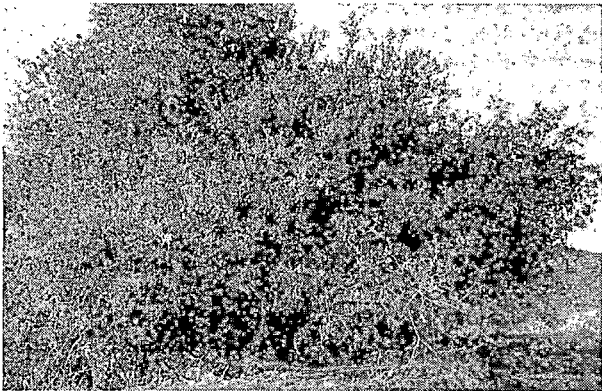
clustered at the top of the coil, looking like popcorn (Raven, 1966).

Riparian Oak Woodlands

Interior Live Oak (*Quercus agrifolia*) has holly-like, convex leaves one to three inches long with sharp spines along the margins. The leaves are thick and leathery.



Acorns produced by these trees are long and sharply pointed. The tree is wide spreading, with major branches twisting and often touching the ground.



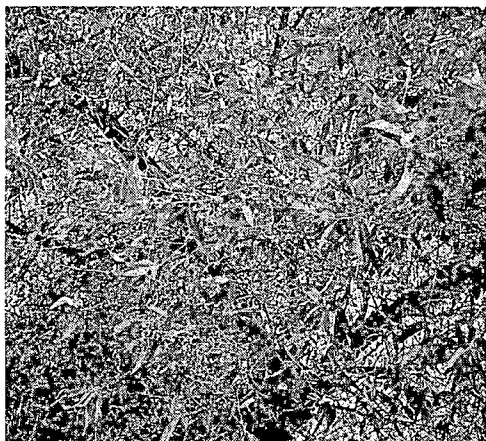
There are occasionally multiple trunks due to stump sprouting after fire (Kricher & Morrison, 1998). The acorns from

live oak trees were the staple of the Cahuilla diet, although the acorns were not of great economic importance to the Cahuilla themselves (Barrows, 1967).



California Sycamore (*Platanus racemosa*) is long-lived and grows up to 100 feet tall. The tree usually has multiple trunks that can be up to

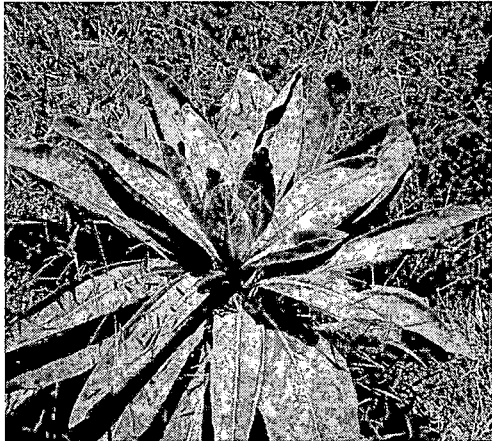
five feet in diameter. These trunks are usually reclining and resting along the ground. The sycamore is a canopy species that is deciduous (Raven, 1966).



Arroyo Willow (*Salix lasiolepis*) can be found on the premises as a small tree, but is often shrubby in habit. It has leaves two to five inches long and broader in their upper half. The leaves are smooth and green, and the plant is found in the wettest areas (Raven, 1966). The wood from the willow tree was used by Cahuilla for making bows to kill small game (Barrows, 1967).



Stinging Nettle (*Urtica dioica*) has a much more immediate and less intense pain than Poison Oak. The hairs on the stalk and leaves cause the stinging pain, compared to the oil on the leaves of the Poison Oak causing the dermatitis. The stems grow three feet or taller with opposite leaves that are lanceolate-ovate (Collins, 1972). The leaves can grow two to five inches long and are edible if the hairs are removed, either by boiling or by crumpling.



Woolly Mullein (*Verbascum thapsus*) has very soft, thick, and large leaves growing close to the ground in a rosette. The stalk produces yellow flowers with five petals growing closely together (Forey

& Fitzsimons, 1986).



Miner's Lettuce (*Claytonia perfoliata*) is distinguishable by the upper leaf completely encircling the stem, with flowers arising from this stem. The leaves are edible and taste watery and similar to other

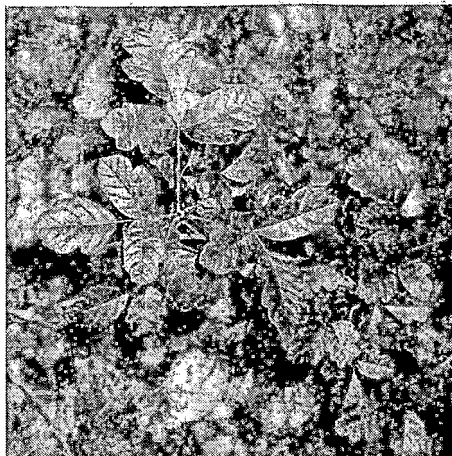
lettuces. The small flowers are white with five petals

and are no larger than a quarter of an inch (Collins, 1972).



Sticky-leaf Monkey Flower (*Mimulus* ssp.) is a type of Bush Monkey flower. It has yellow flowers that are two inches long and yellowish green leaves about two inches or longer (Raven,

1966).



Poison Oak (*Toxicodendron diversiloba*) is one of the most painful plants in North America. Each year thousands are afflicted with moderate to severe dermatitis from touching the foliage. Poison Oak is a widespread deciduous scrub in

California and in Riparian areas, it can also be seen as a climbing vine with aerial roots that adhere to the trunks of oaks (Armstrong & Epstein, 1995). This plant can be identified by its clusters of leaves: always in threes, and the leaves appear shiny and look like a traditional oak leaf.



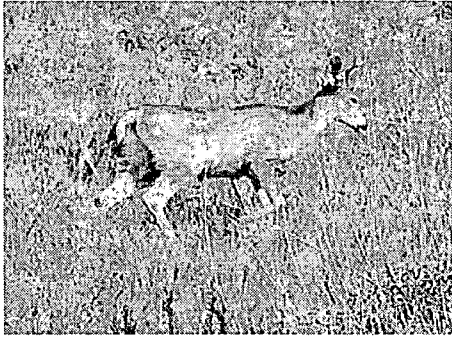
Mugwort (*Artemisia douglasiana*) is a common plant along the banks of Smith Creek, growing next to Stinging Nettle. This plant is tall and erect with lanceolate leaves two to six inches long (Collins, 1972). The

leaves can be used on parts affected by stinging nettle to help curb the sting.

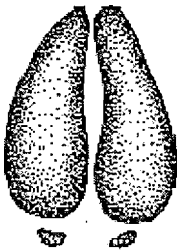
Horehound, White Sage, Black Sage, and Chaparral Current are also found in the Riparian Oak Woodlands. For more information on these plants, see the Chaparral plant section.

SECTION VI

MAMMALS

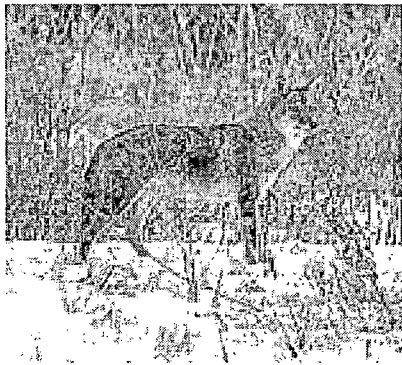


Mule Deer (*Odocoileus hemionus*) have large ears, which attribute to their name. They do not run as other deer, but instead have a distinctive



bounding leap, reaching speeds up to 45 miles per hour. The males are larger with antlers that grow in the spring and shed around December. The deer has a multi-stomach system where food can be stored for later. The Mule Deer is unable to detect motionless objects, but has an acute sense of sight for moving objects (Kricher & Morrison, 1998). They can occasionally be seen in the hills. Deer scat can come in two forms, pellet or cluster. Which form is left depends on what the deer has been eating. The hoof print may be described as two paisley shapes facing one another with smaller "dots" of the dew claws at the wider end of these paisleys.

Coyote (*Canis latrans*) are nocturnal animals that look like a slender, thick-furred dog. They do not hunt in packs, but sometimes combine their efforts to kill



large prey such as deer (Kricher & Morrison, 1998). They are omnivorous and are known to be scavengers. They are skittish and can be best seen from far away.

Coyote scat can contain hair and

bones from the prey eaten. The

coyote track closely resembles

that of a dog or fox although the

coyote tends to follow a straight

path across open areas where the

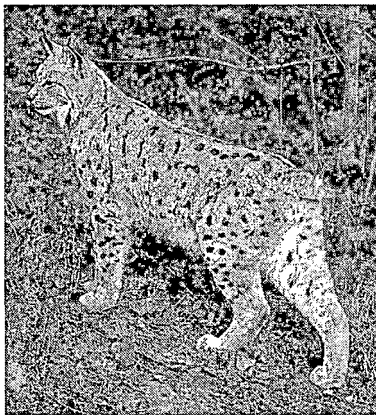
others will wander or follow aspects of the landscape.



FRONT



HIND



Bobcat (*Lynx rufus*) are secretive animals. They are small and have long legs, appearing to bound much like a rabbit when running. They eat small rodents and birds and occasionally fresh grass

and tender leaves (Grater, 1978).

They are rarely seen. Bobcat

scat can be confused with those

of coyotes and dog. It's usually

close to 4 inches in length, segmented, and rounded at all

ends. It should contain hair and bones and no plant



FRONT



HIND

material. The bobcat track is easily distinguished with a round shape, four toes and no claws evident. It is generally twice the size of a domestic cat's print and loosely resembles that of a coyote or dog but is more rounded. At greater speeds the toes of the front foot spread easier than that of the hind one which has a smaller ball pad.



Mountain Lion (*Felis concolor*) are also known as Pumas, Cougars, or Panthers. They are nocturnal and are solitary animals although mated pairs sometime remain together until kittens are born. They are large, reaching average sizes of over 100 pounds (Kricher & Morrison, 1998). They are rarely seen. Mountain Lion



FRONT

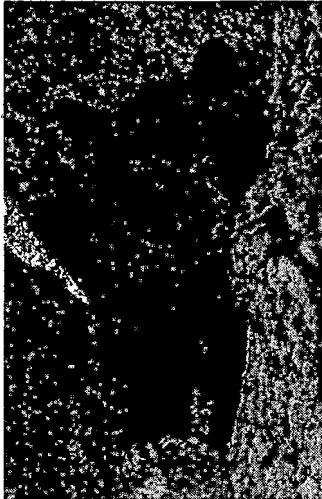


HIND

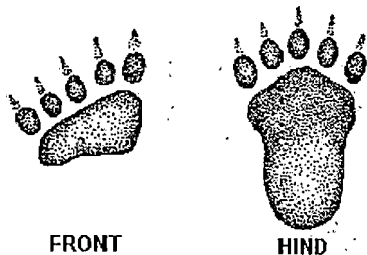
scat tends to be segmented. The presence of hair, bones and teeth is common. Cat scat can be confused with dog scat, but cats

more typically cover their droppings by scratching up ground materials. Mountain lion scat are broken cords or pellets with little or no tails. The cougars tracks rarely show evidence of the claw. The front feet are

larger than the rear and generally the toes spread wider with speed.



Black Bear (*Ursus americanus*) are commonly brownish to cinnamon in color. They are omnivorous and devour many kinds of foods. They often are seen in trees, as they are excellent climbers. Some scientists believe these bears do not hibernate, they just enter a deep

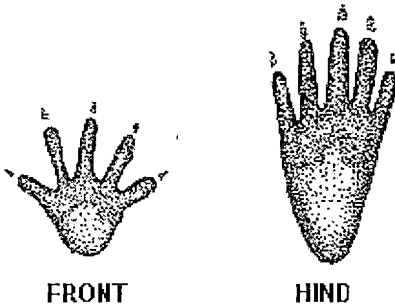


sleep and their body temperature and metabolic rates do not change, others believe they do hibernate, as they sleep all winter and rarely wake up even to urinate (Kricher &

Morrison, 1998). They can be seen around the resort and in Smith Creek. The scat is usually in a loose pile and often, at Camp Highland, has trash inside. The tracks of this slightly pigeon-toed creature are characterized by the overlapping of the hind prints onto those of the front. The heel pad of the rear foot is long and vaguely resembles that of a human. Five toes with equally long claws are evenly spaced along the top of this pad.

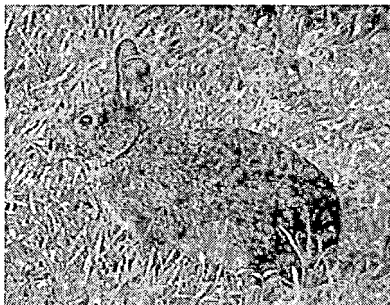


Raccoon (*Procyon lotor*) are nocturnal animals that live in wooded areas near water. They are surly and display a short temper, fighting viciously even with members of the same family.



They do not hibernate but fall into a deep sleep during the winter (Grater, 1978). They are recognizable by their black "mask" across their face. Raccoon scat is

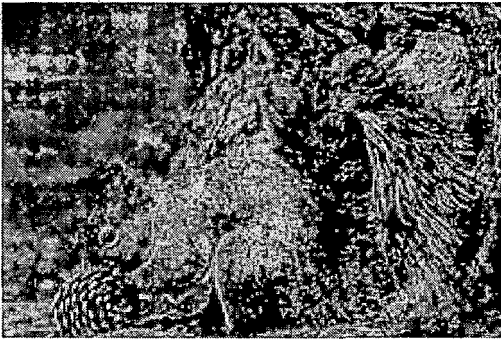
tubular and blunt on the ends. The tracks of this animal are paired, having one rear foot beside one front one. The raccoon has five toes and usually the claw marks are evident in the print. The hind foot makes a print in which the toes and heel pad are joined whereas the front tracks toe and heel pad have a brief space between.



Desert Cottontail Rabbit (*Sylvilagus auduboni*) breed several times a year. They have many natural enemies, and their breeding habits keep their population stable.

In the summer they eat nearly anything green, and in the winter they subsist on woody foods (Grater, 1978).

Cottontail Rabbits can be seen most often around the resort, especially going under buildings. Cottontail scat is round and usually in a pile. Their tracks are distinguishable by their galloping patterns, with the hind legs landing in front of the front legs.



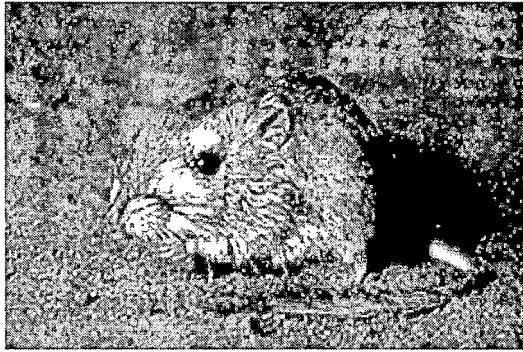
Western Grey Squirrel

(*Sciurus griseus*) blend into trees with their grey fur. They have large bushy tails and eat acorns and pine nuts, in addition to other foods. They build nests in trees where they sleep and raise their young (Grater, 1978). They can be seen in the grove and along Smith Creek. Their tracks are small, and are usually in bounding patterns.

California Ground Squirrel



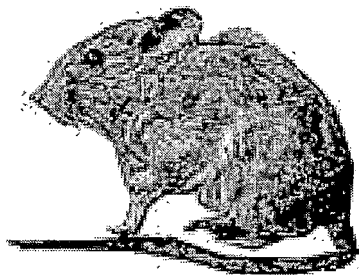
(*Spermophilus beecheyi*) are husky squirrels with bushy tails, suggesting a tree squirrel, though the animal rarely climbs. The burrows of this squirrel have a prominent entrance mound and it eats all manner of plant material (Kricher & Morrison, 1998). They can be seen around the resort.



Kangaroo Rat (*Dipodomys* sp.) are small, seed-eating rodents of the genus *Dipodomys*. Kangaroo Rats, are adapted for survival in an arid environment. Many of the

22 species of Kangaroo Rats occur only in California.

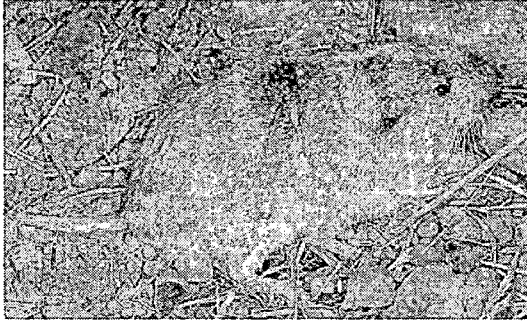
Kangaroo Rats have the ability to convert the dry seeds they eat into water. Kangaroo Rats neither sweat nor pant like other animals to keep cool. Kangaroo Rats have specialized kidneys which allow them to dispose of waste materials with very little output of water (Grater, 1978). Most Kangaroo Rats hop on their hind feet, using their tails for balance.



Wood Rat (*Neotoma* sp.) are commonly called Pack Rats or Trade Rats because they collect various objects and bits of material to deposit in, or use in the

construction of, their nests. They are especially fond of small, bright, shiny objects which they will readily confiscate. Woodrats live in nests built of plant material like branches, twigs, sticks and other debris. The huge, beaver-dam-shaped structures may be up to 4 feet across.

They are usually constructed in a tree or on the ground at the base of a tree or rocky ledge (Grater, 1978). One can be seen at the top of the Zig Zag trail.



Pocket Gopher (*Thomomys* sp.) are rat-sized rodents with short, mostly hairless tails, minute eyes and ears, and large forelimbs with elongated claws. They weigh six to eight ounces and range in color from pale gray to russet to black, depending upon soil color. The lips close behind the large front teeth, which lets the animal dig without getting a mouthful of soil. On each side of the mouth is an external, fur-lined storage pouch (Grater, 1978).

SECTION VII

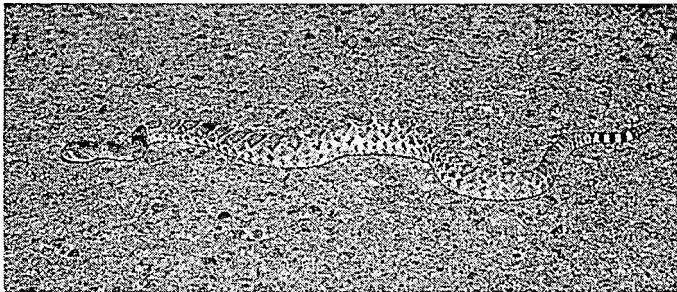
REPTILES AND AMPHIBIANS



Gopher Snakes

(*Pituophis melanoleucus*)

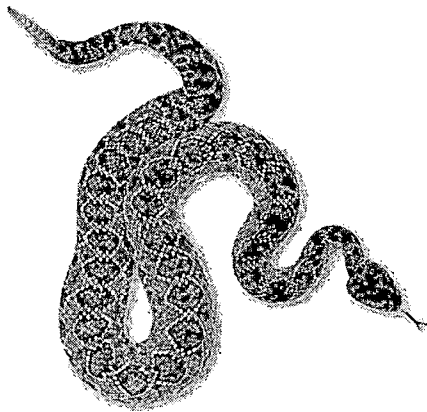
hunt small rodents, young rabbits, lizards, birds and occasionally other snakes, usually by their sense of smell. Prey is killed by constriction and suffocation. Mainly diurnal, these cold-blooded snakes often change their activity patterns to become nocturnal during the intense heat of desert summers. Gopher snakes may become prey to red-tailed hawks or coyotes. Alerted to danger, the snake coils up, vibrates its tail and hisses a warning. The hiss is produced by use of an organ in the mouth called the glottis. The glottis opens and closes rapidly, giving a fair imitation of the rattle of a rattlesnake (Zim & Smith, 1987). Due to this, they are sometimes mistaken for rattlesnakes.



Red diamond
rattle snake

(*Crotalus ruberis*) is
one of the largest

rattlers in the region. The longest on record measures a little over 5 feet, but most individuals are in the 2 1/2 to 3 1/2 foot range. Its coloration sets it apart from other rattlesnake species in our area, and makes it easy to recognize. The body is a reddish or tan color with a light edged diamond pattern on its back. A black and white ringed tail finishes the effect. The young start their lives gray, and become redder as they mature (Zim & Smith, 1987).



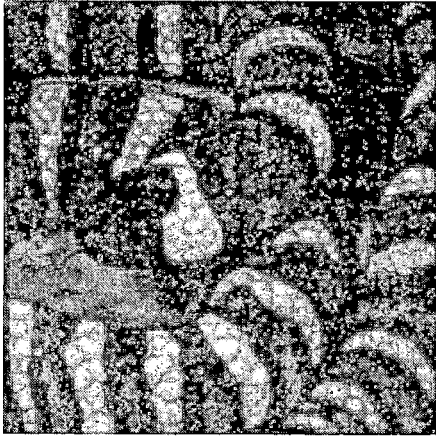
Southern Pacific Rattlesnake (*Crotalus viridis helleri*) is relatively dark in coloration. It has a pattern of dark, diamond shaped blotches with light borders running down the middle of its back. The young have a yellow tail. They are usually 16-64 inches in length (Zim & Smith, 1987).



Rosy Boa (*Lichanura trivirgata*) is one of the smallest members of the Boa family, and rarely grows much larger than 3 feet in length. It has a heavy-bodied build, a short, blunt tail and small

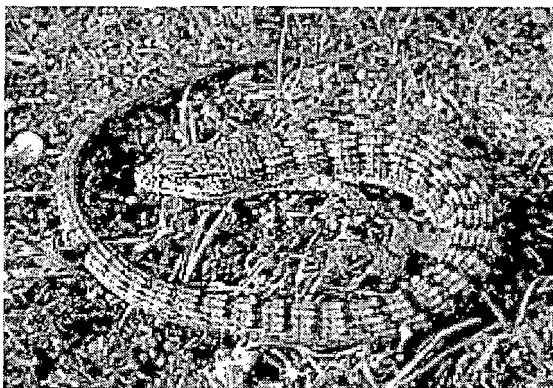
head. Its eyes have elliptical pupils. This species usually has a pattern of three, poorly defined, lengthwise stripes. Coloration includes shades of gray, tan, or reddish brown (Zim & Smith, 1987).

California Mountain King



Snake (*Lampropeltis zonata*) has crossbands arranged in triads of color in the order of black, red, black, separated by white. The head and snout are black, followed by the first white band on the head. Adults have smooth, shiny

scales and can reach lengths of 48 inches. This snake mimics a venomous coral snake, although the two do not overlap in California (Zim & Smith, 1987).



Southern Alligator

Lizards (*Elgaria multicarinata*) look somewhat like tiny alligators, they can swim well, and they bite vigorously. They eat a

variety of small invertebrates, including black widow spiders. When attacked or captured by predators, alligator lizards will often lose their tails (Zim & Smith, 1987).

The tail eventually grows back, but is never as long as the original tail and has a different pattern of scales.

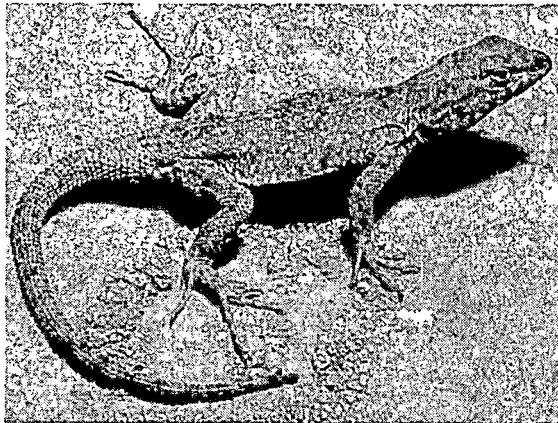


Desert Horned Lizards
(*Phrynosoma platyrhinos*)

have very wide, flattened, toad-like bodies. The tail is short but broad at the base. In most species, the

back of the head and temples are crowned with a prominent row of sharp, pointed horns. The tail and sides are fringed with sharp spines (Zim & Smith, 1987). Horned

lizards are only found in the western United States and Mexico.



Side Blotched Lizard
(*Uta stansburiana*) have brown bodies with a double row of darker spots that run the length of its back,

converging to a single row down the tail. There is a conspicuous dark blotch on each side, just behind the front legs (Zim & Smith, 1987). A narrow white stripe extends from the outside corner of each eye onto the shoulder.



Western Fence Lizard

(*Sceloporus occidentalis*) measures 3 1/2 inches and is about six inches in total length.

Coloration ranges from light gray to black with dark blotches on the back that continue down the tail.

Male Western Fence Lizards have bright blue, sometimes greenish, bellies, and the undersides of

their legs are yellow and are sometimes called blue-bellied lizards or swifts (Zim & Smith, 1987).



Pacific Tree frogs (*Hyla*

regilla) range in size from 3/4 to 1 inch and have slightly expanded toe pads.

They have a dark brown to black eye stripe which

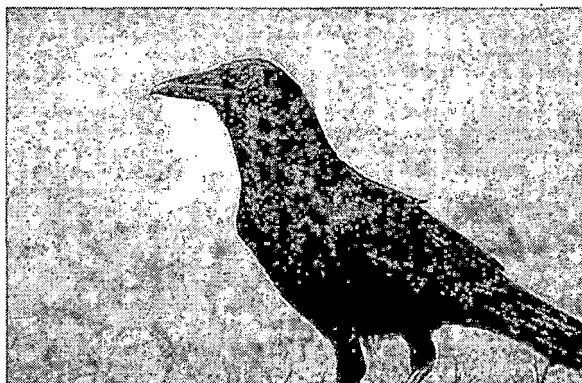
disrupts the outline of the eye. Their color pattern is highly variable ranging from unicolor to mottled with greens, tans, reds, grays, browns, or blacks. They have the ability to change from light to dark. Many individuals have a dark triangular mark on their head. In males, the throat is dusky colored and wrinkled (Zim & Smith, 1987).



Western Toads (*Bufo boreas*) have stocky bodies with short legs, and tend to walk rather than hop. Their thick skin appears dry and bumpy and can range in color from pale green to grey, dark brown, and red (Zim & Smith, 1987).

SECTION VIII

BIRDS



American Crow (*Corvus brachyrhynchos*) is one of the best-known birds in America. It is found in small groups, but occasionally large flocks,

and forms large communal roosts at night where large groups gather in trees (Sibley, 2003). It feeds on small animals, bird eggs, fish, snails, and insects, as well as seeds, fruits, and human refuse.



Common Raven (*Corvus corax*) looks similar to the crow, but has a rounded tail and is much larger, at 24 inches long as an adult, compared to seventeen inches for a crow. It has a diverse diet and travels in pairs or small groups.

It rarely mixes with crows and is often attacked vigorously by them (Sibley, 2003).

Red-Shouldered Hawk (*Buteo lineatus*), like other raptors, is a solitary bird and nests in tall trees where it does most of its hunting. It feeds on reptiles,

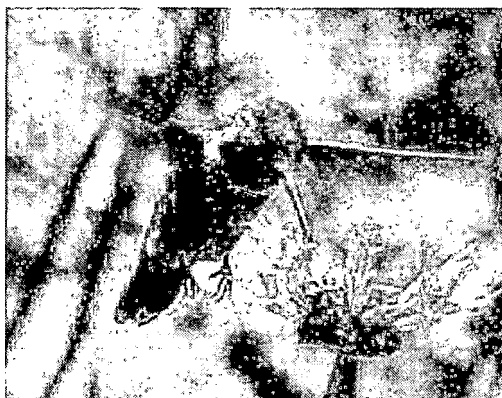


amphibians, small mammals, and birds. It can be distinguished by the light bands on its tail and its red shoulders when it is in flight (Sibley, 2003). The edges of the wings are also banded with black and white stripes.

Red-Tailed Hawk (*Buteo*



jamaicensis) is also solitary and often hunts while kiting in the air. This bird feeds mainly on small mammals. It can be distinguished by its round, red tail. There also appears to be a black outline around the wings (Sibley, 2003). This bird is seen most often circling high in the sky.



Anna's Hummingbirds

(*Calypte anna*) has a relatively short bill and is slightly drab overall for a hummingbird. It is a small bird, at four inches long. The male has a red

throat and crown while the female has a red central throat patch (Sibley, 2003).



House Finch (*Carpodacus mexicanus*) is a common and widespread bird. It is usually in small flocks, and regularly visits bird feeders. It nests on or near buildings and eats seeds, fruit, and some insects. It has a long tail and is about six inches long when full grown. The male has a red head and belly, whereas the female is more drab and grey (Sibley, 2003).



Great Horned Owl (*Bubo virginianus*) is a nocturnal bird that roosts during the day in trees or other secluded spots. It is a solitary bird and is very large, at 22 inches long when an adult, it is distinguishable by its hoot "ho hoo hoo hoododo hooooo hoo" and its ear tufts that create a cat-like head shape (Sibley, 2003). It is rarely seen, but can be heard in camp at night, especially in treed areas like the grove.

Acorn Woodpecker (*Melanerpes*



formicivorus) is noisy and gregarious with a complex social system and distinctive voice. It gathers acorns to store in holes that it drills in trees or poles. It is distinguishable by its clownish face pattern, red crown, and white rump (Sibley, 2003).

Western Scrub Jay



(*Aphelocoma californica*) is sparsely distributed and shy, traveling in small groups and flying low. It feeds on acorns primarily, but also eats other seeds, fruits, and

insects (Sibley, 2003). It is pale blue with grayish spots on the back and under parts.

Yellow-Rumped Warbler



(*Dendroica coronata*) is a small bird, only five inches long, and nests in open coniferous forests

and their edges. They are seen in loose flocks and perch upright on exposed perches to catch passing insects. They can be distinguished by their yellow rump, throat, and flanks while the rest of their body is black, grey, and white (Sibley, 2003).

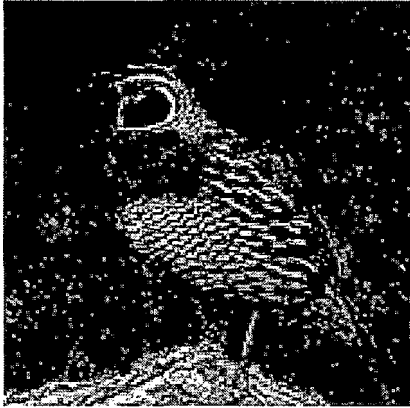


Western Meadowlark (*Sturnella neglecta*) is beloved for its melodic song. It is identified by its yellow throat, chest, and belly, with a black "V" across the chest. It has a brown and streaked back with white outer tail feathers (Sibley, 2003). It is frequently seen singing atop fence posts along roadsides in native grassland and agricultural areas.



American Kestrel (*Falco sparverius*) is perhaps the most colorful raptor in the world and the most common falcon in North America. It is a small raptor, with a height of 9 to 12 inches. Although it does hover to find food, that method is used most often when suitable perches are not available, or when winds are

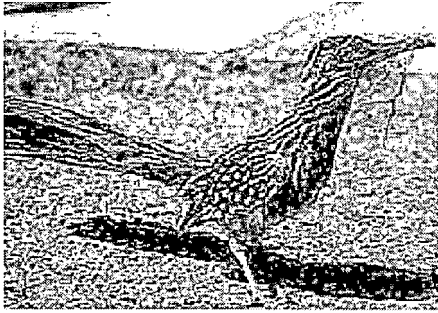
strong enough to create updrafts favorable to hovering (Sibley, 2003).



California Quail (*Callipepla californica*) is a common bird of the chaparral and other western brushy areas, and is tolerant of people. It is a medium size quail, and is distinguishable by its topknot which looks like a single feather, but it is actually a cluster of six overlapping plumes (Sibley, 2003).



Barn Owl (*Tyto alba*) is one of the most widely distributed birds in the world, found on all continents except Antarctica, and on many oceanic islands as well. It is a medium sized owl with a white heart shaped face. The barn owl is one of the few bird species with the female showier than the male. The female has a more reddish chest that is more heavily spotted. It has the best ability to locate prey by sound alone of any animal that has ever been tested (Sibley, 2003).



Greater Roadrunner (*Geococcyx californianus*) is a signature bird of the desert Southwest and the state bird of New Mexico. It is a ground-dwelling cuckoo, and feeds on snakes, scorpions, and any other small animal it can catch and subdue (Sibley, 2003). It does not go "beep-beep"! The call is a downward slurring "co-coo-coo-coo-cooooo" or a clattering "whirrrr" call. It can reach speeds of up to 30 miles per hour.



Nuttall's Woodpecker (*Picoides nuttallii*) is nearly confined to the oak woodlands in California although they do not eat acorns. It is a small black and white woodpecker. The male has a red patch on its head while the female has a black patch (Sibley, 2003).



Black Phoebe (*Sayornis nigricans*) is a medium flycatcher and a small song bird. It grows to 6 inches. It has a white belly with black above and below. Although primarily insectivorous, the Black Phoebe occasionally catches fish. It dives into

ponds to catch small minnows or other tiny fish, and may even feed fish to nestlings (Sibley, 2003). It is often seen near water.



White-Breasted Nuthatch (*Sitta carolinensis*) can be seen hopping headfirst down the trunks of trees in search of insect food. It has a

white face and under parts with a dark grey or black cap. Nuthatches gather nuts and seeds, jam them into tree bark, and hammer or "hatch" the food open with their bills (Sibley, 2003).



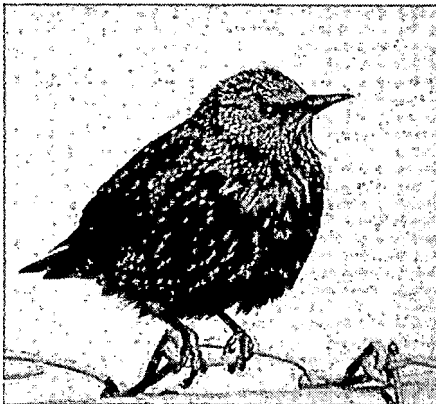
Bushtits (*Psaltriparus minimus*) are very small birds, with a height of 3 inches. They generally forage in large flocks and are not usually noticeable by themselves. They have white under parts and a light grey upper body (Sibley, 2003).

Western Bluebird (*Sialia mexicana*), unlike the other species of bluebirds, does not like large meadows, preferring open forests instead. It is a medium song bird with a large round head. It has a blue tail and wings, and the male



has a bright red chest while the female is drab grey with a duller red chest (Sibley, 2003).

European Starling (*Sturnus vulgaris*) has become one of the most numerous birds on the North American continent, beginning with 100 individuals introduced into Central Park in New York City in the early 1890s. Its



successful spread is believed to have come at the expense of many native birds that compete with the starling for nest holes. It is a stocky black bird with shimmering green and purple feathers in the spring (Sibley, 2003).

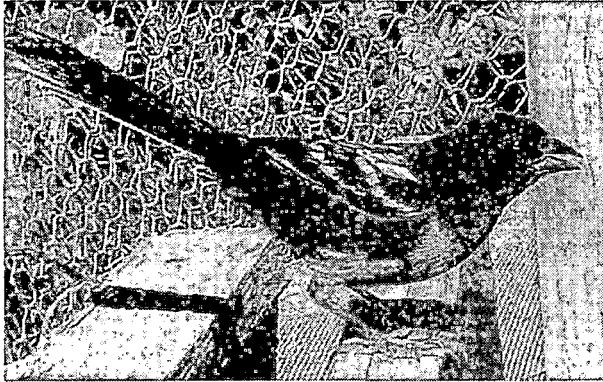


Western Tanager (*Piranga ludoviciana*) is a medium sized song bird that is yellow with dark wings, tail, and back. The male has a red head with bright yellow under parts.

The female has no red and has duller yellow under parts. The red pigment in the face of the Western Tanager is manufactured by the bird, as are the pigments used by the

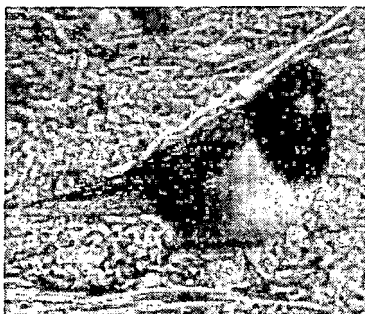
other red tanagers. Instead, it must be acquired from the diet, presumably from insects that themselves acquire the pigment from plants (Sibley, 2003).

Spotted Towhee



(*Pipilo maculatus*) has dark wings, back, tail, and head with white underparts and white spots on the back and wings.

Watching a Spotted Towhee feeding on the ground, its two-footed, backwards-scratching hop is noticeable (Sibley, 2003). This "double-scratching" is used by a number of towhee and sparrow species to unearth the seeds and small invertebrates they feed on.



Dark Eyed Junco (*Junco hyemalis*)

includes five forms that were once considered separate species. The Oregon form is the junco most often seen in the western part of the country, including in California (Sibley, 2003). It is distinguishable by its dark grey or black hood and white belly with light brown to grey back.

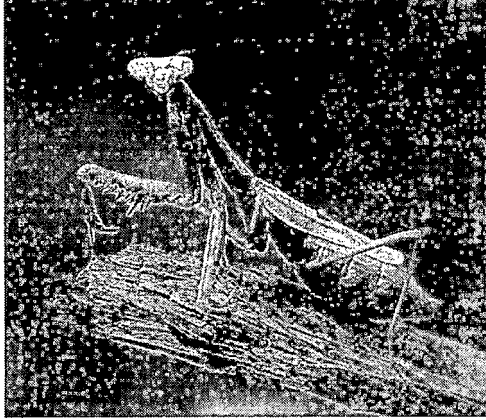


White Crowned Sparrow

(*Zonotrichia leucophrys*), marked in gray, brown, black, and white, is one of the best-studied songbirds in North America. They have two broad black stripes on the top of their head separated by a broad white crown stripe. Male White-crowned Sparrows learn the songs they grew up with and do not travel far from where they were raised, so song dialects have formed. Males on the edge of two dialects may be bilingual and able to sing both dialects (Sibley, 2003).

SECTION IX
INVERTEBRATES

Praying Mantis



(*Stagmomantis californica*) have exceptional vision and can rotate their heads to detect the movements of their small insect prey. After mating, the female may eat the male, after

which she will lay several hundred eggs in a frothy mass that dries like a hard brown foam (Zim & Cottam, 1987). They can be seen in dry areas, but often camouflage, being green or tan in color.

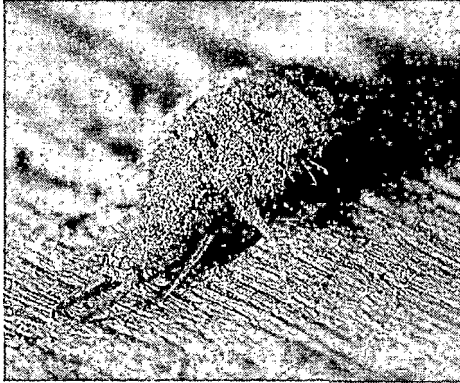


Velvet Ants (*Dasymutilla aureola pacifica*) are named after the wingless females that appear ant-like. The velvet ants are actually hairy wasps. The

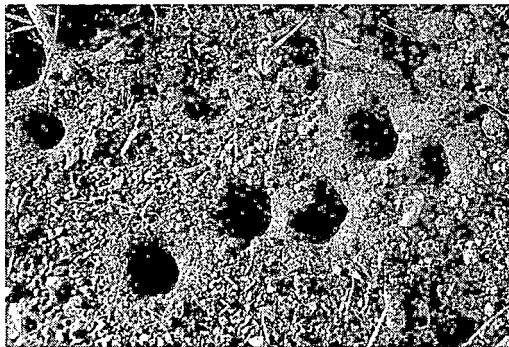
females sting, but the males do not (Zim & Cottam, 1987).

They can be easily found along the trails in the chaparral.

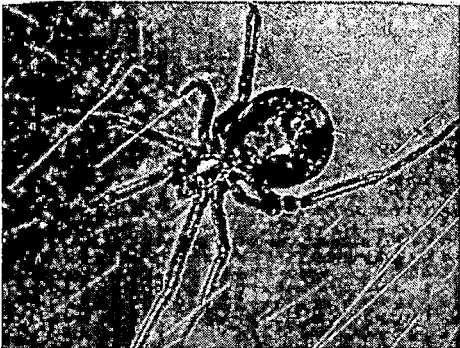
Ant Lions (*Myrmeleon sp.*) trap ants for food. Eggs are laid on the ground, when they hatch, the larva digs a pit into the sandy soil and lives almost completely



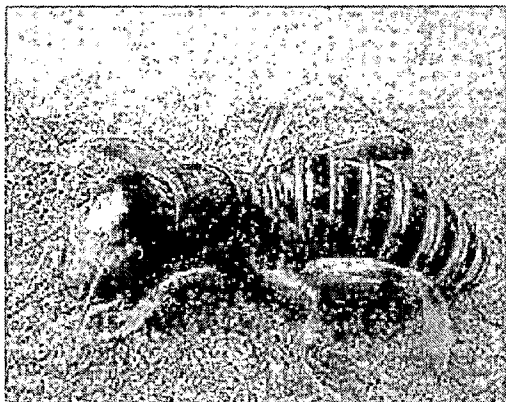
buried. When an ant or other small insect tumbles in, the larva seizes it in its powerful jaws and sucks it dry (Zim & Cottam, 1987). They can be found in sandy soil, especially on



Bradshaw Road.



Black Widow (*Latrodectus hesperus*) is considered the most venomous spider in North America, although only the females are venomous. The female rarely leaves her web (Zim & Cottam, 1987). They are found in the warmer areas and the female is distinguishable by its red hour glass shape on its black back.



Jerusalem Cricket (*Stenopelmatus fuscus*) is one of the most distinctive looking creatures found

anywhere with its black and orange banded body. Adults can reach up to 2 inches long. This nocturnal cricket is thought to be poisonous and dangerous, although it is actually not aggressive and possesses no poison glands, although its jaws can inflict a painful bite (Zim & Cottam, 1987).

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