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Revitalization of the
Valley of Enchantment Elementary School
Nature Center, an On-site Learning Facility

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

Lorraine D. Kearns

Carol G. Parker

June 1992

Approved by:

 May 14, 1992
Date

Dr. Darleen Stoner

 5/14/92
Date

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**Revitalization of the
Valley of Enchantment Elementary School
Nature Center, an On-site Learning Facility**

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

**In Partial Fulfillment
of the Requirements for the Degree
Master of Arts in Elementary Education**

Lorraine D. Kearns

Carol G. Parker

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Abstract

This project proposed a renovation and a revitalization of the existing Valley of Enchantment Elementary School on-site Nature Center, Crestline, California. This project included a comprehensive review of literature related to on-site nature centers. The relevance to the Science Framework for California Public Schools, Kindergarten Through Grade Twelve and the History-Social Science Framework for California Public Schools, Kindergarten Through Grade Twelve is also addressed. Based on a needs assessment, an action plan was developed, sample lesson plans were written, and fundraising for community involvement was initiated. Implications for educators are stated. Extensive references and a comprehensive appendixes complete the project.

Acknowledgements

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Revitalization of the Valley of Enchantment

Elementary School Nature Center,

an On-site Learning Facility

Section 1: Introduction

Purpose of Project

Located on the Valley of Enchantment Elementary School Property, Crestline, California, is a three-quarter acre, second growth, forested area that has been designated as the Valley of Enchantment Elementary School Nature Center. The area naturally lends itself to the opportunity for purposeful learning experiences by elementary school students. The area is an ideal setting to utilize as a facility for teachers to use with students when infusing environmental education throughout the curriculum.

This project proposed a campaign to renovate and to enhance the Valley of Enchantment Elementary School Nature Center, an outdoor learning facility at the school site. The area has great potential for becoming a vital and integral part of the Valley of Enchantment Elementary School curriculum.

The project included sample lesson plans and an extensive list of resource materials. This project may be used as a guide for other educators desiring to develop their own on-site nature center.

History of the Valley of Enchantment Elementary School Nature Center

The area was originally protected from becoming a parking lot, primarily through the efforts of Phyllis Bailey, a teacher at Valley of Enchantment School. Mrs. Bailey convinced the Rim of the World Unified School District administrators that the area would be used as an outdoor study center, providing numerous educational opportunities for the students and community members of Valley of Enchantment. By 1984, Mrs. Bailey had acquired a California License Plate Grant of \$2,000 to purchase environmental materials and equipment for the school, to fence and improve the area, and to provide adult training workshops for teachers, parents, and aides. In 1985-86, Mrs. Bailey qualified for a second grant entitled "Living in a Forest Environment" (LIFE). This grant of \$2,500 was funded by the Rim Education Foundation, Lake Arrowhead,

California. The monies were used for further improvements of the Valley of Enchantment Elementary School Nature Center.

In 1986 and 1987, a science mentor teaching grant allowed Mrs. Karen Cerwin, former Valley of Enchantment Elementary School teacher, to continue the efforts and energies initiated by Mrs. Bailey. Community groups, such as the Crest Forest Parent Teachers' Association, Valley of Enchantment Elementary School Site Council, and the Crest Forest Fire Department, were called on to be partners in the redevelopment of the Nature Center. Mrs. Cerwin, by building on the earlier efforts of Mrs. Bailey, was able to bring about many needed improvements in the area. She encouraged agencies outside of the immediate school community to support this environmental program.

In 1986 school and community groups began using the area appropriately, effectively, and on a regular basis. Students felt pride and satisfaction in using and maintaining the area. The Rim of the World Unified School District also allocated time and money for such things as weed cutting, trail maintenance, and tree pruning.

Present Status

In the past four years there has been a general decline in support and leadership for the Nature Center. Mrs. Cerwin moved to another school and Mrs. Bailey retired. There has also been a change in both School and District administration. Budget cuts have eliminated regular District maintenance. Enthusiasm had waned and, as vandalism destroyed most of what had been accomplished, the area became a less than desirable place to visit. With the present renewed efforts the Nature Center has become an environmental area that Valley of Enchantment Elementary School students can use for years to come.

Demographics

Valley of Enchantment Elementary School, Rim of the World Unified School District, is located at 22836 Fir Lane in the mountain community of Crestline, California, fifteen miles north of San Bernardino. The population of Crestline, and the surrounding communities of Cedarpines Park and Valley of Enchantment, is approximately 15,000. The school community of 840 students is composed of 88% white, 10% Hispanic, and 2% other

ethnic groups. Valley of Enchantment Elementary School currently contains grades Kindergarten through fourth and is on a year-round schedule with a five track system.

Valley of Enchantment Elementary School has 29 regular self-contained classes. The school has one principal, a part-time assistant principal, two head teachers (who are also classroom teachers), one speech therapist, one part-time school psychologist, one part-time school counselor, one part-time adaptive physical education teacher, two resource specialists (one of whom is part-time), one multi-handicapped pre-school/Kindergarten special day class, and one special education teacher of the learning handicapped. The pre-school and special education students are mainstreamed into the regular classrooms.

Relevance to Frameworks

Both the History-Social Science Framework for California Public Schools, Kindergarten Through Grade Twelve (1987) and the Science Framework for California Public Schools, Kindergarten Through Grade Twelve (1990) emphasize learning activities that allow students first-hand

experiences with their environment, both inside and outside the classroom. The Valley of Enchantment Elementary School on-site Nature Center offers students numerous opportunities for these first-hand learning experiences as recommended by the current frameworks.

Section 2: Review of Related Literature

Experiential learning by students has received broad support by educators. Piaget and other learning theorists believed that the progression of learning of the primary-age student to the high school-age student should be from the very concrete progressing to the abstract. The young child will learn more through experiences which are concrete in nature. The older student can build on these concrete experiences and progress to the abstract (Stoner, Clymire, & Helgeson, 1989). An on-site nature center offers ample opportunities for concrete learning experiences by the primary-age child as Piaget suggested. Experiences starting at the Kindergarten level teach awareness and appreciation of the environment. These experiences lay the foundation for knowledge and a commitment to positive action in relation to the environment by the older student.

Concrete learning was also emphasized by Dewey's philosophy in which he stated that students learn best through direct experience.

Furthermore, that experiential education should include active involvement in an environment where students resolve problems in real situations (DuShane, 1979). The actions of humankind on its environment, as reflected in an on-site nature center, create real problems with which the students must contend.

Educators of science continue to state that students should be exposed to direct, purposeful experiences in which they are allowed to use their senses. This exposure allows students to obtain meaningful information. These kinds of experiences are not only enjoyable to the students, but lead them to the achievement of a goal. These purposeful experiences allow the students to feel, react, and develop awareness and sensitivity about the environment (Stoner et al., 1989). Use of an on-site nature center provides meaningful opportunities in which students are allowed to use their senses and in which the joy of learning can be

enhanced. By caring for, using, and maintaining an on-site nature center, students would experience the achievement of a goal.

The Science Framework for California Public Schools, Kindergarten Through Grade Twelve (1990) and the History-Social Science Framework for California Public Schools, Kindergarten Through Grade Twelve (1987)

clearly outline the need for such direct, purposeful experiences by students. The Science Framework defines strategies through which students are actually engaged in learning about the natural and technological world in which they live. The History-Social Science Framework emphasizes that exploratory activities be taught in the neighborhood and the region.

Connections With Science Framework

The Science Framework (1990) recommends that teachers present a dynamic science curriculum with at least 40% hands-on time in the instructional period. Use of an on-site nature center would aid in achieving this suggested 40% hands-on experience by students. Other recommendations made are: (a) science should not be presented as an

isolated subject; (b) the character of science should be shown as open to inquiry, controversy and non-dogmatic thinking; and (c) explanations of knowledge include how and why this information is important.

Along with the instruction should come the depth of understanding, not an encyclopedic approach to science. Science content must be treated accurately, but should be organized around themes rather than facts. The themes suggested in the framework are energy, evolution, patterns of change, scale and structure, stability, and systems and interactions. They were designed as guides for educators to use when developing curricula to present science as a philosophical discipline and not just a collection of facts. One theme that might easily be addressed within an on-site nature center would be patterns of change, such as trends, cycles, and irregular changes (Science Framework, 1990).

The Science Framework (1990) also identifies three unifying concepts in the three basic scientific fields of study: life science - living things are diverse and constantly changing; earth science - the changing earth is part of the changing universe; and physical science - matter and

energy can be changed but not destroyed. All three of these unifying concepts could be attended to in lessons designed specifically for use in an on-site nature center.

The Science Framework (1990) further outlines the goals for elementary school science curricula as to: (a) provide a balance in the physical, earth, and life sciences; (b) show students that science is enjoyable; (c) reinforce conceptual understanding; (d) present an articulated scope and sequence; (e) integrate science with other subjects; (f) include the use of community resources; and (g) arrange the classroom setting and student grouping to optimize positive attitudes for learning science. These goals could be adequately addressed through the utilization of an on-site nature center.

Connections With History-Social Science Framework

A review of the History-Social Science Framework (1987) reveals many goals that can be taught through integration with science, and are also enhanced when implemented in a science program taught using an on-site nature center or study area. A primary goal of this framework is for

all children to participate in a program that will encourage good citizenship and a commitment to democratic values. The framework recommends that critical thinking skills be taught at every grade level. The strands of the framework are divided into three main categories: Knowledge and Cultural Understanding, Democratic Understanding and Civic Value, and Skills Attainment and Social Participation. Nature center lessons and action plans can be designed around these categories. For example, students would experience a sense of ownership and civic responsibility for the area if they were to participate in improving the existing area.

At an on-site nature center, students are able to see the long range effects of humankind on nature as well as on their own community. A sense of historical past is visible when the on-site area is compared to national forest areas as well as historical literature about the area.

Through the use of cooperative learning, students try to solve ethical issues concerning humankind and its world. Through the decision making process students must make decisions about how they will behave toward their nature center. These decisions will help them learn the concepts of

basic economic goals, performance, and problems involved in the trade-offs encountered. Students will be able to understand the close relationship between society and the law while trying to protect the nature center from vandalism and misuse. Students will learn to accept responsibility for their own behavior.

A curriculum that fully utilizes an on-site center will encourage students to make informed, intelligent decisions not only about how they choose to live and believe today, but in the future as well.

Problems and Practices in the Teaching of Elementary Science

Researchers have found definite school related causes for student failure in science. How students feel toward what they are studying and the quality of instruction both have an effect on their achievement.

Simpson and Oliver (1990) concluded that schools are not producing students with positive feelings toward science. By the end of the tenth grade students exhibited toward science both near neutral motivation and attitude. The researchers suggested this was a result of inadequate attention being paid to science in the elementary grades. Because of the

way science was taught, students do not view science with positive feelings. If science is to continue to thrive, it is important that it be viewed positively.

Jacobson and Lind (1992) dealt with attitudes about science in their attention to the gender gap that exists between males and females in science achievement. The gap exists in every science subject, in every grade, and in every nation. In only one area, hands-on laboratory processes, did the gender gap not exist. Jacobson and Lind focused on more hands-on experiences to bridge this gap.

Yager (1986) reported on students losing interest in science as they progress through school. Students are less interested in science after the science course than they were at the beginning of the course. Penick and Yager (1986) concluded that to foster and improve students' attitudes about science, educators must take science outside of the classroom. Schools should take advantage of community resources to help solve real issues and problems. Schools which take advantage of these community resources have students eager to continue their study of science. In

model programs, school science uses the community as a classroom where students have the full opportunity to do, to learn, and to feel a part of their own community outside the classroom.

Another concern addressed by researchers, in regard to student attitude toward science, is that textbooks structure 75 to 90 percent of classroom instruction. The textbooks do not adequately expose students to the processes of scientific inquiry. Emphasis is on products of science rather than processes (Tyson and Woodward, 1989).

Bracey (1988) confirmed the findings of Tyson and Woodward in his report on current research regarding use of textbooks in the teaching of science. He concluded that the time devoted to "frontal teaching" (teacher lecturing to students) ranges from 89% to 100% of science teaching. "The more science that children had, the less they liked it and the less likely they were to choose science as a career" (Bracey, p.685). Honig (1990) stated that science materials must use more technology and hands-on strategies.

In the teaching of elementary school science, the teacher's attitude toward science is an important consideration. There are several factors that affect a teacher's ability to teach science effectively. In a national opinion poll conducted by Instructor (When the Subject is Science, March, 1990) on science teaching, 48% of the respondents said that insufficient funds for equipment and supplies was one of the biggest problems affecting science instruction, and 35% responded that there was not enough time in the day to teach science well.

The results of the informal poll by Instructor (March, 1990) were validated by the research of Ham and Sewing (1987) in which they concluded that lack of time, for both preparation of lessons and class time, was the most important barrier to teaching school science. Their study, based on personal interviews with teachers, also concluded that lack of instructional materials and lack of funding were other important barriers.

From these findings, Ham and Sewing (1987) made several recommendations to reduce some of these barriers. Their recommendations included subject matter integration, a library of

instructional materials, teacher workshops, and the use of activities that can be done in the schoolyard.

Teacher attitude toward science affects the amount of science taught in the classroom. Stefanich and Kelsey (1989), in their review of research, found that in the elementary school less time is spent on science than on any other major subject. As little as 17 minutes per day for Kindergarten through third grade are given for science nationally and 28 minutes daily for fourth through sixth grades. Classrooms where teachers had a positive attitude toward science have a greater intensity of science teaching. "This intensity is reflected in more time spent teaching science, greater utilization of hands-on materials, and greater teacher concern toward including science as an essential basic subject in the elementary curriculum" (Stefanich and Kelsey, p. 187).

Challenges to be met by educators are how: (1) to make knowledge more active and productive in the lives of students; (2) to use activities that allow students to learn on their own; and (3) to give students the tools to embrace a new world (Tilgner, 1990).

The Need for Environmental Education Instruction

Environmental education, whose ultimate goal is the maintenance of a varied, beautiful, and resource-rich planet for future generations, is the logical choice of educators and lay people to insure that the needs of the world are fulfilled (Tanner, 1980).

In order for the citizenry to become environmentally aware, environmental science must be given its instructional time in the classroom. The lack of science teaching time at the elementary level has already been addressed. A solution which has already been recommended by the Science Framework (1990) is integration. Ames (1971) suggested that environmental instruction, which has become successful, has taken place in all subject areas by teaching through the environment rather than just about the environment. An example of this would be an interdisciplinary program, proposed by John Dewey, in which history, geography, and nature study would be a single subject matter (Weldon, 1973).

Environmental education is not a new subject to be introduced in ten-minute blocks of time, but is meant to be fully integrated through all subject areas. Stoner et al. (1987) described education as being environmental

...when it increases the understanding of nature, culture, technology, people, ideas, and feelings about the environment.

Environmental education is truly interdisciplinary, relevant to and part of every academic subject from Kindergarten through college.

Environmental education provides unique contributions to the purpose of all education: to contribute significantly to a person's ability to function effectively. (p. 1.5)

Mitchell and Lunneborge (1973) found in their study that children, as young as Kindergarten age who were exposed to an outdoor experience, developed more environmental awareness and gave fewer environmentally unsound answers. Thus the primary level is not too young to begin an environmental program.

In developing a sound environmental program, an ultimate goal ought to be "the development of a commitment to work toward the removal of conditions which are detrimental to the man-environment relationship" (Keach, 1973, p. 25). Keach also emphasized that environmental curriculum can reinforce such skills as critical thinking and decision making which are intertwined with hands-on, action-oriented experiences. Students develop an understanding of the complexity of various environmental problems and are provided with a means of solving future problems in an experiential, hands-on, environmental education curriculum (Kauchak, Krall and Heimsath, 1978).

According to R. Buckminster Fuller,

Man has been on a spaceship all this time. It is a tiny little spaceship, only 8,000 miles in diameter....

And yet this tiny spaceship is so superbly designed that it provides everything man needs for his journey through space (Engleson, 1985, p. 2).

Every action of humankind must, then, be made with the understanding of the effect on the local environment but, also, the potential world wide effects. An environmental education curriculum based on direct, purposeful experiences and infused throughout the subject areas will give the students of today the tools to be responsible citizens of tomorrow capable of acting on behalf of the environment (Engleson).

Current Research Concerning On-site Nature Centers

The purposes and values of an on-site nature center are many and varied. An on-site nature center can open doors to the outside world. Such a center can inspire and motivate the students to responsible action. An effective nature center and its program should provide education, research, conservation, and culture (Ashbaugh, 1971).

An outdoor, on-site nature center would provide ample opportunities for the young learner to experience lessons dealing with humankind's relationship to the environment, whether natural or built. Engleson (1985) emphasized that outdoor education is a valuable method of instruction which, although not a complete environmental education program, can

contribute substantially to the teaching strategies of environmental education. This guide verified that outdoor education, especially an on-site center, can be a valuable tool in creating direct, purposeful learning experiences for the elementary student.

A nature center should be designed to serve everyone in the community. Young children satisfying curiosity, teenagers seeking constructive activities, young adults contemplating science careers, college students doing research, and adults pursuing hobbies, can all benefit from an adequately designed nature center and program. The center can also serve as a quiet place for a family to take a pleasant walk. For all concerned, a nature center can present a broader, more interesting world (Ashbaugh, 1971).

"People will not safeguard what they do not know, let alone what they do not understand" (Ashbaugh, 1971, p. 5). People will safeguard and value that in which they have a vested interest, in terms of time and energy. A well-planned nature center would bring about an appreciation

for the natural environment and would keep people from destroying the natural resources they hope to preserve.

An on-site nature center could be thought of as a teaching laboratory. Certain subject matter could be taught more effectively in the outdoor setting. In an outdoor, on-site nature center, children could engage in first hand discovery and exploration (Ashbaugh, 1971).

"As we broaden the opportunities to explore - to discover and investigate, to question, hypothesize and put to the test, we increase the likelihood that creativity will be natural, resourcefulness encouraged, and ingenuity accepted and praised" (Marsh, 1971, p. 29). Marsh also emphasized that planning, developing, and using such an outdoor, on-site nature center can be an excellent example of community action. If as many community members as possible, including students, parents, educators, and nearby residents, are included in the creating, developing, enhancing, and utilization of the center, the greater the chances that the program will grow and be vital.

In a study of school landscape as a teaching resource, Harvey (1989) reported on the work of previous researchers. The summary concluded that the out-of-doors provides a stimulating learning environment for relevant fields of study. Use of a school landscape would be a logical extension of John Dewey's idea for an experience curriculum in education. The summary recommended a combination of classroom preparation and outdoor experiences. School grounds were mentioned as a suitable location for study areas in environmental education and as possible sites for creating nature reserves.

Harvey's (1989) actual research study confirmed the positive role of the school landscape as a teaching resource. Evaluation of developed school landscapes found them to be superior to the undeveloped school grounds in enhancing knowledge of science and fostering beneficial attitudes toward the environment.

A similar study by Lisowski and Disinger (1991) reported that a particular feature of environmental learning is its close identification with outside-the-classroom experiences. Their study concluded that field-

based programs in the sciences are effective in assisting students' understanding and retention of concepts.

Further, Miles (1991) reported, in reviewing other researchers, that many educators agree that firsthand experience of nature is the surest path to understanding the natural world and the problems of human interactions with it. Experiential learning, learning by doing, appears to be less easily forgotten than that acquired through abstract learning. He concluded that the important thing is to bring people into contact with nature. These experiences are necessary if students are to appreciate the natural world and come to understand their place in it.

Shomon (1974) stated that one of the roles of a nature center is to provide a place for all of the people in a community, young and old, where people can learn from nature and develop a stewardship toward the earth.

Neperud (1975) further confirmed the importance of a natural setting to provide children with learning environments that are valued both for the activities which they facilitate and for qualities of intrinsic worth. His study on children's images of favorite place, path, and domain concluded

that children value highly the natural element and the kinds of experiences the natural element can provide. Of particular value to children, Neperud found, are those environments which can engage the child both actively or passively. He concluded that a natural setting, a nature trail, may be valued for its animals and trees as well as for its solitude and aesthetic value.

Another justification for valid outdoor education programs, such as an on-site nature study area, was pointed out by the research of Askham (1974). This study concluded that interacting with nature and participating in experiential learning have positive effects on student participation and changes in behavior over a period of time.

A similar research study by Schicker (1988) investigated children's attitudes and behavior toward the natural environment. The study concluded that nature trails are beneficial and that they extend wildlife habitats for children. Day-to-day contact with the natural world, along with hands-on educational experiences, are the most effective methods for

ensuring wildlife appreciation and awareness. Such experiences help make the children better decision makers about their environmental future.

There are many valid reasons for a school or community to establish an on-site nature center facility. Research has shown that such facilities are educationally sound and provide students with purposeful learning experiences.

Section 3: Goals and Objectives

The overall purpose of this project was to renovate and improve the Valley of Enchantment Elementary School Nature Center. This project also proposed to be a model for other educators wishing to establish an on-site nature center. The project was to meet the following goals:

1. Renovate and enhance the existing Nature Center
2. Provide a natural setting for hands-on learning experiences by students
3. Give information and resources for teachers using the Center
4. Encourage community groups to support and use the Nature Center to its potential

5. Encourage implementation of the Science Framework for California Public Schools, Kindergarten Through Grade Twelve (1990) and the History-Social Science Framework for California Public Schools, Kindergarten Through Grade Twelve (1987)
6. Promote the joy of learning and encourage continued interest in science
7. Encourage civic responsibilities and values toward the environment
8. Assure continued support for the Nature Center

The project addressed the following objectives for students:

1. Experience 40% hands-on learning activities through using the Nature Center
2. Gain understanding of humankind's relationship to the environment
3. Participate in discussions and cooperative learning situations related to the environment

4. Experience the scientific processes
5. Use critical thinking skills
6. Develop an appreciation of the forest environment
7. Gain an awareness of humankind's effect on the forest in the past, present, and future
8. Experience a sense of pride and civic responsibility toward their environment

Section 4: Design of Project and Sample Lesson Plans

The overall goal of this project was to enhance and revitalize the existing Nature Center at Valley of Enchantment Elementary School to once again become a vital part of the school curriculum. This goal was accomplished through such things as a teacher needs assessment, an action plan, physical improvements to the Center, plans for the future, and sample lesson plans.

Needs Assessment

A needs assessment (see Appendix A for sample) of the Valley of Enchantment School faculty was done in October, 1991, to ascertain who was using the Nature Center, how often the Center was being used, and for suggestions of ways the Center could be improved. The results of the survey indicated that usage of the Center varied from not at all (three teachers), two to twelve times (13 teachers), and thirty or more times (one teacher) per year. Suggestions for improvement were periodic maintenance of the trail, solving the problems of trash and vandalism, returning the amphitheater seating, providing related classroom science materials, repairing fences, restoring the Nature Center sign, and providing more information about the plants and animals of the area. The survey also showed that some teachers were unaware of possible ways to use the Nature Center and existing science resource materials.

Interest was shown in enlisting outside resource people, such as a forest ranger or naturalist, to present lessons to the students in the Center (see Appendix B for list).

List of needs

As a result of the Faculty Needs Assessment, the Valley of Enchantment School principal was approached with a list of suggested needs to improve the existing Nature Center. The list included the following:

1. Repair sign and anchor in concrete
2. Replace posts and permanently finish trail posts
3. Replace culverts over creek and drainage ditches
4. Prune willows and apple tree
5. Repair fence on school property
6. Remove debris and asphalt
7. Return benches to amphitheater area
8. Add sundial
9. Place San Bernardino County Surveyor's bench mark
10. Survey and draw plot map
11. Designate and prepare archaeological site
12. Build and install bird boxes

13. Develop and install weather station
14. Revise trail guide
15. Provide student tree finder booklet
16. Prepare teacher resource kit
17. Provide for future maintenance
18. Enlist community support
19. Ensure on-going school support
20. Establish a human resource list
21. Conduct tours through the Nature Center during May 1, 1992
Family Science Night.

Action Plan

A presentation was made to the Valley of Enchantment School faculty on November 25, 1991, updating progress and plans for improving the Nature Center. The faculty was enthusiastic about the plans and expressed continued support.

The principal, Mrs. Betty Barnes, was asked to approve a letter to community groups asking for support, including money, labor, and

materials (see Appendix C for sample). She also was asked to consider a student leasing plan for the Nature Center area. This plan was designed to encourage the students of Valley of Enchantment School to take an active role in the support of the Center financially, as well as experience a sense of ownership and responsibility for the area. The student leasing plan included a letter asking for donations (see Appendix D) and a certificate (see Appendix E) to be issued to each student who donated. A District maintenance commitment was also suggested. A possible resource suggested by Mrs. Barnes was the Valley of Enchantment School Site Council. Mrs. Barnes tentatively approved the plans for renovation pending the Superintendent's approval and recommendations.

The Superintendent requested written justification for maintaining and enhancing the existing Nature Center. To address this request, a second survey (see Appendix F) was given to the Valley of Enchantment School teachers present at the faculty meeting on December 9, 1991. In this survey, the teachers were asked to briefly describe a lesson or activity

completed in the Nature Center and the curricular areas that the lessons included.

In the survey, the activities were varied from observing the seasons, changes in the leaves, grass, water table, and weather, to graphing, drawing, cooking, singing, reading, and writing. A few teachers noted that they had not used the Nature Center because they were new to Valley of Enchantment School and were unfamiliar with the area and how it could be utilized.

The results of this second survey were summarized in a notebook and presented to the Superintendent as justification for maintaining the Nature Center.

The Superintendent approved the fund raising efforts proposed to finance needed repairs in the Nature Center. Student leasing of one-square foot of Nature Center land, for fifty cents per square foot, began in January 1992. Student lease donations reached \$180.00 by April 1992. Community donations totaled \$250.00 by April 1992, from such groups as the Crestline Soroptimists and the local Sierra Club. Material donations

included redwood trail posts, wood stain, paint, and concrete. A Senior Girl Scout, working toward a Gold Award, agreed to provide a weather station, a sundial, and an archaeological dig area for the Nature Center.

Two volunteer clean-up days were planned for April 11, 1992, and May 9, 1992. Other clean-up days would be planned as needed. Clean-up was to include pruning, raking, trail maintenance, replacing trail posts, and removing debris.

Completed Improvements

The trail guide (see Appendix G) for the Nature Center was revised to be republished in booklet form with a blackline master to be given to each teacher. The Valley of Enchantment School Nature Center sign was reset and permanently installed. The sign's surface was painted and refinished. New trail markers were placed along the Nature Center trail. These markers were 4"x4"x4' redwood posts, stained, numbered to match the trail guide, and permanently set in concrete with metal crossrods as extra support. A sketch of the mounting method may be found in Appendix H.

Three two-foot sections of 24" reinforced concrete pipe culverts were installed where the trail crossed the creek and drainage ditches.

On April 11, 1992, a school sponsored clean-up was held. Twenty-six volunteers, including school personnel, parents, students, and community members, worked from 8:30 a.m. until 12:00 noon pruning trees and bushes, cleaning and raking, and removing asphalt and other debris from the Center. The 12-foot length of fence that had been vandalized was repaired and the amphitheater benches were permanently anchored in place. A portable sundial and weather station were built for use in the Center. An archaeological dig site was prepared along with a portable archaeological tool kit. A surveyor's bench mark was installed with the elevation above Sea Level marked thereon. The entire Nature Center area was surveyed and a plot map drawn (see Appendix I).

It was decided not to install the bird boxes at this time as the birds were already nesting. Some consideration was given to enticing small birds, such as hummingbirds, to the area. A student forest tree key booklet was prepared (see Appendix J). Also a teacher's resource kit on

the yellow-pine forest and Nature Center activities was prepared (see Appendix K for content). A list of potential resource people, with expertise in the environmental field, was prepared (see Appendix B).

Family Science Night, May 1, 1992

Public tours were conducted through the Nature Center on Family Science Night, May 1, 1992, from 5:30 p.m. to 8:00 p.m. Ami Lloyd, Senior Girl Scout, used the revised trail guide to conduct the tours through the Center. The portable weather station, portable sundial, and archaeological dig site were included in the tours. The tours were an opportunity for many community members who were unaware of the existence of the Nature Center to see its potential first-hand.

Increased Usage of the Nature Center

Since the clean-up of April 11, 1992, and renewed interest through the student leasing program, usage of the Center has increased to the point that it was necessary to implement a usage sign-up system for classes wishing to use the Center.

Plans for the Future

Valley of Enchantment School Principal Betty Barnes made a presentation to the Rim of the World Unified School District Board of Education, April 21, 1992, seeking public recognition and Board support for the Valley of Enchantment School Nature Center. As a result of her presentation, the District has made a commitment to regular maintenance of the Nature Center. Efforts would include periodic pruning, trail maintenance, and fence repair as needed. The District has acknowledged the educational value of the Nature Center.

The student lease plan will continue yearly as a source of income for possible physical additions to the Nature Center, such as picnic tables and bird boxes, and teacher and student resource support materials. Teacher in-services regarding use of the Nature Center will be held annually.

Community interest and support will continue to be encouraged by the staff of Valley of Enchantment School and the Rim of the World Unified

School District. The Crestline Chapter of the Sierra Club has committed to an on-going support and growth of the Nature Center.

To ensure on-going support of the Nature Center as a vital and important aspect of the school curriculum, the Nature Center will be included in the list of curricular responsibilities such as the language arts committee and the science committee. Teachers volunteer to serve on the committees of their choice.

The list of resource persons will be expanded as new candidates are discovered and express an interest in supporting the Valley of Enchantment School Nature Center. Community groups, such as Boy and Girl Scouts and the Sierra Club, will be encouraged to use the Center during non-school hours. The vandalism problem still needs to be solved.

Future plans also include a student Nature Center environmental patrol. Possible duties would include the responsibility for daily clean-up of the area and reporting of any areas needing attention.

Those persons donating money, labor, and materials would be recognized at the awards ceremony at the end of the year. Each donor or

group representative would receive a certificate of recognition and be named on a Nature Center plaque to be maintained at Valley of Enchantment Elementary School.

Sample Lesson Plans

This section contains five sample lesson plans for Kindergarten through grade four, as Valley of Enchantment Elementary School is a Kindergarten through fourth grade school. The lessons were organized around the major theme of science, patterns of change. Each lesson, designed specifically for use in an on-site nature center, states environmental education concepts and outcomes, appropriate grade level, subject matter, objectives, materials needed, background information, procedures, and evaluation.

The lessons are only suggestions as to how a nature center could be used as an educational facility. Some sense of history and change needs to be fostered on a frequent basis. Hence the recommendation that lesson one, "Using the Nature Center Trail Guide," or a somewhat similar introductory lesson, be used at the beginning of each school year.

Younger children will gain an awareness of the area. As the children progress through the grades, the more detailed information given in the trail guide will have increased meaning.

Lesson One: Using the Nature Center Trail Guide

Concepts: Living things are independent with their natural and physical environment.

Living things and environments are in constant change.

Outcomes: Fostering awareness and respect of the environment.

Understanding basic environmental concepts.

Grade Level: K - 4

Subjects: Science, Language Arts, History-Social Science

Objectives: Students will gain a sense of the history of the Nature Center.

Students will gain knowledge of some of the plants and animals of the area.

Students will express themselves orally and/or in writing about their experience walking the Nature Center trail.

Materials: Nature Center trail guide, paper, pencils, crayons

Background: Teacher should be familiar with the contents of the trail guide before taking the students to the Nature Center.

Procedures: Teacher uses the trail guide to conduct tour through the Nature Center, stopping at trail markers and discussing information along the way. The teacher may read the trail guide verbatim or paraphrase as needed for age level of children.

Evaluation: Back in the classroom students may share orally what they experienced; younger children may draw a simple picture of one experience; older children may draw and write of their experience, perhaps in a science journal.

Lesson Two: Using Your Senses in the Nature Center

Concept: People interact mentally and emotionally to the objects and events in their environment.

Outcome: Fostering awareness and respect of the environment.

Grade Level: K - 4

Subjects: Science, language arts

Objectives: Students will use their senses as observation tools.

Students will use oral expression to share experiences.

Students will use, or be exposed to, written expression of their observations.

Materials: Whistle, chalk, chalkboard, paper, pencils, lapboards

Background: None necessary; students should not use sense of taste for obvious safety reasons; students may be allergic to stinging nettles.

Procedures: Before going to the Nature Center, the teacher uses the following dialogue or paraphrases as deemed necessary.

"As scientists we are learning how to observe in nature. Many parts of our bodies are our tools. Today, boys and girls, we are going to be science detectives. We are each going to choose one spot, on or near the trail in the Nature Center, to quietly sit down and use our senses of touch, smell, sight, and hearing. Be sure to avoid touching the

stinging nettles, as they may cause you to break out in a rash. Do not taste anything. We will use our senses to be movie cameras and recorders. We are not going to talk, but we are going to sit quietly to use our eyes, ears, nose, and fingers. Write down what you see, hear, smell, and touch. When I blow my whistle, we will all come back to the benches as quietly as we can. (Allow 10 to 15 minutes of observation before blowing the whistle.) Before leaving the Nature Center, to return to our classroom, will someone please share with us what he or she heard? saw? smelled? touched? What might we have safely tasted? (apples, if in season)."

Return to the classroom for follow up activities.

Evaluation: Younger children, grades K-2, could share orally and perhaps compose class poems or simple lists about the senses. Older students, grades 3-4, could write a paragraph

or poem about the sensory experiences in the Nature Center.

Lesson Three: Forest Tree Key

Concepts: Living things are independent with their natural and physical environment.

People's social behavior is basic to maintaining, altering, or destroying the environment.

Living things and environments are in constant change.

Outcomes: Fostering awareness of the environment

Understanding basic environmental concepts.

Grade Level: 2-4

Subjects: Science

Objectives: Students will classify leaves as coming from deciduous or evergreen trees.

Students will use a forest tree key to classify leaves and seeds found in the Center.

Students will practice identifying cedar, pine, oak, apple, and willow trees.

Materials: Forest Tree Key (See Appendix J), scissors, stapler, crayons

Background: Ranger Rick's NatureScope Trees Are Terrific "Keying Out Trees" is recommended as an introductory lesson.

Procedures: In the classroom, students cut and assemble their Forest Tree Key. Visit the Nature center, using the key to identify pine, cedar, oak, apple, and willow trees. Take one sample of each of the five kinds of leaves back to the classroom. Students color their tree keys to take home.

Evaluation: The teacher will know the lesson objectives have been met when the children can locate and identify the five kinds of trees found in the Nature Center.

Lesson Four: Caretakers of Our Nature Center

Concepts: Living things are independent with their natural and physical environment.

People's social behavior is basic to maintaining, altering, or destroying the environment.

People interact mentally and emotionally to the objects and events in their environment.

Living things and environments are in constant change.

Outcomes: Fostering awareness and respect of the environment

Understanding basic environmental concepts

Sustaining responsible actions toward the environment

Grade Level: K-4

Subjects: Science, History-Social Science, Physical Education

Objectives: Students will contribute financially to the improvement of the Nature Center.

Students will develop a sense of responsibility and awareness toward their natural environment.

Students will care for and clean the Nature Center of unwanted debris.

Materials: Nature Center, one-square foot cardboard sections, trash bags

Background: This lesson is to be done after the student leasing (50 cents per square foot) has begun.

Procedures: The teacher walks to the Nature Center with the class. Class sits on the amphitheater benches before exploring the Center. Appropriate behavior as Nature Center visitors is reinforced or discussed for the first time, if not done previously. The students will need to start thinking as science observers and regarding the nature center as an extension of their classroom. In the Nature Center "classroom" certain things can be done that cannot be done in the indoor classroom. Discuss opportunities for learning that may not be offered in the regular classroom. The students need to develop a caretaker attitude about the Nature Center so that it can be maintained and used by many children every month.

Allow children to walk around the Nature Center, carefully picking up unwanted debris and placing in trash bags. Those children who leased one-square foot of land can pick out his/her area, using the cut cardboard. Those children who have not contributed may go along with others, or pick out a potential area of land to watch over for the remainder of the year.

Reassemble back at the amphitheater area. Class discussion could include amount and kinds of trash found. Any physical damage to fences, posts, etc. can be reported and discussed. Solicit students' suggestions as to what they and others can do about any possible vandalism. Remind students that they will make periodic visits, such as this one, to the Center to check on their leases.

Evaluation: The teacher will know objectives have been met by listening to student responses.

Lesson Five: Little Folk's Trail

Concept: People interact mentally and emotionally to the objects and events in the environment.

Outcome: Fostering awareness and respect of the environment

Grade Level: K-1

Subjects: Physical Education, Science, Humanities, Mathematics

Objectives: Students will exercise.

Students will count to ten.

Students will observe nature.

Students will experience the joy of learning and observing.

Materials: Watch with second hand, Nature Center, task cards for each station along the trail. Suggested tasks (alter as needed):

STATION 1 Student hops on one foot ten times.

STATION 2 Student claps two hands ten times.

STATION 3 Student spins three times.

STATION 4 Student touches four trees.

- STATION 5 Student lies down and rests for five seconds; student looks up at the sky and trees; no talking.
- STATION 6 Student picks up six things (pine needles, leaves, rocks, etc.), counts them, and puts them back.
- STATION 7 Student jumps on both feet seven times.
- STATION 8 Student runs in place eight steps, alternating feet.
- STATION 9 Student sits underneath the willows and listens for nine seconds; student tells what he/she heard.
- STATION 10 Student sits on bench and counts to ten by ones or counts to one hundred by tens.

Procedures: The lesson could be done as a whole class activity, or with teacher, aide, and parent volunteers responsible for five children. Be aware, some children may have allergies.

Evaluation: The teacher will know that the objectives have been met as children perform the given tasks; children can express their feelings about the experience once all are back at the amphitheater benches or back in the classroom.

Section 5: Implications for Educators

The project, although specific to Valley of Enchantment Elementary School, is comprehensive enough that those interested educators wishing to establish an on-site nature center could use this project as a model for developing such a center. A mountain setting is not a necessity for establishing such a center. The immediate school environment or schoolyard would suffice. The nature center should reflect the natural environment of the local area, whether it be desert, grassland, or mountain. The project's review of related literature verifies the use and relevance of such a center as an important part of the elementary school curriculum. Specific to California public schools, the connections to the History-Social Science Framework for California Public Schools, Kindergarten Through Grade Twelve (1987) and the Science Framework

for California Public Schools, Kindergarten Through Grade Twelve (1990) are clearly delineated, further verifying the importance for such an on-site learning center.

Specifics on school, district, and community support are clearly outlined in Section 4 of this project. Those educators wishing to initiate such a center are given specific guidelines and ideas on fund-raising, community and school awareness and support, and suggestions for perpetuating such an on-site facility.

The sample lesson plans are a starting point for educators interested in such an outdoor learning environment. The resources, such as Project Wild, Ranger Rick's NatureScope Trees Are Terrific!, and Project Learning Tree listed in the reference section are excellent sources for lessons to be developed for use in an outdoor nature center.

Materials included in the appendixes offer specific items, such as the trail guide and the list of resource persons, that are specific models for those educators wishing to create a similar center on their own school site.

Educators can no longer ignore the needs for an environmental education curriculum at the elementary school level. Humankind's future on earth is dependent on the development of awareness and respect, decisions based on knowledge, and actions carried out to protect the environment and its inhabitants.

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APPENDIXES

Appendix A

Teacher Needs Assessment

NATURE CENTER

GRADE LEVEL _____

A. I take my class to the Nature Center ___ times per year.

B. I know what to do with my class at the Nature Center.

Yes ___ No ___

C. I would take my class to the Nature Center more often if:

1. _____

2. _____

3. _____

4. _____

D. I would like to have some lessons modelled for the staff at the

Nature Center. Yes ___ No ___

E. I would go to the Nature Center more often if lessons were planned for me that correlated with our science curriculum at each grade level. Yes __ No __ Maybe __

F. Name three outside resource persons that you would like to see present a program for students at the Nature Center, (i.e., forest ranger, entomologist, wildlife biologist, etc.)

- 1. _____
- 2. _____
- 3. _____

Comments:

Appendix B

Local Human Resources

Arrowhead Fish and Game Conservation Club, Inc.

P.O. Box 567

Lake Arrowhead, CA 92352

(714) 337-6770

Beveridge, Carol - Science Mentor Teacher

Lake Arrowhead Elementary School

1300 Golden Rule Lane

P.O. Box 430

Lake Arrowhead, CA 92352

(714) 336-0387

California State Department of Forestry and Fire Protection

3800 N. Sierra Way

San Bernardino, CA 92405

(714) 881-6900

Crest Forest Fire District

(714) 338-3311

Crest Forest Historical Society

Rhea-Frances Tetley - President

P.O. Box 1796

Crestline, CA 92325

Crestline Village County Water District

Don Wagner - Contact Person

(714) 338-1727

Gilbert, Karen - Technology Expert and Classroom Teacher

Valley of Enchantment Elementary School

22836 Fir Lane

Crestline, CA 92325

P.O. Box 430

Lake Arrowhead, CA 92352

(714) 336-0375

Hemphill, Tom - Meteorologist

c/o Falcon Cable TV

26261 Highway 18

Rimforest, CA 92378

(714) 336-2047

Lake Arrowhead Children's Museum

P.O. Box 321

Suite T-100

Lake Arrowhead Village

Lake Arrowhead, CA 92352

(714) 336-1332

Manning, Nancy - Naturalist

San Bernardino County Museum

2024 Orange Tree Lane

Redlands, CA 92374

(714) 798-8570

Mountain Skies Astronomical Society

Lorann Parker - President

P.O. Box 1169

Lake Arrowhead, CA 92352

(714) 337-4075

Parker, D. Lynn - Civil Engineer

P.O. Box 4434

Crestline, CA 92325

Lake Gregory Regional Park

Crestline, CA 92325

714-338-2233

Rim of the World Interpretive Association

P.O. Box 1958

Lake Arrowhead, CA 92352

San Bernardino County Public Library

Crestline Branch

23555 Knapps Cut-Off

Crestline, CA 92325

(714) 338-3294

San Bernardino County Sheriff's Department

Neighborhood Watch

26030 Highway 189

Twin Peaks, CA 92391

(714) 336-0600

Save Our Forest Association

P.O. Box 126

Rim Forest, CA 92378

(714) 337-3667

Sierra Club

San Geronio Chapter

Mountains Group

P.O. Box 6606

Crestline, CA 92325

(714) 338-4008

Southern California Edison Company

26364 Pine Ave.

P. O. Box 96

Rimforest, CA 92378

Southern California Gas Company

(800) 662-9777

Stoner, Darleen, Ph.D. - Environmental Educator

California State University, San Bernardino

5500 University Parkway

San Bernardino, CA 92407

(714) 880-5000

United States Department of Forestry

San Bernardino National Forest

1824 Commerce Center Circle

San Bernardino, CA 92408

Arrowhead Ranger Station

Sky Forest, CA 92385

(714) 337-2444

Appendix C

Fundraiser Letter

Dear ---:

The Valley of Enchantment Elementary School Nature Center was once a vital instructional facility, where classroom activities were integrated with the environment. Due to vandalism and misuse of the area, the center is no longer used by most teachers and their students, and its educational value has been questioned.

Our goal is to revitalize the Nature Center by calling upon community groups and agencies to help improve the area, as well as encouraging these groups to use the area after school hours.

Donations are being solicited from community groups and agencies for fence repair and building materials. Certain community groups are being asked to help in the actual physical improvement of the area. Valley of Enchantment Elementary School students and adult personnel are being encouraged to maintain the area, also.

We would appreciate hearing from you on how your organization might help in this endeavor, whether it be monetarily, physically, or by donating needed materials. Your group would be recognized as a Partner in Education by the Rim of the World Unified School District. Any and all donations will be tax deductible.

Please fill out and return the attached form in the enclosed self-addressed, stamped envelope.

Sincerely,

Carol Parker, Teacher VOE School

Lorraine Kearns, Teacher VOE School

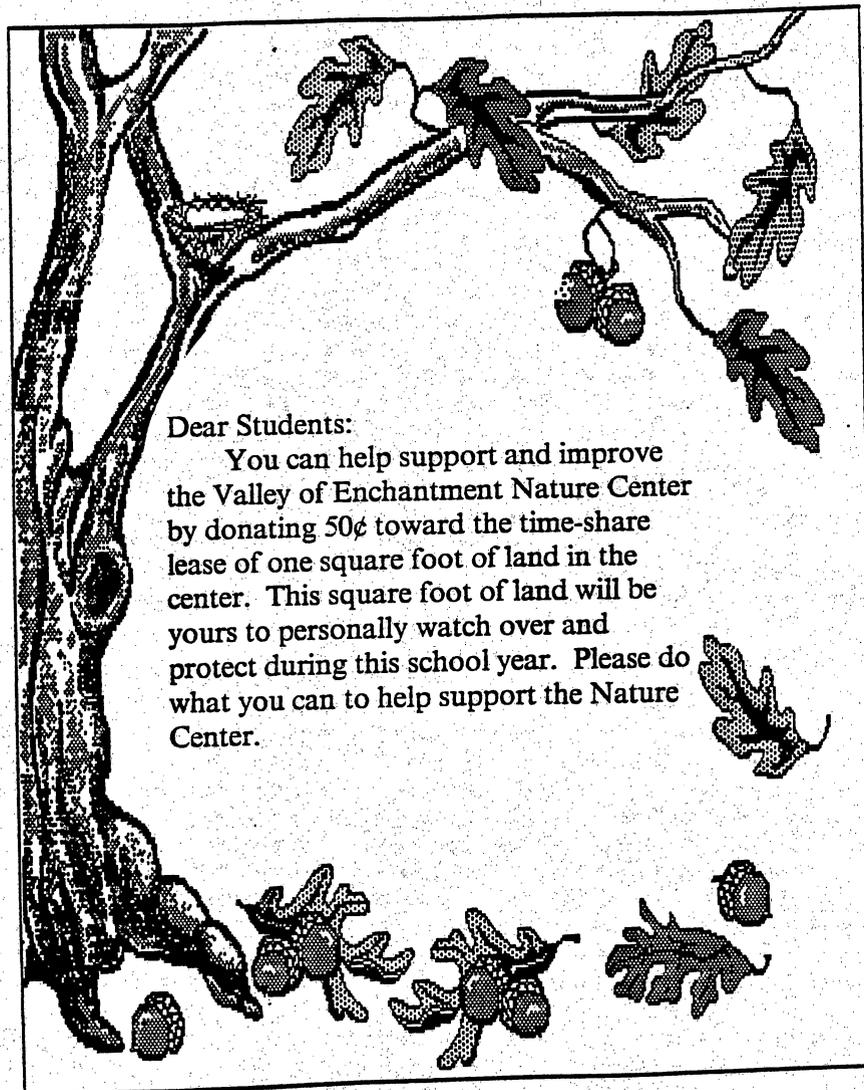
VOE Nature Center Rejuvenation Project

Response

1. Organization: Crest Forest Historical Society
2. Contact person: _____

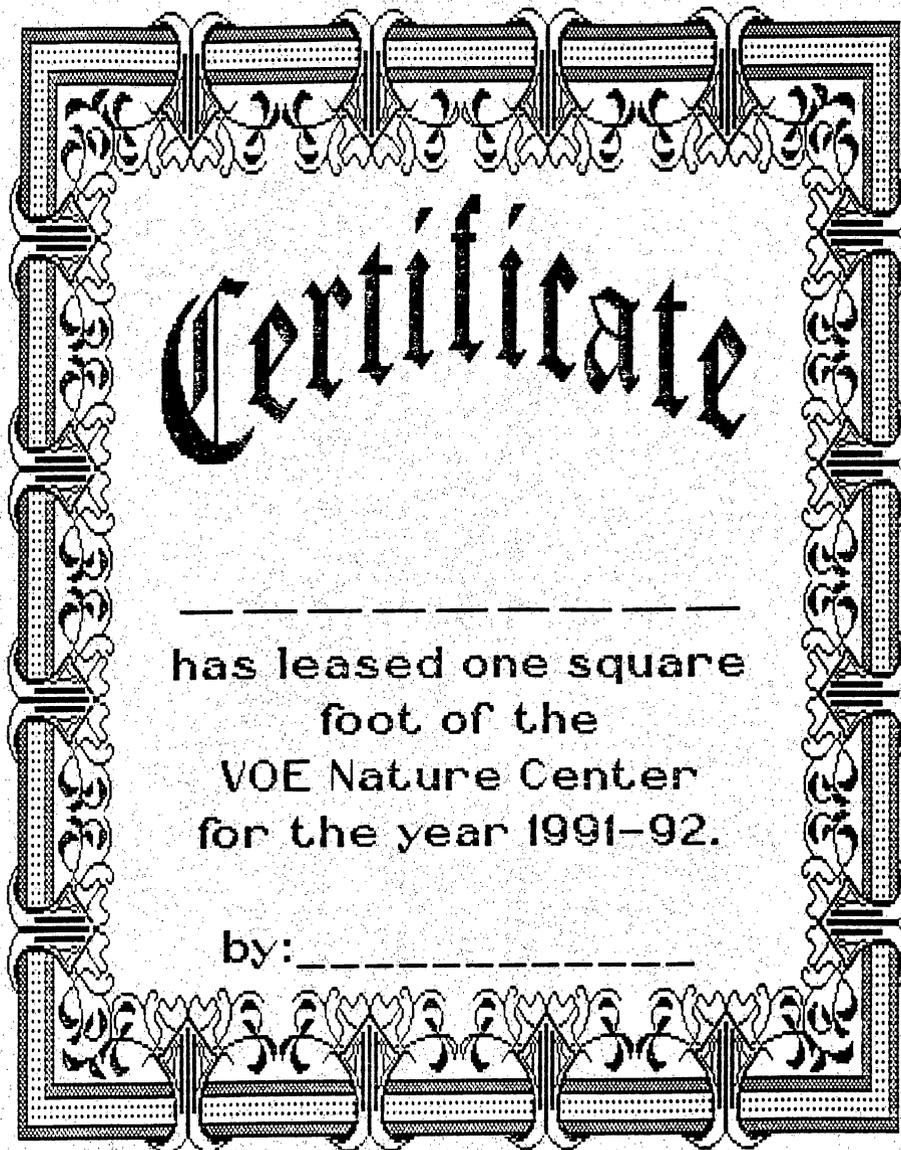
3. Enclosed is our check for \$25 () \$50 () \$100 () Other () _____
(Please make checks payable to ROWUSD-VOE Nature Center)
4. We will donate the following materials:
24" RCP or CSP (12 lf is needed) _____
4" x 4" x 5' Redwood posts (15 needed) _____
6' Chain link fence fabric (20 lf needed) _____
Redi-Mix Concrete mix (20 bags needed) _____
5. We will donate time and labor for a work party _____
6. We are unable to help at this time () _____

Appendix D

Lease Letter

Appendix E

Student Lease Certificate



Appendix F

Nature Center Use Survey

December 5, 1991

To: Valley of Enchantment Elementary School Teachers

Re: Nature Center

JUST A QUICK SURVEY!!!

Dr. Fitzpatrick, District Superintendent, would like to support the Valley of Enchantment Nature Center. However, he needs to know specifically how the Nature Center has been and will be used.

Please briefly describe a lesson or activity that you and your students accomplished in the Nature Center. Your input would be greatly appreciated.

Please return this survey to Carol Parker or Lorraine Kearns by December 9, 1991.

Thank you, Lorraine and Carol

* * * * *

Activity: _____

Curricular Areas: _____

Teacher's Name: _____ Grade: _____

Appendix G

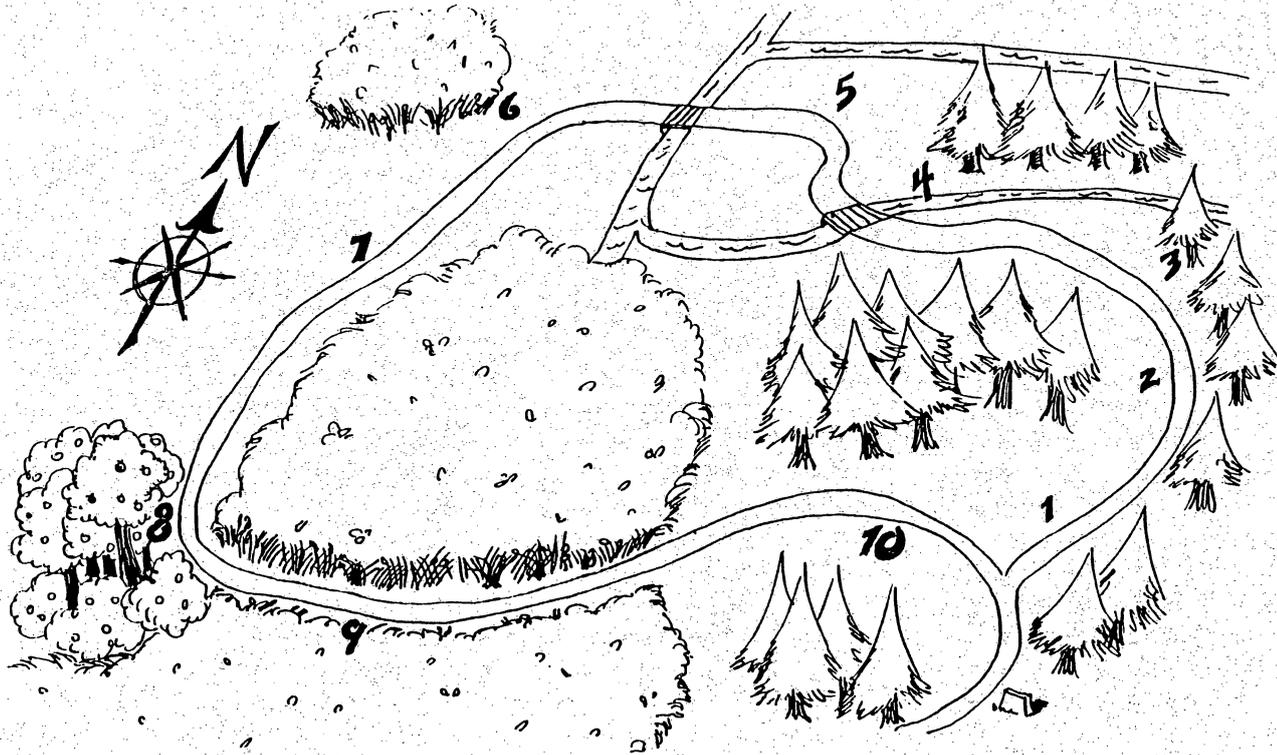
Trail Guide

Valley of Enchantment Elementary School

Yellow Pine Forest

Nature Trail Guide





Where you start

This pleasant walk loops through the forest and returns you to this spot.

We ask that you please...

Take only pictures and memories,

Leave only your footprints.

These rocks at the entrance are granite. Shiny flakes of black mica and white quartz are the easily visible minerals in the rocks and

surrounding soil. Small plants produce acid that decompose the rocks.

You can see the resulting gravel and sand at the base of the rocks.

Decaying plants and the small pieces of granite mix to form soil. The soil in this area is a mixture of granite and organic plant materials.



1. This area is what remains of a pond that may once have covered the playground area of the school. The high level of ground water affects the types of plants growing here. As you walk through this area think about what it might have looked like many years ago when the Serrano (Spanish for "mountaineer") Indians spent

summers here. The mountain meadows offered them cooler summer climates and food sources for the tribe.

You are entering the trail between a stand of yellow pine trees. Beyond the pines, to the west, is a stand of willows.

2. Lumberjacks, sawmills, and oxen teams were common here 100 years ago. A major sawmill operated at Camp Seeley about 1/4 mile north of here. This sawmill provided lumber for the San Bernardino area. As a result, the forest around you is a second growth forest. Most of the trees here are under 100 years old.



When trees and other plants die, they return all of what they took from the soil; nothing is wasted. New soil is formed partly from decaying plants.

Trees are true conservationists. As the trees die, fall, rot, and return to the soil, they provide homes for insects, lizards, and small mammals.



3. Stopping here, notice the plant life is changing. Ground plants such as the nettles are indicative of increased water in the soil. However, in times of drought, nettles do not thrive. Nettles can be irritating to the skin, yet the young shoots of the plant are edible when properly cooked (tastes like spinach). The roots of the plant can be boiled to produce a yellow dye.



4. Plants adapt to the conditions where they live. Plants in the stream channel, such as the willows, need a constant water source.
5. Stopping here, notice the mounds of earth around the path. This soft soil provides a home for burrowing California Pocket Gophers. They build elaborate tunnel systems with separate chambers for nesting, food storage, and water. These gophers eat the roots of the lush meadow grasses. Their burrows include several escape tunnels for protection from predators.



Located to the west of this area is a sample archaeological dig site.

6. The plant life in this area is quite different from the plant life at the beginning of the trail. Here you see mostly grasses and a single willow. All willows require abundant water. The water source for this willow may be underground during part of the year.

South of the willow is a weather station and sundial. (This area was prepared for us by Ami Lloyd for her Senior Girl Scout Gold Award.)

7. This stop is near the center of the meadow area. The grasses and flowering plants here are a mixture of native and introduced plants. This area provides food and shelter for many insects and small animals. They are often well-camouflaged and careful observation is required to see them. Birds come to the meadow for insects, seeds, and water.



Looking up beyond the fence, notice the large spreading Black Oak, named for its black, heavily ridged bark. Notice the mistletoe, a parasitic plant, growing on the oak. Sometimes the interior of an older tree, such as this, rots out, providing an excellent den for the raccoons. Watch for tracks of this nocturnal forest dweller in the mud of the stream.

Viewing the surrounding forest beyond the nature study area, you see a mixture of yellow pines. This forest also includes some Incense Cedar, such as the one growing near the fence. When young, this shade-loving tree grows in the shadow/shade of the yellow pines. This yellow pine forest surrounds our school and, probably, our homes.



8. Here in the shade of the apple tree, you can see many shade-loving plants that require an abundant water supply. The apple tree is not native and was probably introduced by early settlers in the area.

The Serrano Indians may have chosen a spot such as this to build a summer camp. The willows growing along the streambed may have been used by the Indians to build shelters and for other household purposes. The Indians were dependent on acorns as a food source and needed water to leach the acorns of their tannic acid before eating. The water supply, the willows, and the Black Oaks here would have provided food, water, and shelter necessary for life.



9. Upon entering the stand of willows, listen for the birds that find shelter, water, and food here. Feel the coolness of the willow stand as it shades you from the heat of the sun. Stop and pause to enjoy the tranquility of this area. Sit silently for a few moments and listen for the return of the wildlife.



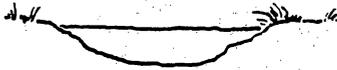
10. All things in nature are constantly changing. The change from one plant community to another is called plant succession. From this stop, as you sit on the benches, look around to observe the three

changing plant communities in the nature area. You will see a meadow, a streambed, and a stand of yellow pine trees. These distinct environments are caused by the amount of natural water available.

At one time, the entire school yard was probably a spring-fed pond bordered by grasses and wildflowers. As the spring dwindled, the water began to run as a stream. Willows and bushes began to grow along the stream. Finally the soil left from the pond provided a growing place for yellow pine seedlings. If the water supply continues to dwindle, this area could become a stand of yellow pine trees.

VALLEY OF ENCHANTMENT PLANT SUCCESSION

1. Pond/Grasses



2. Stream/Willows



3. Stream/Pines



Yellow Pines

Western Yellow Pines

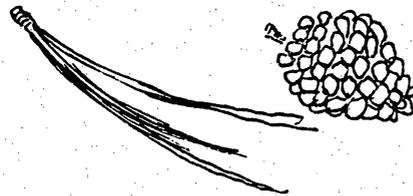
(*Pinus Ponderosa*)

Long Needles (three per leaf)

Cone oval, with scales loose;

Prickly when held in hand.

Bark in jigsaw puzzle plates.



Jeffrey Pine

(*Pinus Jeffrey*)

Long needles (three per leaf)

Cone long-oval, with scales compact;

Not prickly when held in hand.

Bark furrowed.



Coulter Pine

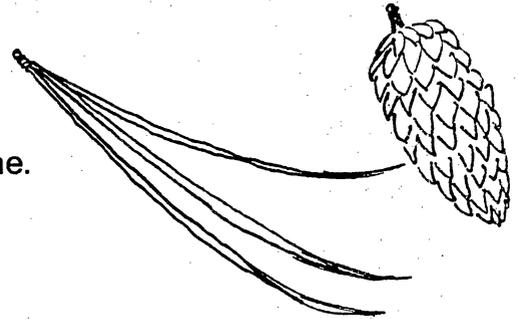
(Pinus Coulter)

Long Needles (three per leaf)

Cones very large and heavy.

Sometimes known as Big Cone Pine.

Dark brown, deeply furrowed bark.



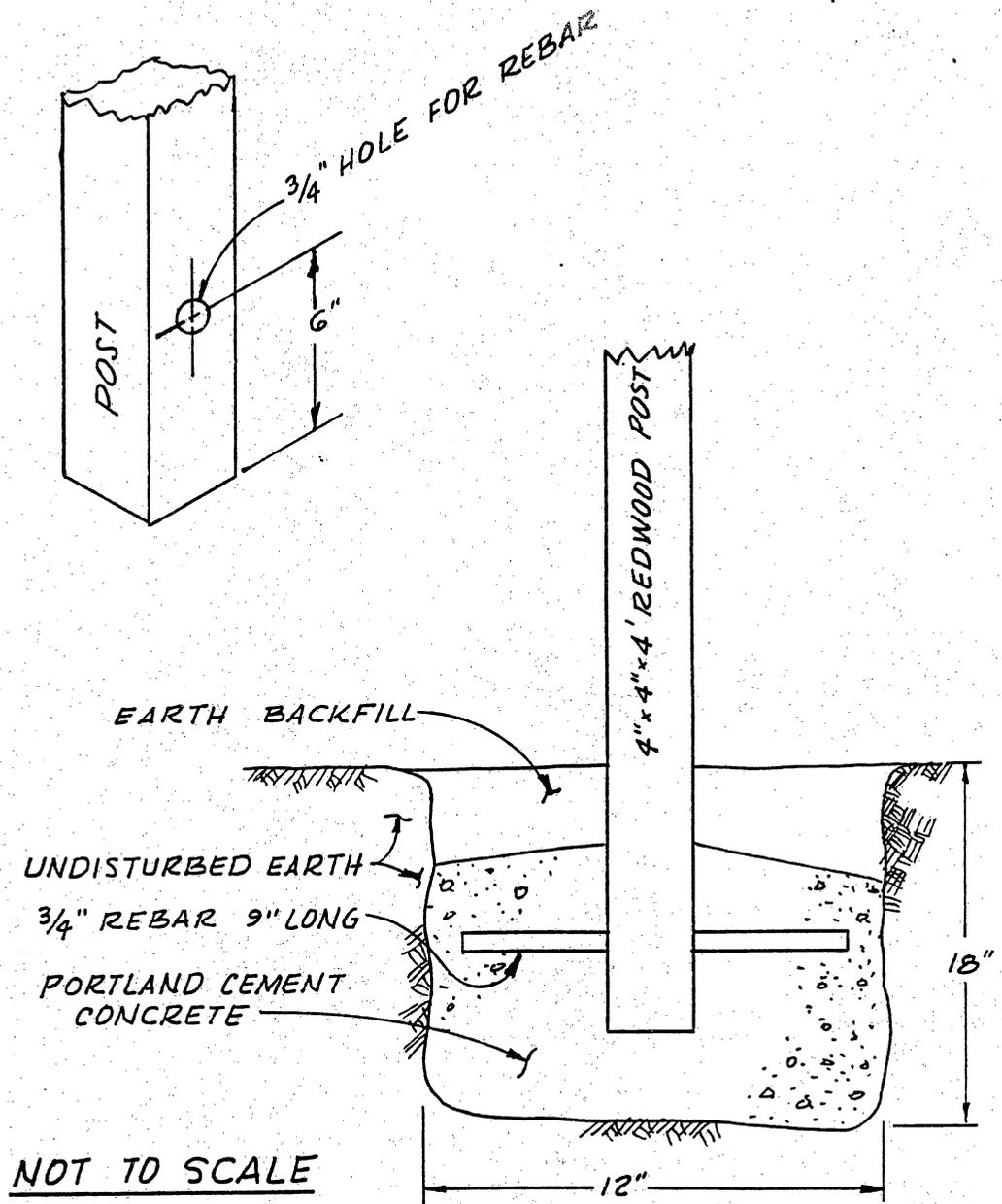
The name yellow pine forest refers to the plant environment where yellow pines are dominant. These pines include ponderosa, coulter, and jeffrey pines. The yellow pine tree of Valley of Enchantment nature area is a hybrid of the ponderosa and the jeffrey pine.

Revised 1992

Artwork by Devin Parker

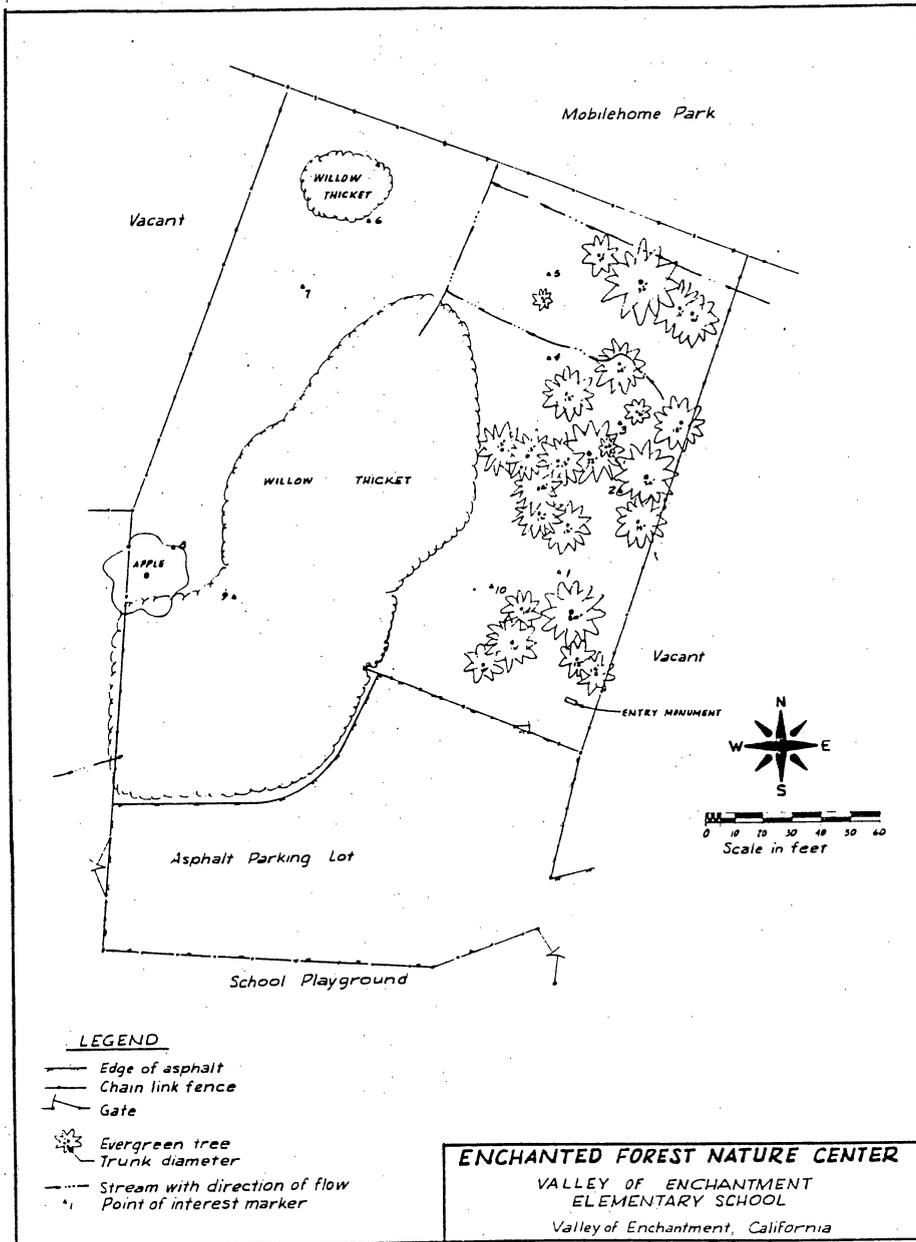
Appendix H

Trail Post Mounting



Appendix I

Plot Map of Nature Center



Appendix J

Forest Tree Key

Page 1

If the tree is deciduous, or loses its leaves in winter...

Go to page 2

If the tree is evergreen, or keeps its leaves all year...

Go to page 3

Page 2



If the leaves or leaf scars are alternate on the branch, the leaves lobed with one main vein, the seed is an acorn, it is a ...

Black Oak

If leaves are paddle shaped, go to page 10.

If leaves are flat oval shaped, go to page 11.

Page 3

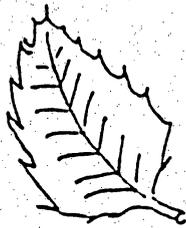
If the tree has needle-like leaves...

Go to page 4



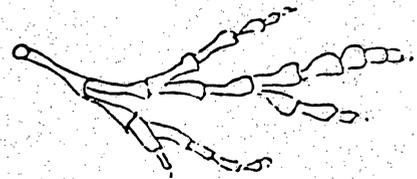
If the tree has broad leaves...

Go to page 5



If the tree has scale-like leaves...

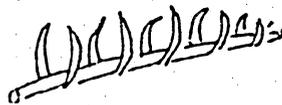
Go to page 6



Page 4

If the needles are attached singly...

Go to page 9



If the needles are in bundles of 3...

Go to pages 7 and 8



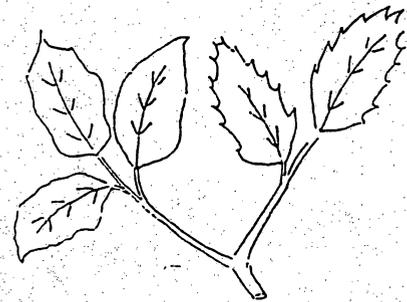
If the needles are in bundles of 5...

Go to page 8



Page 5

If the leaves are shiny green on top with a gray-green underside, lower leaves on tree have prickly edges, upper leaves have smooth edges, seed is an acorn, it is a ...

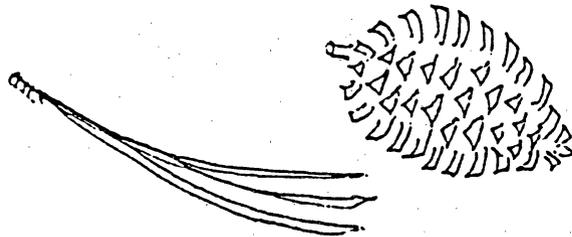
Canyon Live OakPage 6

If the tree has scale-like leaves, cinnamon-red bark that strips off the tree, seed pods that look like a duck's bill, it is an ...

Incense Cedar

Page 7

If the needles are yellow-green, 5-8" long, bark is shaped like puzzle pieces, cones are 3-6" long and prickly, it is a ...

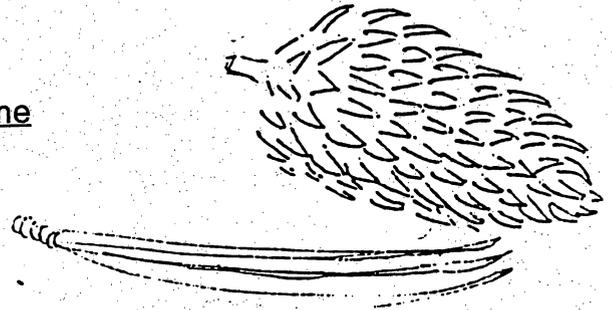
Ponderosa Pine

If the needles are yellow-green, 5-8" long, bark is gray & furrowed, cones are 5-7" long and gentle to the touch, it is a ...

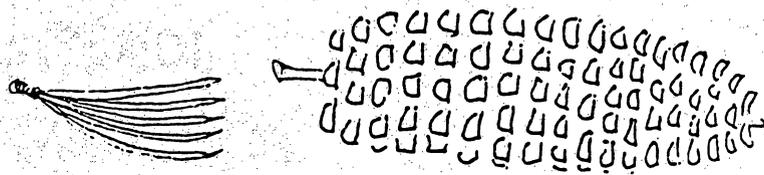
Jeffrey Pine

Page 8

If the needles are bluish-green, 9-12" long, cones are 7-14" long weighing 8-10 pounds, it is a ...

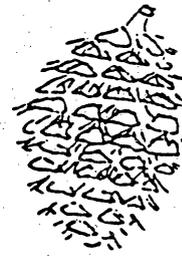
Coulter Pine

If the needles are in bundles of 5, needles are 2-4" long, cones are slender and 12-16" long, it is a ...

Sugar Pine

Page 9

If the needles grow on all sides of the branches, cones are 3-6" long and tufted, it is a ...

Big Cone Spruce

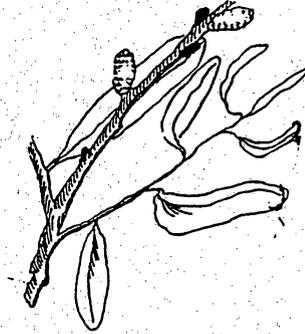
If the needles are attached on only two sides of the branch, needles are 1-2" long with white lines on one side, bark on young trees is smooth and gray, it is a ...

White Fir

Page 10

If the leaves are alternate on the branch, the leaves are paddle shaped, it is a ...

Willow

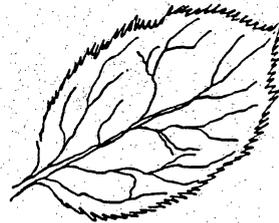


In the spring, the branches of this tall deciduous shrub or small tree are covered with a gray-violet bloom.

Page 11

If the leaves are flat oval shaped and jagged at the edges, it is a ...

Mountain Apple



Appendix K

Resources for Teacher Lesson Plans

National Wildlife Federation. (1991). Naturescope library. Washington,

DC: Author.

Project learning tree activity guide k-6. (1988). Washington, DC:

American Forest Council.

Project wild aquatic. (1987). Boulder: The Western Regional

Environmental Education Council.

Project wild elementary activity guide. (1986). Boulder: Western

Regional Environmental Education Council.

Seasoning math and science, book b. (1987). Fresno, CA: AIMS

Education Foundation.

Water precious water. (1988). Fresno, CA: AIMS Education Foundation.

Other sources:

Teacher resource boxes which may be checked out from the San

Bernardino County Museum, Redlands, CA.

Sample tree cuts of a variety of trees.

Set of tree cuts for counting rings.

Box of sample pine cones.