NATURE JOURNALING IN THE AUBURN STATE RECREATION AREA

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NATURE JOURNALING IN THE AUBURN STATE RECREATION AREA

A Project

by

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Abstract

of

NATURE JOURNALING IN THE AUBURN STATE RECREATION AREA

by

Pamela G. Wirsch

The purpose of this project was to design, pilot, and evaluate a place-based nature journaling unit for high school students utilizing the Auburn State Recreation Area (ASRA). The objectives were to increase understanding of and appreciation for a local environment and issues relating to it, to promote environmental stewardship, and to improve safety awareness. These objectives were undertaken to reconnect youth with the natural world and foster a love and respect that would encourage stewardship behaviors and reduce river-related injuries. The unit consists of five site-specific lessons aligned with state and national science standards. It was piloted in the spring of 2010 and recommendations for subsequent use include increased instructional support for field guide use and reflective writing, guidelines for sketching activities, modeling of environmental stewardship behaviors, and optimal use dates.

Zephaniah T. Davis, Ph.D., Committee Chair

Date
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Chapter 1

INTRODUCTION

In recent years children’s contact and familiarity with their local environment has decreased to such a degree that the phenomenon has been termed nature-deficit disorder by journalist, Richard Louv (2005). In his widely acclaimed book, Last Child in the Woods, he quotes a fourth-grader’s poignant statement, “I like to play indoors better, ‘cause that’s where all the electrical outlets are” (p. 10). The causes of this are likely rooted in a combination of circumstances as diverse as health and safety concerns related to outdoor play, the demands of high-stakes testing on schools, and the recent explosion of electronic entertainment.

There is growing concern that a trend away from nature-based recreation is also being evidenced in the adult population. Research evaluating utilization of state and national parks confirms a steady decline in admissions over the past 20 years (Pergams & Zaradic, 2008). Members of the conservation community have expressed concern that this decline in nature participation will negatively impact conservation efforts at a time when global environmental degradation is reaching crisis proportions.

As a high school science teacher with a love of outdoor recreation and an interest in conservation, I feel I am in a unique position to help young people rediscover the outdoors. I have the privilege of living and working adjacent to a rich educational resource, the Auburn State Recreation Area (ASRA). The ASRA is located within the American River Watershed on the western slope of the Sierra Nevada and is easily accessed via Interstate 80. It includes the popular confluence area
of the North and Middle Forks of the American River and is a short drive from
downtown Auburn. Although the area is familiar to many local students as a recreation
destination, it also offers a fascinating geologic history, evidences of Native American
culture and Gold Rush influence, and a dynamic ecosystem.

The land in the Auburn State Recreation Area is owned by the United States
Bureau of Reclamation and was to have been the site of a major dam. Construction
was underway when the Oroville earthquake of 1975 brought the safety of the project
into question. Discussion of the construction of some form of dam has polarized local,
regional and national interest groups during the past forty years. It will likely continue
to be an issue if climate change increases the demand for flood control and water
storage in California. This story offers insight into the power of grassroots activism.

Utilization of the ASRA as a teaching tool for local students could enrich their
academic studies as they reconnect with this wild and scenic canyon land in safe and
positive ways.

Statement of the Problem

This project addresses the following three areas of primary concern: the
disconnection of youth from the natural world as described by Louv (2005) and others;
lack of environmental stewardship as evidenced by the dumpsters full of debris
removed from the confluence area of the ASRA each year; and river safety issues
documented by disturbing injury and death statistics (S. Nevin, personal
communication, October 14, 2009).
It is important to note that research indicates educational strategies informing students about the severity of environmental issues and training them in conservation and environmental stewardship behaviors have been found to be ineffective (Litzgus-Sianchuk, 1994). At the heart of the issue is the complex problem of will. Though one may desire to behave in certain ways, it does not often happen that way. It is not within the scope of this study to probe the multifaceted psychological aspects of this problem, but one key point is evident. If one is to protect something one must value it both intellectually and emotionally.

Description of the Project

Given the need for a reconnection of youth with the natural world, increased environmental stewardship and river safety, the purpose of this project was to design, pilot and evaluate a place-based nature journaling unit for high school students. The objectives were to increase understanding of and appreciation for a local environment (eco-address) and issues relating to it, to promote environmental stewardship behavior, and educate students regarding important safety issues. Nature journals were utilized to provide evidence of learning and an evaluation was completed by each participant at the conclusion of each lesson.

Students observed living and nonliving components of the river ecosystem, recorded their observations through sketches and descriptive writing, identified local species, wrote reflectively on a topic relevant to each of the five study locations and read brief excerpts from the resource text, recording points of interest in their journals. These entries were reviewed for correct identification of local species, and evidence of
increased understanding of and appreciation for the history, geology and ecology of the ASRA. The evaluation was reviewed by the researcher to provide evidence of students’ prior knowledge, engagement and attitudinal changes.

Importance of the Problem

There is a very real concern that many young people are simply not going outside enough. Many students in the Auburn area are unaware of the unique history, rich ecology and recreational opportunities that are available in the ASRA. Familiarizing students with this resource probably had a positive academic outcome. The project was aligned with state and national science standards, as well as non-standards based knowledge embodying both local and personal relevance. Research suggests that disconnection from nature and place may deprive students of a much needed source of simple enjoyment and deep satisfaction (Louv, 2005). Perhaps it is this void that has lured so many young people into the artificial worlds of chemical and electronic stimulation. It was the intent of this project literally to open a door to the restorative power of the natural world.

The second concern involves environmental stewardship. The confluence area receives heavy use, particularly during the summer months, and its fragile beauty is too often marred by graffiti and trash. The high Foresthill Bridge is a popular place to dispose of unwanted items, leaving debris scattered along the canyon slopes and in the river 730 feet below. Each spring and fall a local environmental group, Protect American River Canyons (PARC), organizes a community clean-up activity to remove the remains of shopping carts, televisions, and furniture, along with the usual river...
refuse such as old shoes, fast-food wrappers and countless drink containers. Several large dumpsters are filled at each event. This local context offers a concrete opportunity to foster environmental awareness and stewardship values among students, as well as to mitigate this disturbing situation through education of local youth.

The third area of concern is safety. Although some local high school students make use of the Auburn State Recreation Area in safe and healthy ways, too many engage in risky activities that result in unnecessary injuries each year and occasional deaths. Activities in the ASRA are overseen by the California Department of Parks and Recreation. Park officials report that, although people drown almost every year in the cold, powerful waters of the winter runoff, local teens are most often injured or killed in the peaceful summer flow of the river. It is popular to jump from high rocks, swinging ropes, cliffs, boats and bridges. But the river is constantly changing, and a swimming hole that was safe for diving or jumping last summer, last week or even yesterday may quickly become extremely hazardous. Logs, rocks and other objects are moved along by the flow of the river, gravel bars shift constantly, and water levels fluctuate during the day. And of course, safe activities mixed with alcohol can turn deadly. By providing local teens with a model of safe and healthy river recreation and knowledge of the dangers, it is my hope to prevent injuries and save lives.

Limitations of the Project

“Exploring the Auburn State Recreation Area – A Nature Journaling Unit” is site specific. It was created for use in the Auburn State Recreation Area located just
east of Auburn, California. It requires transportation to the study areas and two of the parking areas suggested require use fees (currently $5-10). Alternate parking suggestions are given but require additional walking. This unit requires physical abilities that could limit accessibility for some students.

The supporting text, *The American River*, 1998 edition, published by Protect American River Canyons (PARC), is currently out of print awaiting revision. Though a limited number of copies are available at Maidu High School, use of the unit by other schools may be dependent on release of the new edition.

Leaving the classroom presents students with a number of natural hazards. In the ASRA these include poison oak, ticks, rattlesnakes and other wildlife, mine shafts and related debris, and most importantly, the river. An attempt was made to minimize the danger by presenting vital safety information in the introduction section of the unit. Natural hazards are associated with any outdoor learning experience. Recognition of and appropriate respect for such hazards is an important part of the learning.

With slight modifications some of the lessons could be used in other watersheds of the region. Though the concepts of reconnecting students with nature, environmental stewardship, and river safety are applicable to many places, this unit is most effective within the area of its intended use, or as a model of place-based education under other unique circumstances. In its initial production the unit was implemented with students at Maidu High School in Auburn, California. It is my intent to continue this project through to a formal publication locally to interested parties such as other high schools in the Placer Union High School District, local
public and private middle schools, home school families and other interested parties, possibly through the Protect American River Canyons (PARC) organization.

Definitions of Relevant Terms

*Environmental stewardship* – responsible environmental behaviors such as recycling, “leave no trace” wilderness use, and conservative utilization of resources.

*Nature journaling* – “the…recording of observations, perceptions, and feelings about the natural world around you” (Leslie & Roth, p. 5, 2000).

*Place-based education*: the “use of the local ‘place’ (natural and socio-cultural setting) as the context for learning” (Chin, p. 2, 2001).

Organization of the Project

The unit was initially produced as a series of booklets with card stock covers designed for easy use in the field. It contains an introduction with an overview of the objectives of the project and important information about the natural hazards of the area and river safety. Lessons one through four are site specific and directions are given along with items that should be taken and suggested support materials. Lesson five is at a site of the student’s choosing. Lessons from the nature journaling unit may be used for field trips led by a teacher, a small group with an adult leader, or by a student working independently. Students are advised not to go to the river alone, and to let the appropriate people know where they will be and for how long. It is safer and more fun with a parent, friend or friends.

Students are encouraged to provide their own sketch book in which to record their observations, reflections and drawings. The supporting text for the unit is *The
American River, 1998 edition, published by Protect American River Canyons (PARC). It is currently out of print awaiting revision, but copies are available for check-out from the library at Maidu High School.

Chapter 2 includes a review of literature supporting the premises of this undertaking.

Chapter 3 describes the methods used in developing and piloting the lessons.

Chapter 4 includes a discussion of the outcome of the pilot activities, conclusions and relevant recommendations.

The Appendices contain the informed consent letter, student evaluation form, and a curriculum guide entitled “Exploring the Auburn State Recreation Area – A Nature Journaling Unit.”
Chapter 2

REVIEW OF LITERATURE

The purpose of this project was to design, pilot and evaluate a place-based nature journaling unit for high school students. The objectives were to increase understanding of and appreciation for a local environment and issues relating to it, to promote environmental stewardship behavior, and educate students regarding important safety issues.

The significance of the connection between children and the natural world was addressed in the popular press by journalist Richard Louv (2005). In his book, Last Child in the Woods, he used the term nature-deficit disorder to describe the disturbing deterioration of the child-nature relationship. This term is not a diagnosis, but a label to describe the cultural phenomenon which seems to have been exacerbated of late by an increasingly technology-driven culture.

John Dewey (1899) wrote of the isolation of school and the negative consequences of disconnected learning in the late 19th century when the nation was primarily agrarian. Connections to the land were strong for many children as they grew up on farms in rural areas. Their studies, however, drew from a far different knowledge base which often had little relevance to their daily experience. It is an astounding reversal that many of today’s children will learn about the rain forests of Brazil but not experience their local habitats. The dilemma is the same, however. The worlds of school and life are not connected in meaningful ways.
The key topical components of the literature relevant to this project include: *place-based education*, its background and current interpretation in the United States, and evidence for its pedagogic validity; *nature journaling*, its modern relevance, its efficacy as an instructional strategy and further support for reflective writing and drawing; *environmental stewardship*, its objectives, curricular history, obstacles to success and suggestions for overcoming them; and *implementation* of place-based education, understanding and mitigating resistance.

**Place-based Education**

Place-based education is an attempt to move away from the modern incarnation of Dewey’s (1899) warning against isolation of personal relevance in public schooling by reconnecting learners with their local world and helping them discover the uniqueness of their place. Smith (2002) echoed Dewey in reporting that a renewed sense of what there is to value in the local world ensues as learning is connected to community.

The concept of place-based education is nothing new to education in the United States. From 1838 to 1841, Henry David Thoreau, with his brother John, operated a school that utilized field trips as a primary instructional strategy (Harding, 1982). The great writer, naturalist, and founder of the Sierra Club, John Muir, stated, “One day’s exposure to mountains is better than cartloads of books” (Wolfe, 1938, p. 95). John Dewey (1899) encouraged use of a relevant place in education in the late 1800s (Woodhouse, 2001), and Aldo Leopold, as early as 1949, utilized an environment-based curriculum (Kemp, 2006).
The term “place-based education” has come into use in the past 15 years and encompasses a number of prior terms including environmental education, outdoor education, service learning and experiential education (Knapp, 2005).

In addition to the academic interest in place-based education, it has been introduced in the popular press by John Elder (1997-98) and others and through the work of the Orion Society, a nonprofit environmental organization. As a result of the dual efforts of academia and community, place-based education has evolved and diversified producing a body of work, both academic and non-academic, which has been described as “complex and broad in scope” (Nespor, 2008, p. 475). For the purposes of this project, however, sources will be drawn primarily from the academic works.

Current literature in education and environmental studies also references a reconceptualized form of environmental education which uses environment as the context for cross-curricular learning. Environment as an Integrating Context, or EIC, is a term coined by the State Education and Environment Roundtable (SEER). SEER is a group of agencies from twelve states that work cooperatively to build a foundation of practical experience and knowledge by sharing findings on successful practices. Recognizing the limited availability of research on the efficacy of environment-based education, SEER members designed the “Closing the Achievement Gap” (Lieberman & Hoody, 1998) study to identify successful programs and the factors that contributed to their success. This was followed by the “California Student Assessment Project” (Lieberman & Hoody, 2000) which further substantiated the earlier research.
Lieberman and Hoody provided executive summaries for both studies. In the 1998 summary they stated that

EIC-based learning is not primarily focused on learning about the environment nor is it limited to developing environmental awareness. It is about using a school’s surroundings and community as a framework within which students can construct their own learning, guided by teachers and administrators using proven educational practices…” (p. 1)

Place-based education and EIC-based learning are essentially synonymous, providing learning opportunities that also reconnect students with their local eco-address and their community. Utilizing the findings of the SEER studies, Jack Chin (2001) posited the definition: place-based education is the “use of the local ‘place’ (natural and socio-cultural setting) as the context for learning” (p. 2). Though recent interest has resulted in a variety of interpretations, for the purposes of this study Chin’s 2001 definition will be utilized.

Curriculum designed to fit the place-based education model must honor certain essential characteristics. Woodhouse and Knapp (2001) itemize the following essential characteristics of place-based education.

- It emerges from the particular attributes of a place.
- It is inherently multidisciplinary.
- It is inherently experiential.
- It reflects an educational philosophy that is broader than “learn to earn.”
- It connects place with self and community.

The place-based nature journaling unit produced for this project incorporates each of these essential characteristics.

*Pedagogic Validity of Place-based Education*

SEER’s studies are of particular interest in supporting the validity of place-based/EIC-based education. Validity is intended to indicate the effectiveness of the strategy to improve students’ competence with content, i.e. that learning measured by standardized tests or other traditional assessment tools. SEER’s “Closing the Achievement Gap” (Lieberman & Hoody, 1998) study examined forty successful EIC programs from around the United States. It was followed in 2000 by SEER’s “California Student Assessment Project”, adding data from 13 schools in California. Lieberman and Hoody identified several significant outcomes from these studies including: improved standardized test scores in reading, writing, math, science, and social studies; reduced discipline problems; increased enthusiasm for learning; and greater pride and ownership in accomplishments. Summary reports were reviewed for both the 1998 and 2000 studies. The 1998 study collected evidence from site visits at the 40 schools including: interviews with students, teachers and administrators, four different surveys of the educators, comparative studies of comprehensive and discipline-specific standardized test scores, GPAs, and attitudinal measures. The 2000 study reported findings from schools which were identified as having EIC programs, matched with comparison pairs with analogous students in traditional programs.
Selection of control populations was based on comparative demographics and proximity to the treatment school. Quantitative data for achievement and attendance were collected from treatment and control programs. Achievement was assessed based on standardized test scores of many tests, including the following: Stanford Achievement Test, California Test of Basic Skills, and California Achievement Test, or grade-point averages in one case. Attendance was assessed based on actual attendance rates. Qualitative data was drawn from 23 rubrics developed by SEER to assess alignment with EIC’s principal characteristics.

Findings were reported for each program-pair in the 2000 study as well as aggregated data for the 1998 and 2000 studies (Lieberman & Hoody). The aggregated data results showed that 77% (137 of 179) of EIC students scored higher in academic achievement and 81% (22 of 27) scored higher in attendance assessments. Demographic information was not provided. Additional details are available in the full report.

A National Environmental Education and Training Foundation (NEETF) study (Glenn, 2000) was inspired by the findings of the SEER study and corroborated its conclusions. It utilized case studies of schools from six states: five individual schools, a model school program involving five schools, and a state-wide program that adopted environmental education as the central focus of their academic programs. Basic demographic information prefaced each case study but was not assessed statistically. Each of the study sites did report some degree of improvement and some reported “spectacular” improvement. Glenn stated that
reading scores improve, sometimes spectacularly; math scores also improve; students perform better in science and social studies; students develop the ability to make connections and transfer their knowledge from familiar to unfamiliar contexts; students learn to ‘do science’ rather than just ‘learn about science’” (pp. 5-6)

An increase in motivation and decline in discipline problems were also noted. Overviews of the seven case studies are given, but because the schools are in different states the assessment/achievement data has limited comparison value. No evidence was provided in support of claims for transfer of knowledge, motivation or discipline issues.

Although these findings offer encouraging evidence for the efficacy of place-based education, Glenn suggests some valid limitations. These include the use of test scores as a primary academic indicator, challenges with comparison of state-specific academic standards which are not nationally normed, and inherent difficulties such as the varied abilities of individual teachers and the effects of different teaching methods. Chin (2001) reported the outcomes of the SEER studies as intriguing but limited and called for “more rigorous evaluation…to establish more definitively the relationship between place-based education and its apparent outcomes” (p. 24).

Drawing upon this foundation of pedagogic validity, the place-based unit was designed with nature journaling as its primary activity.
Nature Journaling

Nature journaling is a simple but powerful tool for learning about the world around us. It has been used by people of many cultures to facilitate observation, understanding and appreciation of the natural world, and evidence suggests that it is a valuable strategy for educators today. Because one of the objectives of this project is to increase understanding of and appreciation for a local environment, nature journaling was selected as the primary activity for the unit. This researcher considers it to be an example of Dewian educational philosophy that blends seamlessly with place-based curriculum and instruction because students learn about local history, geology and ecology in a rich and dynamic environment.

A brief historical sampling provides insight into the deeply human resonance of nature journaling. Ancient records of hunts, travels and local flora and fauna were recorded on cave walls, vases and tepees, and captains noted atmospheric and oceanographic observations in ships’ logs (Leslie & Roth, 2000). The archives of American history contain numerous journals including the following: the journals Thomas Jefferson instructed Lewis and Clark to provide; John Wesley Powell’s account of his explorations of the Colorado River; and John Muir’s field journals. Muir, one of the most influential naturalists of the early 1900s, drew from his journals many years later as he wrote such influential works as My First Summer in Sierra and The Mountains of California

Natural science artist and educator, Anna Botsford Comstock, provides a fascinating history of the nature study movement of the early 1900s in the preface to
her ambitious *Handbook of Nature Study* (1911). Working in western New York State in the early 1900s, Comstock was committed to the power of direct experience. She recognized, however, that many teachers had little familiarity with the natural world outside of their classrooms and even less time to devote to lesson development. To mitigate this problem she developed more than 200 teacher-friendly lessons which were published in her *Handbook*. Comstock encouraged the use of a field notebook in which the student could record observations and provided guidelines for journaling activities. She observed that: “These books, of whatever quality, are precious beyond price to their owners. And why not? For they represent what cannot be bought or sold, personal experience in the happy world of out-of-doors” (p. 15)

Comstock’s (1911) *Handbook* was just one of many books published in the 50 years leading up to 1940 emphasizing the importance of firsthand experience with nature. Most of these are no longer available, but it is the good fortune of a new generation of educators that Comstock’s *Handbook of Nature Study* returned to print in 1986. Though many of the species described in Comstock’s activities reside on the East Coast, alternate species for other geographic areas may be substituted.

Nature journaling, once a mainstay of science education, fell by the wayside as the new math-science focus of the Cold War and post-Sputnik era took its place. Urban migration, which took children away from the countryside, coincided with the rise of hard sciences which demanded repeatability and shunned the anecdotal, empirical nature of descriptive science (Pyle, 2001). Simply put, time spent observing and reflecting upon nature was no longer a priority. Nature journaling could have great
relevance today by providing young people with firsthand experience in a local environment. Our internet-driven world can provide virtual experiences, but they are an inferior substitute for the richness that comes from direct contact with living things.

**Efficacy of Nature Journaling as an Instructional Strategy**

In this nature journaling unit students observed, recorded their observations through sketches and descriptive writing, identified local species, and wrote both informatively and reflectively. Although these activities are not mentioned specifically in the *Science Content Standards for California Public Schools* (California State Board of Education, 2000) or *National Science Education Standards* (National Research Council, 1996) they are important foundational skills that support mastery of the content described in those documents. They are the basis for the “method” of scientific inquiry described in the *National Science Education Standards* and referenced in the Introduction to the *Science Content Standards for California Public Schools*. Individual lessons do address specific content contained in those standards. For example, use of field guides and dichotomous keys like *The Laws Field Guide to the Sierra Nevada* (Laws, 2007) and the Pacific Coast Tree Finder (Watts, 1973) aligns with the Investigation and Experimentation strand #1-a of *Science Content Standards for California Public Schools* for selection and use of appropriate tools to collect data. Interpretation of topographic and geologic maps aligns with strand #1-h. Although a reflective writing prompt is incorporated into each lesson, writing standards in English Language Arts are not currently addressed in this unit. The reflective writing activity is intended to engage students in a multisensory outdoor
experience utilizing observation, reflection and introspection. A standards-based writing activity could be incorporated into future versions of the lessons.

Because nature journaling is an emergent, or more correctly a re-emergent strategy, limited recent quantitative research is available assessing its efficacy. Nevertheless, it is informative to consider what might be useful. A study by McMillan and Wilhelm (2007) does provide some insight. Utilizing a moon observation activity from Comstock, they developed a five-week journaling unit for seventh graders. It integrated math, science and moon-themed reading in language arts. Their objectives were to assess the impact of nature journaling on formation of identity and sense of self; ability to construct and comprehend natural imagery; and to discover what form student journal writings would take.

McMillan and Wilhelm’s (2007) study utilized a test group of 67 students. Students were instructed to make a simple sketch of the night sky and a two-or-more sentence journal entry nightly for five consecutive weeks. Methods involved review of all student journals, identification of common themes and selection of a small group of students to interview for further insights. The authors reported improved understanding of natural imagery dealing with the night sky and “a sense of gratefulness for their lives and a sense of appreciation for the larger natural world” (p. 376). Students reported gaining a sense of peace from the rhythmic patterns of the moon’s cycles. The authors also noted increased facility with descriptive language. Recognition of the cyclic quality of natural processes is an important insight in science, and accurate observations paired with precise description are essential skills.
Recognition of patterns and morphologic features facilitates accurate identification of species in field guides or with dichotomous keys. Support for the value of this nature-based observation is provided in the work of Howard Gardner. In his revised, *Intelligence Reframed* (1999), he expanded his original seven intelligences (1983) to include naturalist intelligence. Characteristics of this eighth intelligence include pattern recognition and correlation skills that allow accurate identification and a love of nature described by biologist E. O. Wilson as “biophilia”. Gardner points out that the same pattern recognition skills used to identify members of a species can be applied to patterns in seemingly remote areas like poetry or electronics configurations. Facility with these skills could have positive long-term benefits for career or other interests.

The reflective writing component of nature journaling is particularly well suited to the sciences. McDonald & Dominguez (2009) note that while critical thinking is external and task-focused, generally toward answering a question or solving a problem, reflective thinking is internally directed toward understanding and making judgments about events or observations. Both are important parts of the scientific process and of the learning process.

Each lesson includes a reflective writing prompt to assist students in constructing relevance. Brain research documented by Wolfe (2001) provides insight into the brain’s filtering process. Incoming sensory information is sorted and most is “dumped” as inconsequential. Only information deemed relevant by the reticular activating system (RAS) is retained (p. 82). It is important for teachers to activate this
selective attention. The reflective writing prompt contained in each lesson of this unit is intended to trigger the RAS to recognize the relevance of concepts.

Selection of the writing prompts was guided by the work of McDonald and Dominguez (2009) and Bricker (2007). They utilized reflective writing in the science classroom to expand student understanding of concepts explored in lab activities. By considering, “What did I discover?” or “What surprised me?” students were encouraged to assimilate outcomes and make connections that resulted in the higher order thought processes described in Bloom’s taxonomy. The value of this recognition of discovery and surprise is supported by Wolfe’s suggestion that attention is stimulated by novelty and emotion (pp. 82-83). Nature journaling embodies the essence of discovery and surprise because it is based in the natural world, a place that is literally alive with possibility. Although the McDonald and Dominguez article addresses classroom-based instruction, is theoretical and does not provide empirical support, they argue convincingly that “reflection creates meaning” (p. 49).

Many young people, when asked to draw a familiar object, immediately revert to symbolic representations rather than what they really see. A tree may be drawn as a ball on a stick or a person as a stick figure. By giving students the opportunity to make accurate observations and patiently record them in a sketch, the tools of science and art are linked. Artist Frederick Franck stated, “I have learned that what I have not drawn I have never really seen” (1973, p. 6). Sketching can be a vehicle for developing observational skills. Leslie and Roth’s (2000) *Keeping a Nature Journal* is an excellent tool for beginners. They consider nature journaling an effectual means of
reconnecting with nature as observations lead to simple sketches as well as descriptive writing. They suggest several sketching strategies to reduce the panic non-artists sometimes experience when confronted with the empty page. These include confidence-builders like modified contour drawing, blind contour drawing, and use of quick gestures to encourage creative right-brain function. Modified contour drawing is incorporated into the sketching guidelines for lesson one of the nature journaling unit. Leslie and Roth enumerate skills and knowledge fostered by the sketching process including: scientific and aesthetic observation; perception and analysis; questioning, inventiveness, synthesis; and greater appreciation of nature and place (p. 13).

While students may misconceive the places around them as static, taking note of small details while journaling can quickly bring an awareness of the dynamic nature of living systems. Hobart (2005) stresses the value of observing change. She also encourages students to share work with each other to foster an appreciation for alternative viewpoints, as one tree may be viewed from many different angles, and different aspects of that tree will be highlighted by each student.

Although the nature journaling unit developed for this project may be utilized at any time of the year, it is highly recommended that it be reserved for the spring. Beginning in mid-March, weekly visits to the canyon will reveal a dramatic progression of blooms by wildflowers, redbud, manzanita and even poison oak. Awakening students to this dramatic springtime display could initiate a long-term attitude of respect and appreciation which is the foundation of stewardship.
Environmental Stewardship

Most environmental educators agree that one of the main objectives of environmental education is to achieve responsible environmental behaviors at the local level and an understanding of global environmental issues. While this objective does not address state standards it is a critical educational outcome. Local behaviors such as recycling, “leave no trace” wilderness use, and more conservative utilization of resources, when practiced by many people can have a global impact. These behaviors constitute environmental stewardship, and one of the objectives of this project is to promote environmental stewardship behavior. Success in achieving such behavior, not only among young people but humanity in general, has been considered by a number of researchers.

These investigations have been primarily psychological in nature and many revolve around the issue of will. An understanding of the dilemma is crucial in developing strategies for success. Litzgus-Sianchuk described the evolution of education aimed at achieving stewardship behavior and assessed the dilemma in her 1994 thesis *The Problem of Will in Environmental Education and its Implications for Curriculum*. She described the early effort of the 1960s as the “information approach.” Scientists recognized growing environmental problems and used the media to disseminate compelling data. Rachel Carson’s *Silent Spring* was released in 1962, the National Environmental Policy Act of 1969 was passed, and in April of 1970 millions of adults and youth celebrated the first Earth Day. Change seemed to be in the air, but it did not come. Through the 1970s environmental education attempted to impart
environmentally healthy values and attitudes. Ironically, as knowledge of
environmental issues increased, environmental attitudes were actually moderated
(Litzgus-Sianchuk, 1994, p. 23). Psychological studies attempted to explain this, but a
disturbing situation was apparent…

Humanity has enough knowledge and resources to respond effectively to the
environmental and related global crises, and large international coalitions of
scientists and religious leaders urge humanity to immediately and dramatically
change our relationship with nature. Although many individuals express
agreement with these recommendations, the ‘will’ to respond to the
environmental crisis seems to be lacking. (Litzgus-Sianchuk, p. 6)

Litgus-Sianchuk’s (1994) summary of this dilemma resonates in many of the
crises of our day. Many people know it is important to act immediately to curb carbon
dioxide emissions and reduce solid waste, but make only minimal changes in their
behavior.

Research suggests that the perceived magnitude of a problem may actually
inhibit willingness or ability to respond to it. David Sobel (1996, 2004), writing in the
Orion Society’s Environmental Literacy series, commented on the impact of
burdening young people with the world’s environmental crises. In his 1996 essay,
Beyond Ecophobia, he cited findings by one of his graduate students suggesting that
children may actually dissociate themselves from the environmental abuses they are
confronted with in a way that is similar to children traumatized by sexual abuse. They
distance themselves to minimize the pain. It is certainly not the intention of this
project to traumatize students. If information and education cannot motivate action, what can?

*Overcoming Obstacles to Environmental Stewardship*

The will to act is as significant for local recycling as it is for global environmental issues. What will prompt students to engage in stewardship behaviors? Litzgus-Sianchuk (1994) reviewed an extensive number of studies from 1970 through the early 1990s that approached the issue from both a psychological and social perspective and notes four curricular strategies that facilitate action. The first of these is the discovery of personal value and meaning in the interconnectedness of humanity and nature that is physical, emotional and spiritual as well as rational or intellectual. Other strategies include: education that fosters the development of competence through action; experiences that are personally fulfilling to the learner as well as to the goals of the educator; and a foundation in the local bioregion and culture (pp. 137-140). The nature journaling unit developed for this thesis incorporates all four of these strategies as it prompts students to discover connections through observation, record and reflect upon these connections through writing or drawing, identify local plants and animals and learn how they were utilized by early inhabitants and their role in the ecosystem, and act to preserve the health of a local environment through activities like river cleanup. The intent is that students will gain not just an intellectual knowledge of a local environment, but an emotional and possibly spiritual connection as well.
Because a great deal of behavior-based literature has been produced relating to environmental issues since Litzgus-Sianchuk’s work in 1994, it is important to consider more recent findings. Heimlich and Ardoin (2008) provide an updated review of the current literature. They group the body of work into ten behavior models. While acknowledging the complexity of human behavior and motivation, they provide some generalities that are relevant. Significant to this work is their report that external incentives induced only short-term behavior change, while long-term lifestyle changes and habit modification required a greater sense of self-efficacy.

Students participating in this unit at Maidu High School will earn credit, an external incentive. How might the desired long-term behavior be achieved? Suggestions are provided by the work of Darner (2009) regarding self-determination theory and its impact on self-efficacy. Self-determination theory deals with the degree to which we actively choose our actions. Darner notes that environmentalists, persons with high-level environmental stewardship behavior, usually have experienced some combination of the following: “childhood experiences in natural, relatively pristine, undeveloped areas; being influenced by family, peers, or role models who cared for nature; witnessing the destruction of a beloved natural area; and participating in formal environmental education.” (p. 40). In each situation personal experience shaped conviction and prompted action.

The nature journaling unit fulfills the first of these by utilizing the ASRA, a spectacular natural area that is essentially undeveloped. It also provides role models for environmental stewardship behaviors. It is recommended that any individuals
participating as adult leaders be willing to demonstrate a sincere appreciation for the
natural environments that are visited. The unit could certainly be incorporated into a
formal environmental education course thereby meeting the fourth point. As for point
three, it is hoped that no student will experience the destruction of a beloved natural
area.

The importance of experiences in natural, relatively pristine, undeveloped
areas is also suggested by the work of Weinstein, Przybylski, and Ryan (2009). They
observed a positive correlation between the degree of immersion in nature and
increased intrinsic aspirations such as a desire for relationships with people and
community. Environmental stewardship behaviors could represent such intrinsic
aspirations. Although their work was conducted indoors using virtual representations
of nature in images or natural objects, they suggested that actual immersion in natural
environments should produce even more robust results.

Litzgus-Sianchuk (2004) further noted that environmental education was most
successful in promoting stewardship behaviors if it honored students’ autonomy by
allowing them to choose projects of personal interest. The proposed nature journaling
unit honors this point by allowing students to select areas and species for observation
and sketching. Through meaningful contact students may come to love this place, and
then be willing to act as environmental stewards to protect it.

The unit will also point out the incredible restorative power of the natural
world. Most people have felt despair over damage done in their physical, emotional
or social worlds. As the history of the gold rush and its environmental devastation is
juxtaposed with the rejuvenated ecosystem of today’s ASRA, students troubled by the immensities of environmental damage or other personal problems may find cause for hope and the will to act in the renewal of the earth and themselves. Research is available regarding this restorative effect in the field of environmental psychology. It was considered tangential to this review of literature, but offers an interesting opportunity for further investigation.

Implementation of PBE

Although place-based education offers an outstanding opportunity to impact students in many positive ways, it requires teachers to step outside their comfort zone and take students with them. The prospect may be a bit too daunting for some, who prefer to teach in a more structured classroom environment. This section discusses resistance and mitigating resistance to implementation.

Understanding Resistance to Implementation

There is a puzzling disparity between research, which clearly supports the efficacy of environment-based education (EBE), and the failure of teachers to utilize it. Julie Ernst (2007) observed the disparity, even in schools with environment-based programs. She enlisted an exploratory survey strategy directed toward a target population of K-12 teachers in the United States who used some form of environmental education (EE) in their classrooms. The accessible population was teachers who worked at schools identified from Internet lists as having environment-based programs, or who were known by some environmental educators to use EBE or other forms of EE in their classrooms. The sample consisted of the 200 respondents to
a survey mailed to the accessible population of 287. The convenience sampling and target of teachers known to use EBE was utilized to obtain variation and insure that the small population of teachers using EBE was adequately represented.

Ernst (2007) utilized two types of analyses in this study. The first was a one-way analysis of variances (ANOVAS) in which the independent variable was group membership based on type of EE used. The groups were primary EBE, partial EBE, or other EE, determined by responses to survey questions. The dependent variable was the composite or barrier indicated. These composites (11 total) were groups of characteristics that seemed to have high correlation values with likelihood of implementation, and barriers (18 total) were those conditions that reduced likelihood of implementation. The alternate analysis involved three stepwise discriminant function analyses in which the “predictor variables were the 11 composites (or 18 barriers), and the outcome variable was group membership” (p. 23). The composites, barriers and groups were the same for each type of analysis.

Ernst (2007) concluded that teachers’ decisions to use environment-based education were affected by their personal environmental literacy and environmental sensitivity, their perceived skill and knowledge of environmental education and abilities to implement the curriculum, as well as the constraints of instructional time in an era of standards-driven high-stakes testing. Because this nature journaling unit is designed to be utilized by students in an independent study setting, some of these concerns, such as limited teacher skill and knowledge of environmental education or their perceived ability to implement the curriculum, are not relevant. Students may
elect to participate in the lessons through a teacher-guided trip, or obtain the lesson booklets and support materials and carry out the activities on their own. A teacher’s lack of personal environmental literacy or sensitivity could result in low interest in encouraging students to pursue credit with the nature journaling unit. Independent study teachers, like their traditional classroom counterparts, are impacted by the demands of preparation for standards-driven high-stakes testing and may direct students to curriculum considered to be more in alignment with test content.

*Mitigating Resistance to Implementation*

If the nature journaling unit is to be utilized beyond the sphere of Maidu High School, this resistance must be mitigated. Crumley (1992) considered ways to improve success in implementation in traditional classrooms. He developed and introduced a one-year interdisciplinary environmental studies course which was classroom based, but designed to have more than 15% of class-time spent outside of the classroom. Based on his experience in piloting the curriculum, he suggested that success could be supported by utilization of a team-teaching delivery which provided teacher support in moving outside the classroom “safe zone.” Contributions of local professionals who volunteered to work with students in hands-on off-site activities also reduced teacher stress and facilitated implementation. Other suggestions included keeping the class size small, with the optimum ratio being eight students with two teachers; providing adequate staff development to prepare teachers; and implementing the instruction district-wide through a gradual infusion process, thereby training students in appropriate off-site behavior from the earliest grades (pp. 41-42).
Crumley’s (1992) suggestions may not be practical in many high school situations, but are particularly relevant to this nature journaling unit because its initial implementation was in an independent study setting conducive to small group activities. Future implementation could be enhanced by the involvement of local volunteers and could easily be delivered via a team-teaching model utilizing the expertise of both an art and science teacher.

It should also be recognized that some students may be uncomfortable with outdoor-based activities. These students may be particularly impacted in a positive way by the nature journaling experience. Dirnberger, McCullah, and Horwick (2005) suggest that creating a naturalist’s journal “helps students connect to and engage with nature, as they increase their familiarity, understanding, and positive attitudes regarding the natural environment” (p. 39). Their practical suggestions for implementing nature journaling are intended more for the traditional classroom setting, but should weather cut short the field work of any of the lessons included in the nature journaling unit, these options could be very useful. They include: making brief anecdotal observations in the field concerning temperature, cloud cover or seasonal conditions, and then bringing small specimens into the classroom for further description, and mitigating the challenges of inclement field conditions by using pocket-sized notebooks during brief data collection forays into the field, then developing formal journals in the classroom.
The continued disuse of environmental education, a proven learning strategy (Ernst, 2007), is truly ironic in the face of the ongoing deterioration of our life-supporting ecosystems.” (p. 231).

Conclusion

In its 2005 report to Congress, the National Environmental Education Advisory Council stated the need to raise the level of environmental literacy of all citizens, enabling them to make more informed decisions. This is certainly a commendable goal and one to strive for as educators in the 21st century. David Sobel (1996) suggests a place to begin:

What’s important is that children have an opportunity to bond with the natural world, to learn to love it and feel comfortable in it, before being asked to heal its wounds. John Burroughs remarked that ‘Knowledge without love will not stick. But if love comes first, knowledge is sure to follow.’ Our problem is that we are trying to invoke knowledge, and responsibility, before we have allowed a loving relationship to flourish. (p. 10)

Sobel and Burroughs’ voices are joined in emphasizing the importance of connecting young people with place in a positive way. The intent of the place-based nature journaling unit is to provide high school students with an experience in the natural world that is multidimensional, engaging their minds, bodies and hearts, and invoking in them a connection to place, a love of nature, and a sense of wonder.
Chapter 3

METHODS

The purpose of this project was to design, pilot and evaluate a place-based nature journaling unit for high school students. The goal was to increase understanding of and appreciation for a local environment and issues relating to it, to promote environmental stewardship behavior, and to educate students regarding important safety issues. Nature journals were utilized to provide evidence of learning. An evaluation was completed by each participant and reviewed by the researcher to provide evidence of prior knowledge, awareness of safety issues and willingness to act in an environmentally responsible way.

The first objective of this project, increasing understanding of and appreciation for a local environment and issues relating to it, is to help youth reconnect with the natural world. This objective is based on a growing body of evidence suggesting that direct exposure to nature is essential for physical and emotional health in children and adults (Louv, 2005). The second objective, promotion of environmental stewardship behavior, is an attempt to ameliorate in part the current shortage of environmental stewardship. The shortage is evidenced by dumpsters full of debris removed from the canyon each spring and fall as part of two river clean-up days. The third objective, education regarding river safety issues, strives to reduce the disturbing number of river related injuries and deaths that occur in the Auburn State Recreation Area. Information provided by the California State Parks documented three river-related injury incidents in the ASRA in 2008 and seven in 2009, which included one death (S. Nevin, personal
communication, October 14, 2009). The steps taken in this project to help solve the
three problems circumscribed by these three objectives constitute concrete steps to
meet our collective environmental stewardship needs.

This chapter describes the identification of relevant science standards,
selection of locations, organization of lessons, resource materials, the implementation
of a pilot program, use of journals and the evaluation for the project.

Identification of Relevant Science Standards

This unit evolved into a series of cross-curricular lessons with an underlying
focus that remained essentially science-based. A review of the Science Content
Standards for California Public Schools (California State Board of Education, 2000),
and National Science Education Standards (National Research Council, 1996) Content
Standards for grades 9-12 identified the following relevant standards:

*California*

*Earth Science-California Geology standards #9-a,b,c*, which pertain to
resources of economic importance, natural hazards, and water resources.

*Investigation and Experimentation standards #1a,h,m*, which pertain to
utilizing tools to solve problems, reading topographic and geologic maps, and
investigating science-based societal issues.

*Biology/Life Science – Ecology standards #6-a,b*, which pertain to biodiversity
and changes in ecosystems.
National

*Earth and Space Science – Content Standard D* which pertains to the scale of geologic time.

*Science in Personal and Social Perspectives – Content Standard F* which pertains to natural resources, environmental quality, and natural and human-induced hazards.

Selection of Locations

A series of locations were chosen in the confluence area of the ASRA based on their accessibility, beauty, unique characteristics, relevance to the topics, capacity to support the activities, historical significance, safety, and other practical considerations. This selection process honored the recommendations of Woodhouse and Knapp (2001) by emerging from the particular attributes of the place.

Organization of the Lessons

Consideration of the desired cross-curricular emphasis of the unit led to the development of a series of activities that would constitute each lesson. The activities selected were:

Story – in which students read a brief summary of historical setting and introduction to content from the journal booklet.

Observation/Description – in which students actively use their senses and various tools, such as a field guide or dichotomous key, to observe and identify species present at the location and describe each species briefly in their journal booklet.
Sketch – in which students continue to observe and record, through simple drawings in the journal booklet, the physical characteristics of the location and/or species populating it.

Reflection – in which a reflective writing prompt appropriate to the focus of the lesson is given and responded to in the journal booklet.

Reading – in which students read from the text, *The American River* (PARC, 1998), to gain further insight into the history, geology, ecology or some other aspect of the ASRA.

An overview of lessons 1-5 is provided in Table 1.
Table 1. Nature Journaling in the Auburn State Recreation Area (ASRA) - Overview of Lessons 1-5

<table>
<thead>
<tr>
<th>Lesson</th>
<th>Location</th>
<th>Story</th>
<th>Observation/Description</th>
<th>Sketch</th>
<th>Reflection</th>
<th>Reading</th>
<th>Standards Addressed</th>
<th>Materials Needed</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Confluence of the North and Middle Forks of the American River</td>
<td>What is a confluence? Its significance to native people and their historical presence in the canyon.</td>
<td>Use the Pacific Coast Tree Finder to identify three types of trees. Use this information to determine the bioregion of the ASRA.</td>
<td>Sketch a tree showing its structure and shape. Sketch a twig with 2-3 leaves or one with several clusters of needles.</td>
<td>Consider how trees add value to a home, community, life.</td>
<td>“Native American River History” from The American River guide book pp. 183-185.</td>
<td>CA: Invest. &amp; Exp. #1a. National: Content Standard F.</td>
<td>The American River guide book, the Pacific Coast Tree Finder.</td>
</tr>
<tr>
<td>Lesson 4</td>
<td>Location</td>
<td>Story</td>
<td>Observation/Description</td>
<td>Sketch</td>
<td>Reflection</td>
<td>Reading</td>
<td>Standards Addressed</td>
<td>Materials Needed</td>
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Resource Materials


Pilot Program

Students from Maidu High School were offered the opportunity to participate in a series of field trips to pilot the unit. Trips were open to all students and information regarding field study trips was distributed through teachers and on the Maidu High School website. Students signed up and provided the required permission form for participation in school field trips, and earned science credit for completing the activities. Five trips were originally scheduled on Fridays in January, February, and March of 2010. One lesson was presented on each of the first three trips, with time constrains necessitating the combining of two lessons on the fourth trip. The number of participants ranged from three to nine students per trip, with two students participating in all of the trips, and a total of 10 different students participating in at least one trip. Of the 10 participants, five were male and five were female, seven were seniors, two were juniors and one was a sophomore. Trips were led by teacher/researcher, Pam Wirsch, and an additional teacher/driver participated in two of the trips. Students met at the school site and were transported by school van
approximately six miles to the Auburn State Recreation Area. Students were asked to put away electronic devices while participating in the activities, although some calls and text messages were deemed necessary to coordinate transportation at the conclusion of the activity.

Upon arrival at the lesson location the topic was introduced and journaling booklets, along with other materials such as field guides or binoculars, were provided to students. Instructional segments of the lessons were conducted as a group. Sketching and reflective writing activities were completed with students spaced far enough apart to discourage conversation and to encourage students to focus on the natural environment around them. The final reading activity was carried out as a group activity, after which students finished the final journaling assignment, filled out an evaluation form, and returned any field guides or other materials. The time required to complete each lesson was approximately three hours.

Student Journals

The purpose of the student journals was to both direct activities and record evidence of learning. The journal booklets provided directions to the locations as well as written instructions for the activities to be completed at each location. Sufficient space was provided to record all sketches or written responses in the journal booklet. Students could bring their own journals in which to record their work if they preferred. The journals were utilized as a write-to-learn tool and were reviewed by the researcher informally during the trip, in order to determine the need for supplemental instruction, and more thoroughly after the completion of the trip to determine the success of the
unit in accomplishing the desired objectives. Journals were collected and assessed for correct identification of three species, evidence of effort to sketch from observed details rather than symbolic representations or cartoon-like images, responses to reflective writing prompts that were at least three sentences and provided evidence of thoughtful consideration rather than clichéd or generic responses, and three points of interest from the reading selection.

Evaluation

The evaluation form was prepared to provide additional information about the effectiveness of the activities. In addition, students responded to questions aimed at identifying their prior knowledge of the ASRA, if they had previously utilized the area for recreation, and if they intended to return to the ASRA for recreation in the future. As the trips were completed and evaluations were reviewed, notes were made by the researcher concerning changes that could clarify the questions and elicit more meaningful responses. The evaluation form is included in Appendix B. In addition to the evaluation completed by students, anecdotal observations were recorded during and after each trip by the researcher. These observations related to the engagement of students, their responses to the various activities, time required to complete various activities, logistical issues and suggestions for changes. These were then used to improve the presentation of the lessons in the journaling booklets which should improve student learning on future trips.

Six key questions were identified to aid in determining the success of the unit in accomplishing its objectives.
• Did students understand the informational material and activity instructions provided?

• Was there evidence of student learning based on their ability to successfully identify species using the field guides?

• Did the sketching activity help students observe details, patterns and morphologic features of objects or species in the river ecosystem?

• Were students able to understand the writing prompts and respond to them in a meaningful way?

• Did student participation in this unit change their self-described willingness to engage in environmental stewardship activities?

• Did student participation in this unit increase their awareness of river safety issues?

The first four questions will be answered primarily by categorizing student responses to the evaluation questions, and the final two questions will be answered based on evaluation and categorizing of students’ journal activity entries. All questions stem from qualitative information collected from each of the three sources: the journals, evaluations and anecdotal observations of the researcher. These answers will be shared in the next section.
Chapter 4

DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

This project addressed three areas of primary concern. These were the disconnection of youth from the natural world, lack of environmental stewardship in the Auburn State Recreation Area (ASRA), and river safety issues concerning injury and death.

A nature journaling unit was developed for use in the ASRA. Entitled “Exploring the Auburn State Recreation Area – A Nature Journaling Unit”, it consists of five lessons that were piloted with small groups of student volunteers from Maidu High School. Students participating in these trips completed a series of activities, recorded observations, made simple sketches, responded to a reflective writing prompt, and read brief excerpts from the resource text, recording points of interest in their journals. At the end of each lesson students completed an evaluation form to provide additional information to the researcher. Evidence from the journals and evaluation forms and anecdotal observations by the observer was used to answer the key questions posed for this project.

Discussion

The scheduled trips were completed, as scheduled, in January, February, and March of 2010. A total of 24 journals containing 31 lessons, and 23 evaluation forms were collected from the four trips.

Student participants indicated that they had been to most of the locations (18 of 23) in the ASRA before and 21 of 23 indicated they would have no difficulty following
the directions provided in the lesson. Because students self-selected to participate in this activity it is possible that those who were familiar with the ASRA were more likely to attend and also to understand the directions provided.

Because the pilot program involved group field trips no students piloted the program as individuals providing their own transportation. Therefore, all students responded that they participated with others, not alone. The unit was designed to be used for field trips led by a teacher, a small group with an adult leader, or by a student working independently. The evaluation question regarding their comfort was actually intended to assess if they felt safe participating in the activity in the ASRA as an individual. Three respondents indicated that rain or cold had caused them discomfort, but that was not the intent of the question. Information regarding feeling safe while working as an individual will need to be obtained from future participants who work independently, rather than as members of a field trip group.

Only 4 of the 23 evaluations indicated that students were familiar with the story of the place and two of those four were familiar with only part of it. This suggests that the lessons presented new material to support learning.

All students indicated that the instructions for the observation and description activity were clear with one student not responding to the question.

Most students (18 of 23) responded that sketching had helped them notice more details in the objects they had observed with three responding that it had not. Two students provided additional input, one stating that the sketching was fun, and the other that it helped him notice more details in birds. Review of the journals suggested
that 23 students had used observations to guide their sketching, with only one student producing cartoonish sketches.

The greatest variation was in response to the “reflection” writing prompt. Two of the five prompts were metaphorical and the other three were experiential. On the evaluation form students were asked to choose any number of appropriate descriptors from six adjectives provided, or write in their own descriptive word(s) to describe the writing experience. Three of the descriptive words provided were considered positive by the researcher (enjoyable, relaxing, thoughtful) and three were considered negative (confusing, difficult, pointless). Nineteen of the responses selected were positive descriptors, seven were negative. The journal entries for the reflective writing prompts indicated that although most students were successful with the metaphorical prompts, three did not respond. This suggests that metaphorical prompts require additional explanation for some students.

Most students (21 of 23) indicated that they were willing to engage in some kind of environmental stewardship activity to protect the river. Student responses were divided equally between not leaving trash and picking up trash. It was unclear to the researcher if the subtle difference in wording indicated a difference in intent. It is possible that some students are willing to remove only their own trash while others are willing to remove any trash. There was also one commitment to avoid boat-related pollution, one to recycle, and one to protect the river. In addition there were two “don’t know” responses. It is interesting to note that on the first trip only two of the three participants indicated that they were willing to engage in environmental
stewardship activities. In later trips these same individuals all indicated that they would be willing to participate in stewardship activities and one expanded his description of the types of activities he would engage in from “not litter” to “not litter and be thoughtful about the land”.

Most students (16 of 23) had been to the ASRA to swim, and only one responded that he/she was not interested in returning to the ASRA for recreation in the future. All students indicated that they understood how to be safe at the river. The hazards of cold, fast water and changing river conditions were reviewed on all trips.

Thirteen of the evaluations contained additional thoughts, most of which were positive comments like “great experience” and “loved coming to the river”. One student responded that he did not like the rain.

Anecdotal observations that were made by the instructor allow adjustments to the lessons to improve future trips. Some of the significant observations that will influence future trips include the impact of seasonal characteristics of the ASRA, the effectiveness of the various activities, the importance of modeling desired environmental stewardship attitudes and behaviors, the dynamics of groups of varying sizes and the value of having a second adult to assist.

Conclusions

Based on the entries in the student journals and the responses to the evaluation questions, the following conclusions were drawn for the six key questions.

- Students did understand the informational material and most of the activity instructions as evidenced written responses in their journals and by oral
responses during group discussion. For example, in the discussion of the reflective writing prompt for the first lesson, all students were able to identify a tree that had been significant in their life and give a reason why.

- All students’ successfully identified three species of trees, birds, and plants present in the ASRA in their journals. This indicates that they were able to use field guides successfully when participating in a group with a teacher providing instructional support. This may not be the case, however, for a student participating as an individual. More data is needed from individual participants to determine this.

- Because all but one student participant used the sketching activity to observe details, patterns and other details of the features of objects or species in the river ecosystem, it is considered to be a successful instructional strategy.

- Most students were able to understand and respond to the writing prompts in a meaningful way; however, metaphorical prompts required additional explanation and may not be appropriate for students working as individuals.

- Based on the student responses to the evaluation question about environmental stewardship behavior, the researcher considers students’ self-described willingness to engage in environmental stewardship activities to have changed in a positive way. As described previously, with each trip enthusiasm for stewardship behaviors grew.
• All students indicated that they were aware of river safety issues on all of the evaluations completed. Based on this data there is no way to assess if there was an increase in actual student awareness, but it is hoped that the modeling of safe river practices during the four trips will result in safe practices by students.

The first objective of this project was to connect students with the natural world in their local area. By immersing students in the dynamic world of the ASRA, helping them to identify some of the local species of the area and learn the stories from its unique history it was hoped that they would understand and appreciate it more deeply. Based on students’ enthusiasm during the trips and their responses on the evaluation form, it is the opinion of the researcher that they valued their connection to the ASRA and will return to it in the future.

The second objective of this project was to improve environmental stewardship behaviors in those young people who use the ASRA. Environmental stewardship was modeled and encouraged on all of the trips as students were instructed to utilize “leave no trace” practices. It is hoped that persons who come after them will find no evidence of their visits.

The third objective of this project was to improve the safety awareness of the students. Respect for the power of the river was modeled throughout the lessons and trip leaders pointed out the powerful flow of the spring runoff and discussed how the river changes from day to day and hour to hour as upstream releases of water and debris are carried downstream. Because of the cold spring runoff we collected samples
of aquatic invertebrates from the shore and discussed alternate collecting strategies for warmer, slower-flow seasons. Future behavior of students can only be suggested, but it is hoped that this unit provided a positive example of river safety that they will choose to follow.

The three respective problem-solving goals of these three objectives will not be fully realized in the short-term, but the activities included in the lessons are a step toward bringing the young people of this community to a better understanding of and appreciation for this local environment. Based on the student responses in the evaluation, journal entries and the anecdotal observations by the instructor, the following six additional conclusions were also drawn.

- These trips were conducted in January, February and March of 2010. An attempt to initiate this program at Maidu High School in September of 2009 met with limited success due to lack of student volunteers interested in participating. Although there were probably a number of factors at play, two of these may have been the need for students to become familiar with teachers and other students before they were comfortable participating in group activities, and the more appealing physical conditions of the ASRA in the spring of the year.

- The locations selected were effective for the activities even though some modifications had to be made to accommodate a student participant who was on crutches. This situation was atypical and it is not likely that future trips will be impacted similarly. It was highly informative, however, and
suggests that the lessons could be utilized by other students with reduced mobility.

- Students appeared to enjoy the sketching activity and it engaged students’ attention for sustained periods of ten minutes or more. During this activity there was minimal conversation. Spacing students at least twenty feet apart further supported concentration and quiet reflection, helping students to be more aware of their surroundings.

- We collected trash on only one of the trips and most students were very willing to participate. Environmental stewardship modeling could be further improved on by bringing trash bags on every trip and removing trash, thereby improving the beauty of each area and eliminating hazardous items that could endanger wildlife. It could also be presented as a competition to see who could get the most in their bag.

- Having varying numbers of students on the four trips and a second adult leader on two of the trips allowed for observation of the dynamics of each arrangement. The optimal number of students, based on the anecdotal observations of the researcher, seemed to be three to five with one leader or six to ten with two leaders. In order to minimize the impact to the natural environment these smaller group sizes are also suggested.

- Combining two lessons into one trip resulted in diminished success in the second lesson with insufficient time to complete the final activities, thus reducing the impact of the lesson.
Recommendations

Implementation of this place-based science curriculum project involved group participation by Maidu High School students. Based on the conclusions drawn from the pilot, the following recommendations should inform the next implementation of it.

1. Students may have difficulty completing some of the activities without instructor support. In particular, students using field guides to identify trees, birds, invertebrates and small plants may become frustrated or miss important features necessary for correct identification. It is therefore suggested that the lessons be utilized primarily in a group setting. Small groups of three to five students with one leader or 6 to 10 students with two leaders are recommended. Approximately three hours is suggested for each lesson and only one lesson should be attempted on a trip.

2. The sketching activity should be conducted with students working at least twenty feet apart and without any electronic devices that might distract them from total sensory immersion in the place. Sharing of drawings could be of value. Although most students were happy to share their drawings with the group they should be free not to share them if that is their preference.

3. The reflective writing prompt should be discussed as a group to insure that all students understand the metaphorical nature of some of the prompts. Alternate prompts may be utilized on future trips.
4. Environmental stewardship behaviors should be modeled and encouraged at all times. A careless moment can be very damaging.

5. Finally, it is strongly suggested that these lessons be utilized in the spring. The optimum time frame would be to begin in late winter when the weather permits and complete the series of lessons as the wildflowers are blooming in late March to late April. The spectacular display of the flowers, the trilling songs of the birds and roaring energy of the river make spring the perfect time to explore the Auburn State Recreation Area.
APPENDIX A

Informed Consent Letter
Placer Union High School District
EDUCATIONAL OPTIONS CENTER
Chana High School 3775 Richardson Drive Maidu High School
Auburn, CA 95602
(530) 885-8401
(530) 885-1657 Fax
www.puhsd.k12.ca.us/edoptions

Kathleen Sutphen
Principal

Stan Parker
Assistant Principal

To: Maidu students and parents

Regarding: Participation in “Fridays at the River” field study trips

I am pleased to let you know that I am currently working toward a Master of Arts degree in Education through California State University, Sacramento.

My thesis includes development of a place-based nature journaling unit for high school science students. Some of the “Fridays at the River” activities will include pilot lessons from that unit, and student input will be requested.

Student privacy will be protected at all times, and any data associated with participation in these activities will be anonymously aggregated with that of other participants. You may request your student’s input not be included at any time without explanation or consequences.

It is a pleasure to work with your young people and I hope to share with them some of my love for the special places that are a part of the history and character of this area.

Sincerely,

Pam Wirsch

It is not necessary to return this letter if you do not object to having your student’s input included in the study.

I request that my student's data not be included in the research described above.

Parent Signature                  Student Signature
APPENDIX B

Student Evaluation Form
Maidu High School
Exploring the American River Nature Journaling Unit

Name: _______________________
Date:________________________
Lesson #:_____________________

About how long did it take you to complete this lesson?  _____________________

Did the directions allow you to find the study location without confusion? ______

Had you ever been to this location before?_________________________________

Were you familiar with any of the “Story” already?__________________________

Were you comfortable while you were at the river?__________________________

If not, explain why______________________________________________________

Did you do this activity alone or with others?_______________________________

Were the instructions for the “Observation/description” clear?_________________

Did you find that the sketching activity helped you to see the details of objects more
clearly?_________________________________________________________________

Did you find the “Reflection” activity: (Circle any that apply)
confusing enjoyable difficult pointless relaxing thoughtful
other?_______________

Have you ever come to the river to swim or for other recreation?______________

Do you think you will come to the river for recreation in the future?____________

Do you think you understand how to be safe when enjoying river activities?_______
What are you willing to do to help protect the river environment? ________________

Any thoughts on this lesson that you would like to share:

___________________________________________________________________

___________________________________________________________________

Thank you for your participation in the lesson and evaluation.

Sincerely, Pam
APPENDIX C

Curriculum Guide. “Exploring the Auburn State Recreation Area – A Nature Journaling Unit”
Exploring the Auburn State Recreation Area
A Nature Journaling Unit

The Auburn State Recreation Area (ASRA) lies just outside of the town of Auburn, California. The North and Middle Forks of the American River, and the canyons that surround the river, provide a spectacular recreational resource for thousands of people who visit the area each year. They come to hike, swim, raft and kayak, or just enjoy relaxing in a beautiful place.

For many local teens the river is a popular place to meet friends, swim and socialize. Sadly, people die there far too often.

The purpose of this unit is to help you develop a better understanding of the history and ecology of the ASRA. It is my hope that by learning to understand and respect this place, its natural hazards and its dynamic ecosystem, it will enrich your life and you will enjoy it safely.

Pam Wirsch
September 2009

Please note that the formatting of this unit has been modified for thesis publication.
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**Natural Hazards**

Enjoying any wild place requires respect for the power of nature. Plants, animals, steep slopes, and water can be dangerous. Things to watch for in the ASRA include...

**Poison Oak:**
Before you head down a trail be sure you can identify this abundant canyon shrub. Its oil can cause severe skin irritation. It is potent, even in the winter when it has no leaves.

**Western Rattlesnake or Northern Pacific Rattlesnake:**
The rattlesnake is an important canyon inhabitant. It keeps rodents in check, is shy and rarely seen. Be watchful! If you spot one be calm and be still. Back away carefully if you need to (look before stepping), but left alone it should soon continue on its way.

**Ticks:**
Ticks are common in the ASRA and it’s important to check for them while you are outdoors and when you get home. Wear light colored clothing so you will see them and tuck pants into your socks. Avoid brushing against bushes or tall grass and don’t sit on logs or leafy areas.
Large Carnivores:

Other canyon inhabitants include mountain lions, bobcats, black bear, foxes and coyotes. Most of these creatures will avoid humans and are **crepuscular**, or active at dawn and dusk. Pay attention if you are out at those times and you may be lucky enough to catch a glimpse of one.

Mine Shafts and Debris:

The mining legacy of the area means that there are old abandoned mine shafts and iron debris. Most shafts are blocked or gated, but if you find one that is open do not enter it. They are dangerous and could collapse.

The River

The greatest danger in the canyons is the river. When the spring runoff is fast and cold even wading in shallow water can be life threatening if your foot becomes trapped between rocks and the water knocks you over. It is possible to drown in less than a foot of water.

If you are swept out into the deeper flow of the river it can pull you under and pin you against hidden obstacles with a force greater than the strength of any human.

On a hot day in the early summer it is tempting to want to jump in, but the water temperature may be only 50 or 60 degrees. The shock of entering such cold water will cause your muscles to seize up and can even stop your heart.
Please read this carefully!

Teens are most often injured or killed in the peaceful summer flow of the river. It is always popular to jump from high rocks, swinging ropes, cliffs, boats and bridges. But the river is constantly changing! A swimming hole that was safe for diving or jumping last summer, last week or even yesterday may have changed. Logs, rocks and other objects are moved along by the flow of the river, gravel bars shift constantly, and water levels fluctuate during the day.

Never jump or dive from bridges. Never take dares that you aren’t prepared for. Always check swimming holes for hidden dangers like broken glass and adequate water depth before the jumping begins. And remember… safe activities mixed with alcohol can turn deadly.

Be smart, be safe.
This nature journaling unit can be used for a field trip led by a teacher, a small group with an adult leader, or by a student working independently. Always go to the river with someone; a parent, friend or friends, and let the appropriate people know where you will be. Directions are provided for each location and an approximate time for each lesson. Don’t rush the experience. You will learn more and have more fun if you are relaxed.

**What to Bring**

Wear clothing that is appropriate for the weather. Wear shoes that are safe for uneven, rocky trails. This is not a flip-flop activity! Choose a time of day when you will be comfortable sitting for 20 to 30 minutes.

The text for this unit is: *The American River, 1998* edition, published by Protect American River Canyons (PARC). It is currently out of print while awaiting revision but copies are available in the library at Maidu High School.

You will also need:
- This booklet
- A pencil or pen
- Drinking water (don’t drink river water – it contains giardia and other microorganisms that will make you sick.)

Other items that you may find useful include:
- A sketch pad – you can sketch in this booklet, but may prefer having a small sketch pad.
- Colored pencils or water colors to add details to your drawings.
- Magnifier, binoculars, camera
- Sunscreen, hat, lunch, folding chair

**Leave the entertainment electronics at home.**
The place will provide the entertainment.
Lesson 1 – The Confluence

Estimated time to complete this activity: 2-3 hours.


**Location:** Take Highway 49 South through Auburn. At the intersection with Lincoln Way, Highway 49 drops into the canyon. Go 2.2 miles to the Hwy 49 turn-off toward Cool, but do not turn there. Continue to the curved bridge, cross it, then park in the gravel area on the right. Take the trail past the outhouse, and down to the rocky area where the two forks of the river join.

**Story:** A confluence is a place where two rivers come together, joining their strength and moving on toward the sea. Confluences have been considered sacred places by many cultures throughout human history. This location is at the confluence of the North Fork and the Middle Fork of the American River. The water flowing here still has over 100 miles to travel, through two reservoirs, and then through the San Francisco Bay before it reaches the Pacific Ocean.

For thousands of years prior to the Gold Rush of the mid-1800s, Nisenan villages were clustered in this canyon along the river. It provided a bounty of fish, while the hillsides were rich with acorns and game animals. Walk around the rocky point where the rivers meet and find the bowl-like depressions left by women grinding acorns into meal.

In the lessons ahead you will learn about the major events that have shaped this beautiful area. Some of these events occurred millions of years ago, and some within the last 100 years. By understanding the story you may come to recognize how special this place is.
**Record:** date, time, and conditions (temperature estimate, flow of river (fast, muddy, low), cloud cover? rain? fog? etc.

**Observation/Description:** Today you will identify a few of the major species that live here. This will allow you to discover the bioregion of this area.

Using the *American River* guidebook and/or the Pacific Coast Tree Finder, **identify three different kinds of trees** that you see on the hills around you. Walk back up toward the parking area and look closely at the trees. Choose one to identify. Use your sense of touch and smell to become more familiar with it. How do the bark and leaves or needles feel, smell, taste? Avoid poison oak, of course.

The *Pacific Coast Tree Finder* is a dichotomous key. It gives step-by-step, go-here-or-there instructions. Read the first few pages to get some background and then open to page 6 to start the identification process.

If you are using the *American River* guidebook refer to pages 263-279. Look at the pictures and read the descriptions to find the best match for each tree.

On the next page (or in your sketch book) give the **common name** of each tree you have identified. Also give the **scientific name**, and a **brief description** of each tree. Include things like its shape, height, color, how close to the river or how high up on the slope it is growing, and if the ground around it is grassy, sandy, rocky or something else.
Example: Toyon – *Heteromeles arbutifolia*
A bush about 5 feet tall with dark green, stiff oval leaves with jagged edges. It was growing partway up a grassy slope above the river under an oak. I’ve seen this bush in the winter with red berries.

Tree #1:

Tree #2:

Tree #3:
You have probably identified at least one of the oaks that are so plentiful in this area. The bioregion for much of the Auburn State Recreation Area is oak woodland. Oak woodlands cover much of the western foothills of the Sierra Nevada.

Sketch: Choose one of your trees for two sketches. The goal is not to produce a nice drawing. The goal is to see the tree more clearly. Take at least 10 minutes for your first sketch and 20 minutes for the second one.

“I have learned that what I have not drawn I have never really seen.” — Fredrick Franck

Before you draw find a comfortable place to sit with a clear view of your tree. Study it carefully, noticing how it is built and details like: how the major branches join, what angles they make with each other and with the ground below, how the leaves look from this distance, where they are on the branches and what the overall shape of the tree is.
In the first sketch try to see the **structure and shape** of the tree and draw it with as few lines as possible. You may choose to do this in your sketch book.

**Sketch #1:**

For the second sketch, choose a twig with two or three leaves, or if your tree has needles choose a twig about six inches long. Again, study it, and then allow your eye to move slowly along the main lines as you draw them. Look at the paper as little as possible to keep oriented. Remember, this is really about seeing, not drawing.

**Sketch #2:**

Reflection: Consider how trees add value to a home, a community, a wild place, a life. Spend the next 15 to 20 minutes writing about a tree that has been important in your life. Do you know what kind of tree it was? Describe it. How was it important to you? You may write here or in your sketch book.

Reading: “Native American River History” from The American River guide book pp. 183-185. List three things that you learned from the reading.
Lesson 2 – “No Hands Bridge”

Estimated time to complete this activity: 2-3 hours.

Additional Materials suggested: *The Laws Field Guide to the Sierra Nevada* or the *Pacific Coast Bird Finder* may help you to identify birds, plants and other things. They are available to check out at Maidu High School.

**Location:** Take Highway 49 South through Auburn. At the intersection of Hwy 49 and Lincoln Way you will drive into the canyon. Go 2.2 miles to the Hwy 49 turn-off toward Cool. Turn right on Hwy 49 and cross the bridge. Park in the gravel area on the right.

Take the trail around the gate and notice the concrete foundation on the right. It was a part of the old suspension bridge shown on p. 16 of *The American River* guidebook. Continue along the river about ¼ mile to “No Hands Bridge”. Cross the bridge and read the informative sign on the far side. A brief history of the bridge is given there along with other information.

**Story of “The Recent Past”:** The actual name of this historic bridge is the Mountain Quarries Bridge. It was built by the Pacific Portland Cement Company and was completed in 1912. It was the longest concrete arch bridge in the world at that time. A rail line ran from the Portland Cement Quarry, about a mile up the river on the Middle Fork, to Auburn. Running about ten miles, it transported limestone to the Southern Pacific main line in Auburn. The limestone was used in the refining of sugar. The quarry operated from 1912 until 1939 when the limestone was depleted. A new mine was later opened nearby and still operates today, but the crushed limestone is now carried out by truck.
As you walked along the trail to the bridge, you may have noticed the concrete slabs and cables in the river. They are the remains of the highway bridge just upriver that was washed out in 1964 when the dam broke at the Hell Hole reservoir. The No Hands Bridge withstood the wall of water that roared down the canyon. It was not longer in use, but was put back in service for car and truck traffic until a new bridge was completed. It was only wide enough for one vehicle, and had no railings at that time. At 150 feet above the river, it was a nerve-testing drive.

**Story of “The Ancient Past”:** The geology, or study of the rocks in this area, tells an amazing story. In the ancient past, 300-160 million years ago, the whole foothills area was ocean floor and the edge of the continent was far to the east. The ocean floor, then and now, is made of volcanic rock. Limestone forms from the remains tiny ocean organisms and accumulates on top of the volcanic rock. Scientists see evidence that ancient ocean rocks were slammed up onto the continent by powerful forces deep inside the earth.

Those forces then injected molten granite deep underground. The granite carried with it the quartz and gold that would be so important later. Because the granite was lighter, or less dense, than the surrounding ocean floor rock, it was like a cork under the water trying to rise up to the surface. Over time the granite did rise, forming the “ancestral Sierra,” a huge range of mountains in central Nevada. Those mountains slowly eroded and the heavy gold collected in river channels. By about 10 million years ago those mountains were worn down, becoming a broad, smooth plain. Then the lifting forces carried the rocks upward again, forming the Sierra Nevada that we see today. The miners of the 1800’s looked for those ancient river channels to find the gold that had collected there (from *The American River*).
Observation/Description: Listen to the sounds around you. You will probably notice the calls of some of the birds of the area. If you sit down and are still for a few minutes you should begin to see birds nearby. Look up at the ridges. There are usually large black birds soaring on the updrafts. Many kinds of small birds will flit through the trees and bushes as water birds paddle along the river. You may wish to make your observations here above the river, or continue along the trail, and then take the turn-off down to the water.

Using *The American River* guidebook p. 296-301 or *Laws Field Guide to the Sierra Nevada* p. 248-303, identify at least three different birds that you see. Give the **common name** and **scientific name** of each, a **brief description** of what it looks like, and tell where it was and what it was doing.

Example:

California Quail - *Callipepla californica*

A brownish-gray bird with a little plume on its head. It was scampering along the ground under the bushes in a group of five or six. It made a clucking noise when it ran.

Bird #1:

Bird #2:

Bird #3:
Sketch: If you wish, you may choose one of the birds you have identified for your sketch. Birds are often too quick to be good subjects, though. You may prefer to do a landscape sketch of the No Hands Bridge with the river and hillsides of the canyon. See the small sketches in *The American River* guidebook, p. 36 and 43 for an idea of how to keep it simple. You may sketch here or in your sketch book.

Reflection: Bridges take us from one place, across an obstacle or barrier, to another place. A bridge could be a symbol, or metaphor, for a passage from one part of life to another. Reflect on a time when you crossed from one part of your life to another. Write about that symbolic crossing or about a “bridge” you hope to cross in the future. You may write here or in your sketch book.


Hawver Cave was in the limestone quarry that the Mountain Quarries Railroad hauled from. What remains is about two miles up the Middle Fork and can be reached by continuing about ¼ mile farther on Hwy 49 south, turning into the parking area for the Quarry Trail, then walking up the trail along the river about a mile and a half. The last few hundred feet is a steep climb to the gated entrance. The gate is locked, but feel the cool air escaping, and hear the sound of dripping water coming from inside the cave.

John C. Hawver, a local dentist and adventurer, explored the caves of this area with only a rope and a few candles. A plaque commemorating him is at the far end of the In-N-Out Burger parking lot in Auburn, where his home used to be. List three things you learned from the reading.
Lesson 3 – North Fork Dam

Estimated time to complete this activity: 2-3 hours.
Add about an hour each way if you’re going to be walking from the confluence.

Location: From I-80 take the Foresthill exit and go toward Foresthill. From the stop light by Raley’s it is 3.2 miles to the turn-out on the left for Lower Clementine. It is a 2 mile drive on a narrow paved road to a hairpin turn, then .4 miles to the fee box. There is a $10 fee to park here. If you choose to park here, walk the last .2 miles to the boat ramp then go up the wooden steps and about 100 feet along the fence to get a spectacular view of the dam. Alternate directions: If you do not wish to pay the parking fee, park at the Confluence parking area from Lesson #1 and walk along the North Fork on the east side (right side when facing high bridge) of the river. It is a pleasant 30-40 minute walk to reach the same spot.

Story: The American River Watershed is made up of the North, Middle and South Forks of the American River and all of its tributaries, or streams that flow into it. The watershed starts high in the Sierra and meets the Sacramento River at Discovery Park in Sacramento. See the map right after the table of contents in The American River guide book. The “wild and scenic” North Fork of the American River flows into Lake Clementine, a reservoir behind the North Fork Dam. The dam is a debris-control dam built to trap sediment washed into the river upstream by the destructive hydraulic mining of the past.

Gold was discovered at Sutter’s Mill on the South Fork of the American River in January of 1848. At first miners shoveled gravel from streams into sluice boxes to sort out the gold.
After depleting the streams they looked up and saw the ancient stream beds where the gold had come from, now lifted to form hillsides cut by the modern canyons. How to get it down? In 1853 hydraulic mining began. To get to the gold, forests were clear-cut and wooden flumes were built to carry water to giant nozzles that washed tons of gravel down to sluice boxes where the gold was removed. The waste water and gravel were dumped into the rivers. As these mountains of gravel moved toward the Sacramento Valley the rivers were clogged, there was flooding, the San Francisco Bay turned brown, and ships could no longer travel through much of the delta. By 1884 the damage was horrific and a United States Circuit Court banned the flushing of debris into the waterways. A few locations tried to contain the debris, but it was too costly and hydraulic mining ended. Some scars still remain, but in the last 100 years the rivers and canyons have managed to rejuvenate themselves. See the photos in *The American River* guide book pp. 110-113 to compare. The North Fork Dam has helped trap sediment and keep it from going downstream.

**Observation/Description:** Most of us rely primarily on our eyes for messages about the world around us. Only if we lose all or part of our vision do we develop keener skills with our other senses. Pretend for the next few minutes that your vision is very poor and rely on smell and hearing to learn about the world around you. Start at the area near the boat launch and explore the shallow water and some of the plants and natural objects by listening, feeling and smelling. Record your observations here or in your sketch book. Fill at least a page with your observations. Try to use your best descriptive words, and avoid poison oak.

**Observations:**
**Sketch:** Choose any natural object from this area to sketch, or sketch the dam and surrounding area. The large rock that juts out from the hillside above the lake is called “Robber’s Roost” and its story is in the reading for this lesson. Sketch here or in your sketch book.

**Reflection:** Dams have been built by creatures such as beavers, and by humans throughout history. Dams may slow the flow of the river but they do not stop it. They are temporary and will eventually crumble. Rivers carry sediment, and in time the lakes behind all dams will fill with sediment, eventually becoming swamps, meadows, then forests.

Consider the saying… “You can never step into the same river twice.” What might this mean for an actual river? How might it explain the changes to a dam as time passes? How could it be a metaphor for life?

Write your reflections here or in your sketch book.

**Reading:** “Mile 14-18 Lake Clementine” and “The Rock and the Legend” from *The American River* guide book pp. 72-77.

List three things that you learned from the reading.

You may also be interested in reading an excerpt from an 1849 miner’s journal found in *The American River* guide book pp. 159-161.
Lesson 4 – Foresthill Bridge
(viewed from the North Fork)

Estimated time to complete this activity:  2-3 hours.

Additional materials needed:  A small plastic bowl, fine-mesh net, magnifying lens, and The Laws Field Guide to the Sierra Nevada (available for checkout at Maidu High School).

Location:  Take Highway 49 South through Auburn. From the intersection of Hwy 49 and Lincoln Way it is 2.2 miles to the Hwy 49 turn-off toward Cool. Do not turn there. Continue straight and park just before crossing the curved bridge over the North Fork, along the road or in the gravel area on the left. Go around the gate then take the trail on the right down to the river.

Story:  One of the most spectacular features of the Confluence area is the high bridge known as the Foresthill Bridge. It is the third highest bridge in the United States at about 730' above the North Fork of the American River. It was completed in 1973 and was to have provided passage between Foresthill and Auburn after the Auburn Dam was complete and this canyon was flooded. At high water the concrete supports of the high bridge would have been almost entirely underwater.

So why wasn’t the dam built?  It was started in the late 1960’s and work on the foundation was making progress when, in 1975, there was an earthquake in Oroville, CA.  It was clear to geologists that the system of cracks, or faults, which ran through the foothills, was similar in the Oroville area and in Auburn. It was possible that the weight of the water in the reservoir at Oroville had caused the earthquake.
A fault ran right through the foundation of the Auburn dam. If an earthquake could occur at Oroville, one could occur here too. The dam at Oroville was filled with rock and dirt.

It was broad and stable and wasn’t damaged by the quake. But because there was a shortage of fill rock and dirt in the Auburn area, the proposed dam was a different type known as a thin-arch dam. If an earthquake the same size as the one at Oroville were to occur at Auburn, a thin-arch dam would crumble, causing devastating flooding down-river in Sacramento. The thin-arch design was scrapped, but other plans have been proposed in the last 30 years. Increased demand for water in the Sacramento Valley may yet lead to a dam at Auburn.

**Observation/Description:** If it’s not spring, when the river is dangerous with its water running fast and cold, wade in a few steps and turn over some rocks. If it’s spring, keep your feet on the shore and reach out. Try to find some of the small creatures that are an important part of the river food chain. These may be the larval, or worm-like, stage of small insects. Fly fisherman try to reproduce these to “match the hatch” and get fish to bite. With a small bowl and fine mesh net, turn over some rocks in a riffle, a part of the river where the water runs shallow over rocks. There is usually more oxygen in these areas because of the churning of the water by the rocks. When you flip a rock over, quickly sweep the net along the under-side where the little critters may be hiding, and empty them into the bowl. Do this several times to make a bowl of “river soup”. Observe them for a few minutes using a magnifier, but don’t let direct sun pass through the lens and burn them. After observing them, return them safely to the river. A fish will thank you for its lunch. Describe two or three of the creatures you have observed, here or in your sketchbook, and try to identify at least one of them using *The Laws Field Guide to the Sierra Nevada*, pp. 206-209.

**Observations:**
**Sketch:** Choose five or six rocks from the river that look like good “stackers”. Not too round. Choose several different colors of rocks. Build a tower with your rocks, and then sketch it. Pay attention to the way they are shaded, and use shading to help show the curved surfaces in your sketch. Sketch here or in your sketchbook.

**Reflection:** When you drive over the high bridge you see very little of the river and canyon it is crossing. It is possible to drive by without ever knowing about the amazing world that lies below. Think of a time you have stopped, perhaps gotten out of the car, looked around and discovered a new world. Describe that place. It could be the place where you are right now.
Write your reflections here or in your sketch book.

**Reading:** “Foothill Rocks, Gold and Quartz, Bedrock” from The American River guide book pp. 56-57.

All the rocks in your stack came from somewhere upstream. The more round they are the farther they have come.
Using the descriptions in the reading, what kind of rocks do you think are in your stack? (See the last paragraph of “Gold and Quartz”.)
Lesson 5 – Your Place at the River

Estimated time to complete this activity: 2-3 hours.


**Location:** You may choose a previous location that you would like to return to, or a new location you have not yet visited. Murderer’s bar, located just downstream from Mammoth Bar, is a beautiful spot (with an unfortunate name), that requires a parking fee and a short hike to get down to the river.

If you wish to go to Murderer’s Bar, continue on Old Foresthill Road over the curved North Fork Bridge about 1.5 miles to the Mammoth Bar OHV area entry on the right. Take the gravel road about ½ mile to a parking area on the right. A sign says “Warning! River flow may change”. Park and take the trail from the parking area down to the river (about a 10 minute walk.) About half way down there is a rocky outcrop on the left with a beautiful view of the falls and rapids.

**Story:** The story for this final lesson is about the power of community activism. As you have read, the Auburn Dam was under construction from the late 1960’s until 1975 when the Oroville earthquake halted it. Many maps of this area have shown it as completed, with a huge reservoir behind it, even though the building project stopped over 30 years ago, and the reservoir has never existed.

In order to begin construction of the dam, the river had to be moved out of its channel. A tunnel almost half a mile long was blasted in the canyon below what is now the Auburn Skate Park and the river was directed into it. Fish didn’t like the long, dark stretch of river in the tunnel and wouldn’t continue upstream to spawn. Boaters going downstream were required to take-out at
the Confluence. It was no longer possible to reach Folsom Lake from the North or Middle Forks. Even after construction had halted, the river remained in its “temporary” diversion tunnel.

The Placer County Water Agency spent huge amounts of money installing a temporary pump station along the river each summer to provide water to western Placer County. During years with heavy spring runoff the tunnel couldn’t carry all the water and the overflow would return temporarily to its channel, flooding the site where the pumps were. Each fall the pumps were removed and taken to higher ground. After twenty years this situation had cost millions of dollars and become absurd.

Some local river recreation enthusiasts had formed a group called Protect American River Canyons, or PARC. They were opposed to the dam, which would flood 48 miles of river habitat. Many of the members were kayakers, increasingly unhappy about the extended closure of the river for boating. Through library research a member discovered a powerful point of law called the Public Trust Doctrine. It says that no one can keep the public from using a navigable waterway without demonstrating just cause. PARC felt there was no just cause for keeping the river in the tunnel. By combining forces with the state attorney general’s office they were able to oppose a powerful congressman and win.

Since early 2009 the river is not only back in its channel; it has a kayak obstacle course near where the Water Agency has built its permanent pump station.

People can make a difference!
**Observation/Description:**

Using the *American River* guidebook pp. 275-295 or *The Laws Field Guide to the Sierra Nevada* pp. 38-163, identify three different kinds of plants, other than trees, that you see.

Below (or in your sketch book) give the common name of each plant you have identified. Also give the scientific name, and a brief description of each plant. Include anything interesting about it like what it looks like or where it is growing.

When you look a plant up in *The Laws Field Guide* it may say non-native. A native species is one that has grown in an area for hundreds or thousands of years and has adapted to a particular environment. Non-native or alien species have been introduced from somewhere else and can be very damaging to the native species. Note if your plants are non-natives.

Example: Himalayan Blackberry – *Rubus armeniacus*

Non-native. This vine has stickers and seems to be mostly in the low wet area along creeks. It is September and right now it has red and purple berries that look like raspberries.

**Observations:**

Plant #1:

Plant #2:

Plant #3:
**Sketch:** Choose one of your plants and sketch it here or in your sketch book. Keep in mind that this is about seeing, not producing a pretty picture. Most of the time your eyes will be on the plant, not on the paper.

**Reflection:** Powerful forces inside the earth and on the surface of the earth have shaped this place. Living things have added to its unique character, and people have left their marks as well. How would you like to shape the world that you live in?

“Those who contemplate the beauty of the earth find reserves of strength that will endure as long as life lasts.”
Rachel Carson

**Reading:** Choose one of the three selections listed below.


List three things that you learned from the reading you chose.
REFERENCES


Weimar, CA: Author.


