AN EDUCATOR’S GUIDE TO TEACHING ENVIRONMENTAL AND SUSTAINABILITY CURRICULUM IN OUTDOOR EDUCATION

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Presented
to the Faculty of
California State University, Chico

In Partial Fulfillment
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Master of Arts
in
Interdisciplinary Studies:
Outdoor Education

by
Lilita Wood
Spring 2012
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SUSTAINABILITY CURRICULUM IN OUTDOOR EDUCATION

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DEDICATION

This project is dedicated to all the past, present, and future teachers and students of the Outdoor Education Program at California State University, Chico. May the experiences under this program continue to be inspiring, challenging and life changing.
ACKNOWLEDGEMENTS

I want to acknowledge the two giants that I have been standing on
the shoulders of: Dr. Reid Cross and Dr. Mark Stemen. You have both greatly
influenced my educational path and life journey.

Dr. Reid- the work you do could never be measured. You opened the
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versions of themselves. My foundation for Outdoor Education will always be
rooted in your teachings. Thank you.

Dr. Mark- you asked me to seize my education, you showed me the
importance in celebrating community and remembering what I want sustainably
to feel like. Your service and dedication to students and the Chico Community
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ABSTRACT

AN EDUCATOR’S GUIDE TO TEACHING ENVIRONMENTAL AND SUSTAINABILITY CURRICULUM IN OUTDOOR EDUCATION

by

Lilita Wood

Master of Arts in Interdisciplinary Studies:

Outdoor Education

California State University, Chico

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Wilderness based learning can serve as a powerful medium to environmental education and sustainability education. However, many Outdoor Education programs do not have the tools and resources for effectively facilitating connection to the environment or building knowledge in environmental and sustainability issues. This project develops an environmental education and sustainability education resource guide for The Department of Kinesiology’s Outdoor Education Program at California State University Chico. The environmental and sustainability curriculum developed and gathered for this project will serve as a resource for the educators to build on the outdoor experiences and places which are integral to the program. The curriculum includes basic ecological concepts, natural history, current issues and sensory awareness activities, and provides methods and information for fostering connection to, knowledge of, and responsibility for
environmental and sustainability issues. Ultimately this resource guide aims to facilitate the educator’s ability to deepen and develop stewardship practices of the students in the Outdoor Education courses.
CHAPTER I

INTRODUCTION

Many educators argue that the narrowness of academic disciplines significantly contributes to our lack in understanding of interdependence between humans and the planet. This failure to see issues in their entirety is foundational to the enormity of economic, social and environmental issues of our time (Fien, 2003; Orr, 2004). Due to this emphasis in specialization, even the field of Outdoor Education should not be assumed or relied upon to teach about the environment or sustainability concepts.

Outdoor Education has two main educational channels: adventure education and environmental education. Through these channels the function of learning should be placed on interpersonal, intrapersonal, ekistic and ecosystemic relationships (Priest & Gass, 2005). However, many Outdoor Education programs, organizations and educators are not equipped to teach about environmental education or sustainability, which fall under the categories of ekistic and ecosystemic learning, beyond minimum impact techniques and plant and animal identification (Ross, 1997; Baker, 2005). Consequently, courses frequently go without components in environmental ethics, or development of skills for becoming environmentally acting citizens.

Outdoor Educators have a responsibility to incorporate Environmental Education (EE) and Sustainability Education (SE) into the learning objectives their
courses. First and foremost, this responsibility lies in protecting the wilderness environments in which we visit (Ford & Blanchard, 1993; Parkin, 1998). Bringing people into the wilderness can affect the environment negatively if we do not teach, role model and expect minimum impact techniques. By teaching these techniques not only is the environment better protected but the students learn the importance of transferring the practices of traveling and camping with environmental consideration into the future (Ross, 1997). Further on, providing insight into the political history and horizon in land designation is imperative in wilderness protection. The people who have grown to have love and respect for these places dominated by nature will be the most likely to defend their survival, but only if they are aware of the issues.

Another responsibility tied to incorporation of EE and SE is the need to help students feel safe in the wilderness. According to Maslow (1943) if a person does not have their survival and safety needs met, there will be no advancement to higher thinking. A student should never be panicked or stressed about simply being in the wilderness. When a person is not comfortable in the outdoor setting, he or she is not prepared to learn in that setting (Ford & Blanchard, 1993). Helping students feel at home in nature will help remedy fear and provide greater ability for learning effectively (1993).

This feeling of safety and comfort in the wilderness must come from development in both interpersonal, interpersonal relationships and ekistic and ecosystemic relationships. When a student group develops competency in technical skills to put up a shelter, cook meals and navigate, they will know that individually and collectively have the ability to meet their basic needs. This promotes a positive self-efficacy and positive group culture. When students learn about basic ecological concepts
they will learn to know the difference between perceived risk and real risk from flora and fauna. For example, by teaching which snakes or insects are poisonous, how to identify them, their behavior, and what one can do if they see them will help a student understand the low probability of getting hurt. Understanding the role that snakes and insects play in their environment will also help build an understanding in ecological systems.

When students develop comfort and a sense of belonging, they will often be more receptive to learning about the environment, building a connection to the environment and possibly growing appreciation for the environment. Building an appreciation for and connection with the natural environment is one of the least emphasized strategies in environmental and sustainability education and yet, it is one of the most crucial.

Moreover, the wilderness provides a unique opportunity for personal reflection and introspection. Harnessing this kind of learning is a necessary move in changing both attitudes and behavior towards a deeper and more holistic environmental ethic. Often times, the students of outdoor education are experiencing the wilderness for the first time and they may never return again. It is an educator's responsibility to seize this opportunity to impel these kinds of learning experiences central to EE and SE.

Purpose

This project provides an environmental and sustainability curriculum resource guide to the faculty of the Outdoor Education Program of California State University Chico. It will assist the faculty in weaving environmental and sustainability practices, ethics and concepts into the outdoor education curriculum and build upon outdoor
experiences. These curriculums are designed to build ecological and sustainability knowledge and develop human-nature relationships. Hopefully, this shall motivate and empower the students of the Chico State Outdoor Education Program towards a paradigm shift and a change in behavior towards sustainability.

Limited access to relevant, current, and organized resources present some of the largest barriers to the inclusion of environmental education (Hanna, 1992). Currently, at California State University, Chico, the Department of Kinesiology’s Outdoor Education Program does not have any EE or SE manuals or resources specifically for the program. Any environmental or sustainability education being taught in the Outdoor Education courses is being done so because of the interest and drive of faculty to research, develop and implement their own curriculum. This resource guide will support and benefit the progress of incorporating environmental and sustainability curriculum in Outdoor Education courses.

Scope

The EE and SE of this project is designed to be a resource for the educators at California State University Chico’s Outdoor Education program. The wilderness-based courses offered at the University are divided into two outcome oriented categories. One category of courses offers students electives in lifetime activity; these are beginning level and introductory level courses in backpacking, climbing, canoeing and kayaking. The rest of the courses offered in the Outdoor Education Program are for students to learn how to teach outdoor education. Method based courses such as Methods of Teaching Wilderness Living, Methods of Teaching Rock Climbing and Methods of Teaching Canoeing and
Kayaking, a winter living and travel course called Winter and the Mountain, and a field-based set of courses which together create the Immersion Semester are all offered for aspiring outdoor educators. The Students of these courses come from a wide range of disciplines including those majoring in Outdoor Education. If this resource is utilized, each Outdoor Education course at California State University Chico’s Kinesiology Department will have an environmental and sustainability component.

Significance

The Outdoor Education Program at California State University, Chico, provides wilderness-based learning. Because experiences in nature have been attributed by many as their foundation for pro-environmental behavior (Finger, 1994), it is important to appreciate and utilize the unparalleled context for EE and SE which this rare classroom setting creates.

Providing students with challenging educational experiences which nurture an environmental ethic is one of the programmatic goals of the Outdoor Education Department. A resource guide for the instructors of this program will encourage, contribute, and facilitate educative experiences which fit into this goal.

It is important to note that this Outdoor Education Program is designed to prepare students who complete the program to be future outdoor educators. Incorporating EE and SE into this program is important because educators are more likely to emphasize topics and concepts of which they are knowledgeable and comfortable with and avoid areas in which they are less familiar with (Martin, 2008). Essentially, preparing these
students with knowledge in the areas of EE and SE will further perpetuate educative opportunities for their future students. Also, having an awareness of environmental and sustainability issues will increase these future educators' ability to instruct courses in an environmentally conscious manner and pass on stewardship practices.

Furthermore, in the Outdoor Education field possessing the knowledge and skills to teach EE and SE are standard skills. The Wilderness Education Association (WEA) is an accreditation body for outdoor leaders. One of their six core competencies is environmental integration. Some of the skills and knowledge included under environmental integration by the WEA include understanding and demonstration of ecological and cultural literacy, civic responsibility to reduce environmental impact in the backcountry and also in day to day life, and the capacity to interpret the health of the environment. Providing students with tools and knowledge to employ environmental stewardship is an expectation the future employers of the graduates of CSU Chico's Outdoor Education Program will expect.

The significance of this project is also linked to the greater sustainability initiative at California State University, Chico. In an effort to incorporate sustainability across disciplines, over 100 “green courses” are now offered in 37 subjects.

According to the University’s Institute of Sustainable Development (2010) Green Courses promotes understanding in the economic, social, and environmental consequences that individual and collective actions create and also encourage stewardship.

The current Outdoor Education courses considered green courses are: Methods of Teaching Rock Climbing (KINE 224), Methods of Teaching Wilderness
Living (KINE 226), Winter and the Mountain (KINE 227), Methods of Teaching Canoeing and Kayaking (KINE 228) and Facilitating the Adventure Experience (KINE 564).

Limitations

This resource guide is not intended to provide students with a deep understanding of hard sciences or a comprehensive understanding of the threats to sustainability comparable to that of an environmental studies program. This resource guide does not replace conservation ecology, biology, environmental studies or any other focused discipline.

Because this resource guide is designed specifically for courses taught at CSU Chico, some of the information and curricula are not necessarily transferable to other programs or organizations. Understandably, a graduate of the Outdoor Education Program will have to modify some of the tools and techniques learned in order to implement them more appropriately in other programs situated in other environments, with other age groups or different educational missions

Definition of Terms

Environmental Education (EE)

Is a branch under Outdoor Education which is “concerned primarily with ecosystemic and ekistic relationships” (Preist & Gass, 2005. p.18).

Sustainability Education (SE)

An educational thinking and practice “through which education becomes more transformative” (Sterling, 2004, p. 55).
Outdoor Education

An Educational field that primarily takes place outdoors and uses adventure based and environmental based educational channels to improve relationships concerning people and the natural environment (Priest & Gass, 2005).

Adventure Education-

“The branch of outdoor education concerned primarily with interpersonal and interpersonal relationships” (Priest & Gass, 2005, p.17).

Outdoor Recreation-

“Organized free-time activities participated in for their own sake and where there is an interaction between the participant and an element of nature” (Ibrahim & Cordes, 2008, p.5).
CHAPTER II

REVIEW OF RELATED LITERATURE

Introduction

The Earth’s ability to support life, its carrying capacity, continues to be exceeded; the environment and thus humanity is heading for collapse (Meadows, 2004). Signs and symptoms of environmental despair and warnings of collapse are across the board. Desertification, deforestation, falling water tables, collapsing fisheries, loss of biodiversity, rising temperatures, and melting glaciers are just some of the environmental crisis we are facing (Brown, 2008). Our current actions determine the economic and ecological fate of future generations (Padilla, 2002).

As economic and environmental issues ensue, human health is dramatically affected. For example, over 30 years ago, Surgeon General Richmond stated that environmental factors contribute to almost every major chronic disease (U.S. Department of Health, Education, and Welfare, 1979). The global phenomenon of climate change will continue to deteriorate health and add to mortality through geographical spreading of drought, heat waves, floods, harmful algae blooms, diminished air quality, which create environmental infectious diseases such as dengue fever, West Nile encephalitis, Lyme disease, and human hantavirus (English et al. 2009).

These numerous environmental health issues bleed over into issues of economics and social justice. It is often the poor who are most effected by
environmental degradation. Low-income areas not only experience disproportionately high levels of multiple environmental problems but they also have less ability to avoid or resist environmental hazards (Pearce, Richardson, Mitchell, & Shortt, 2010). This is especially unfair because wealthier nations create the most carbon dioxide pollution per person, essentially propelling the climate change problems affecting the poorest people on earth (Jones, 2008). Equality and sustainability have direct correlations. Countries with a more equal income distribution, high levels of civil liberties and literacy levels, also tend to have higher environmental quality conversely countries with less equality tend to have lower environmental quality (Bullard, Evans, & Agyman, 2003). This intense complexity of sustainability issues are driven by challenges of both over consumption and poverty (Wackernackel & Reese, 1996). The way each one of us treats the earth, affects all people and the way we treat each other is a reflection of how we treat the earth (Hawken, 2007).

Clearly, these multifaceted issues are symptoms of larger, more dynamic problems that are beyond the scope of any singular discipline (Kessler et al., 1998). However, higher education has been deficient in promoting an understanding of the concrete relationships between health, economics, social justice, psychology, and the environment (Armstrong & LeHew, 2011; Cortese, 2003; Everett, 2009; Orr, 2004). We are estranged from our sources and distanced from knowing the social and ecological consequences of the things we produce and consume (Alberta department of education, 1993; Princen et al., 2002), we have lost our personal relationships with the environment (Beckford, Jacobs, Williams, & Nahdee, 2010), and this growing disconnect is not only
the foundation for our problems but also the cause for their perpetuation (Fien, 2003; Orr, 2004).

Impact of Disconnection

For more than 99% of human existence, people lived intimately involved with the Earth and its organisms (Kellert & Wilson, 1993). Yet today, over half of the world's population resides in urban environments and we spend 95% of our time indoors (Sheppard, 2006; Orr, 2004). We are immersed in industry, urbanization and technology, yet it is important to remember that our current way of living with such convenience and instant gratification take up a very small part of our human history (Mayer, Frants, Bruehlman-Senecal, & Dolliver, 2009).

These modern lifestyles have created both psychological and physical divisions between humans and the natural world leading to a cycle of apathy and a lack of concern with ecological issues (Hinds, 2008; Pyle, 1978). Thought and appreciation for the ecosystems of which our lives depend on has greatly diminished (Blanchard & Ford, 1993). And, regretfully, many today feel increasingly disconnected from the natural world (Pedretti & Soren, 2006; Palmer, 1998). This prevailing departure of relationship from nature presents an illusion: connection to the environment is no longer needed; responsibility to the environment is no longer needed.

Unfortunately, we have severed “our connection to the Earth so thoroughly in our epistemology and psychology that even though we are bleeding at the roots, we neither understand the problem nor know what we can do about it” (Conn, 1995, p161). It is essential to recognize that in relation to the environment, we have lost our way
(Beckford, Jacobs, Williams, & Nahdee, 2010). Clearly, this ecological crisis calls for the direct experience and understanding of our interconnectedness (Conn, 1995).

**Issues in Environmental and Sustainability Education**

Environmental Education (EE) and Sustainability Education (SE) are natural solutions to reverse negative trends in environmental and sustainability endorsed by environmentalists, conservationists, and educators. In colleges and universities, these disciplines are becoming more commonplace through B.A., M.A. and Ph. D. programs such as sustainable agriculture, environmental law, sustainable studies, and sustainable business (Calder & Dautremont-Smith, 2009).

Unfortunately, EE and SE have not proven to motivate an effective change in behavior and have failed to transform both individuals and communities to live sustainably (Strife, 2010). Also, upon examination, many of the dominating strategies and trends in EE and SE are tragically widening the division of humans and the environment. This divide contributes to problems in society’s thoughts and behavior in relation to the environment and sustainability. Four major themes in EE and SE which contribute to the illusion of separateness between humans and the Earth have become apparent: increased specialization of educational programs, over emphasis in content knowledge, presentation of shallow fixes to deep problems, and a focus on the negatives as the norm.
Increased Specialization of Educational Programs

EE and SE are often taught as specialty studies. These fields are frequently misunderstood as “education concerned with far-off endangered Species” (Strife, 2010, p.7). Courses such as environmental economics, environmental health, conservation ecology, and management for sustainability are important in providing depth in understanding. However, it is critical to include environmental and sustainability concepts into the traditional courses also. For example, environmental justice and health in equalities are largely studied separately (Brulle & Pellow, 2006; Fien, 2003). Conventional economic analysis assumes infinite environmental resource substitutions, does not consider intergenerational problems associated with sustainability, and does not equate for externalities placed upon the earth (Padilla, 2002). Without an EE and SE component, courses in economics emphasize projects with distant costs and prompt benefits (2002).

If a university is truly committed to sustainability it will take an interdisciplinary and holistic approach of incorporation (Calder & Dautremont-Smith, 2009). Without the inclusion of EE and SE across all disciplines, an implicit message of their independence and irrelevance from other disciplines is conveyed. If EE and SE remain as subjects taught autonomously, and do not traverse the academic barriers, they will continue to seem unimportant to the majority of students. Our connections with the earth extend beyond disciplinary boundaries; understanding complex environmental issues requires interdisciplinary approaches (Funtowicz & Ravetz, 1993)
The illusion of separateness to environmental and sustainability issues is present not only in where EE and SE are taught but also how they are presented. Many educators frame EE and SE within two paradigms, conservation and preservation.

Under conservation, the environment is framed as a resource, a source of goods and services for humans. This places humans above the environment. Preservation however, places humans below the environment. Preservation advocates that the environment is a sacred place which loses its value with the inclusion of humans (Jordan, 2003). This theory confines humans to the role of visitor. With the presentation of these two theories, humans do not belong and are separate from all other living and non-living things in the world.

The perception of human independence from the environment is totally false (Thompson, 2009). Additionally, feelings of apartness and division from nature are often a cause for unethical behavior (Kellert, 1987). If EE and SE remain specialized, they will strengthen the illusion of separateness.

**Issue 2**

**Over Emphasis of Content Knowledge**

In order to change behaviors towards sustainability, Clifford Knapp (1999) expresses the importance of value forming experiences in EE. Congruently, many others (Elder, 1998; Sobel, 2004; Birkeland, 2008; Zwinger, 1999) point to the necessity in growing a strong sense of place, which comes from interacting with local community while building and maintaining relationships to nature and culture. Yet, if most people were asked to describe their relationship with nature, they would likely not know how to
even begin to answer the question (Martin, 2004). This human nature relationship is clearly important because, “We cannot win the battle to save species and environment without forging an emotional bond between ourselves and nature as well—for we will not fight in order to save what we do not love. . . .” (Gould, 1994, p.44).

Regretfully, the traditional approach in EE has been to teach facts (Swan, 1974). And, the success of EE has been evaluated by cognitive gain and unfortunately, the way students feel or behave towards the environment has not been a focus of importance (Cachelin, Paisley, & Blanchard, 2009; Capra, 2007; Chawla, 2006). This emphasis on teaching and measuring intellectual comprehension of environmental issues is disheartening because scientific literacy alone has not been proven effective in moving people into ethical action (Capra, 2007; Finger, 1994; Kim & Roth, 2008; Orr, 2004; Sobel, 2007). Moreover, when environmental knowledge remains conceptualized and not related to one’s decision making and action, pro-environmental behavior is not a reasonably expectable outcome (Kim & Roth, 2008). Even in a time of very high environmental concern, many graduates of high schools and universities have no idea how their personal decisions and actions affect the earth (Orr, 2004).

Environmental and sustainability issues are born and persisted from the dominating values, knowledge and behavior. Learning about the environment and sustainability through information alone, does not build connections, develop ethics, or impel people into action. Additionally, reason alone will not increase one’s sense of place or quality of life (Smith, 2001; Birkeland, 2008). To move closer to a sustainable world we must value both the environment and sustainability, possess knowledge of ways to act towards sustainability and finally the experience of that action. Without that experience,
our false perception of separation between the earth and humanity will only be strengthened (Winter, 1996). It is undeniably certain that EE and SE must move past this primary focus on the attainment of knowledge (Smith & Pulver, 2009).

**Issue 3**

**Focus on the Negatives**

EE and SE are often presented in an ominous tone, and curricula concentrating on issues, threats and concerns for the environment and human welfare take precedent. The dominant messages are fearful and calamitous (Strife, 2010). Constant warnings of climate change, species extinction, habitat fragmentation etc. are creating an association of nature with fear and catastrophe (Louv, 2008; Sobel, 2008). When EE is based solely on our knowledge of these issues, feelings of helplessness or desensitization may arise and therefore diminish one’s personal interest and actions for change (Kefford, 2006; Nicholson-Cole, 2005). Also, a primary focus on the damage created to the earth by humans can cause a loss of hope in our ability to make positive change (Hudson, 2001) and feelings of guilt for just being human (West, 2007). Undoubtedly, the emphasis of negative information is helping to perpetuate the broken bond between students and the natural world, creating a larger illusion of disconnection (Louv, 2008).

**Issue 4**

**Presentations of Shallow Fixes to Deep Problems**

Many of the actions taught in the name of environmentalism are in fact wasting time in unrealistic and over simplified directions; many people participate in
false solutions, such as green consumerism in order to feel good (Jensen; 2011). Sustainability through consumption, a highly promoted solution, still emphasizes materialism and growth. And our consumerism has helped us contribute to a lifestyle with a global ecological footprint one-third larger than Earth is capable of sustaining (de Blas, 2010).

To make matters worse, this focus on green consumerism may actually distract from better environmental solutions and dis-empower green citizenship (Hamilton, 2010; Hamilton 2009; Maniates, 2002). Green purchasing as a political act, places too much emphasis on consumerism taking away attention and promotion of active citizenry (Jenson, 2009). This misdirection of action, is an indicator that even though many people are good intentioned in acting in environmentally conscious ways, we don’t know how to be sustainable.

As EE and SE continue in these trends, perception of the dynamic relationship of humans and the earth will continue to be further misunderstood and ignored. Illusions of the natural environment as unrelated and independent cannot be sustained (Thompson, 2009). The human-environment relationship is deeply estranged and we are both suffering because of it (Atkisson, 1999).

Visions for Change

Both the problems causing environmental and sustainability issues and their solutions are rooted in what people value (Wade-Benzoni, Min, Thompson, & Bazerman, 2007). Clearly, we must value sustainability in order to behave sustainably. But, we must reach beyond the usual definition of meeting the needs of today without jeopardizing the
needs of the future. This aim does not help to acknowledge the possibilities of which living with sustainability can be enjoyed and appreciated. Our perceived value of sustainability must also include the social, environmental and health benefits for those alive today and its foundational role in authentic happiness, connection, hope and genuine prosperity, for the earth and humans.

It is critical that education emphasizes a holistic and interdisciplinary approach to values, behavior and lifestyles for a sustainable future (Fien, 2003). Through affective or emotional learning derived from direct contact with nature a deep respect for the natural environment can be fostered (Kellert, 1987). Furthermore, this opportunity in education will provide foundations for building personal connections with the environment, creating a way for the benefits of sustainability to be seen, felt and understood. As a consequence, the restoration of human relationship to place will benefit in terms of health, and true quality of life (Birkeland, 2008).

Strengths and Weaknesses in Outdoor Education

Outdoor Education provides opportunities for students to explore and learn EE and SE experientially (Havlick & Hourdequin, 2005). In outdoor education a person sees the details and interactions, feels the ground slept upon, tastes the air, this initiates a dialogue with place. When one fully participates in a place, she or he becomes part of its life, its story (Stewart, 2003). Wilderness presents a powerful opportunity to discover “that within it, humans are but a small part of a much larger community of beings” (Borrie & Roggenbuck, 1996, p.3). Leopold (1970) wrote of the Land Ethic viewing humans as part of a community that includes “soils, waters, plants, and animals, or
collectively: the land” (p.239-40). This paradigm creates a relationship and view of the earth that allows humans to belong. Furthermore, William Jordan (2003) points to the importance of Leopold's land ethic based environmental paradigm, to replace the two historically dominant paradigms: conservation, which sees nature as a resource for human use, and preservation, which views nature as sacred, above, and apart from humans.

Instead, Jordan acknowledges the need for processes achieving Leopold’s land ethic. These build a community where humans and nature are members, and the dynamic of taking and destroying as well as creating and giving are better understood (2003).

Wilderness-based learning can also provide rare platforms for building a connection with the earth and developing an identity as a member of the earth community (Martin, 2004; Savoie, 2008). Immersion into the out-of-doors allows “the senses to soak in the experience as sights, sounds, tastes, smells and feel until something like profound respect, or more, begins to take root.” (Orr, 2004, p.96). This experience of connection and respect presents an opportunity for many students to understand ecological connections to their actions and to see themselves as part of the world they are learning about, rather than just passively observing (Havlick & Hourdequin, 2005). Through this understanding students often gain insight into the importance of their everyday decisions and actions (2005).

The effectiveness of outdoor education towards pro-environmental behavior can be attributed to its many educational strategies and approaches that build a sense of belonging, connection to and appreciation for the environment. These experiences develop understanding and recognition of personal roles and responsibilities in relation to the environment and sustainability. Moreover, field time often engages students
physically, intellectually and emotionally, presenting options for many learning styles. While classroom based educators often work hard to create learning through experience and reflection, outdoor education brings these types of learning naturally (Havlick & Hourdequin, 2005). Also, because there are usually no walls or separations between instructors and students, Outdoor Education provides transparency of the instructor’s actions and intentions. This transparency or modeling is an effective way of teaching beyond providing instruction or information (Higgs & McMilla, 2006; Winter, 1996). For example, if field educators behave environmentally responsible their actions are witnessed by the students and this implies responsible behavior is expected. Additionally, a greater ability to focus has been a surprising benefit found in wilderness based learning. Students have reported that feelings of simplicity and high perception of relevancy in the topic to the environment have provided more opportunity to focus on the learning (Alagona, & Simon, 2010). Ultimately, the field of Outdoor Education has been found to provide experiences in wilderness based settings which contribute to the development of values and attitudes influential of pro-environmental behavior (Bogeholz, 2006).

Ideally, with wilderness-based experiences EE and SE are assured outcomes. Research has shown correlations between pro-environmental behavior and experiences in nature (Finger, 1994; Jackson, 1987). And, there is a common assumption that students on wilderness-based courses will develop an ethic of care for the environment (Holuzka-Delay, 2001). However, to claim that all it takes is time in the great outdoors to convert a person into an environmentally- minded individual is clearly simplistic. In a 1975 study, association between outdoor recreation and environmental concern was found to be “modest” (Dunlap & Heffernan, p.26). Also, the existing environmental concern was
greater when related directly to the environment connected to the activity. Modest environmental concern or concern of specific resources, are not of the depth and breadth of environmental understanding and attitude that will contribute greatly to sustainability.

The recipe for cultivating environmentally and sustainability acting individuals often requires more than wilderness visitation. Molly Baker (2005) states that the environment often serves as a mere backdrop for adventure activities and even on a month long, wilderness-based course, students may not develop a connection to or concern for the environment. Another study compared environmental feelings of students in wilderness-based programs of different durations. Surprisingly, the students on the longer course had a decrease in positive environmental feelings (Yoshino, 2005). Again, it can require more than time outside to develop environmental and sustainable minded individuals.

It is evident that Outdoor Educators should take caution of letting the wilderness do all the teaching and must reinforce and expand on the lessons it provides (Borrie & Roggenbuck, 1996). For example, even when a personal connection to the environment is made and an ethic of care while in the wilderness is promoted and practiced, transference of those ideals and actions into non-wilderness areas is not certain. Nature or wilderness can be conceived as a place far removed from one's everyday life and as a consequence, one's newly gained environmental ethic may seem unrelated when returning to urban environments (Hanna, 1995). Actions such as recycling, turning off lights, and carpooling may seem abstract. Even worse, some may go home feeling a dichotomy between nature and civilization (Haluzia-Delay, 2001). Wilderness-based experiences alone, cannot and should not be expected to create and increase
environmental attitudes and behaviors (Baker, 2005; Borrie & Roggenbuck, 1996; Yoshino, 2005)

Environmental and Sustainability Education
In Outdoor Education

Cultivating the need for a sense of connectivity to the earth, ourselves and each other, in the effort to achieve ecological and economic sustainability requires working across existing systems (Jordan, 2003). To understand the interconnectedness of sustainability and environmental issues with every aspect of life, education must clearly traverse over the academic barriers and be incorporated across disciplines (Fien, 2003; Tarabu-a-Fiertak, 2004; Jardine, 1990; Knapp, 1999; Martin, 1990; Orr, 2004; Strife, 2010). Intelligibly, the field of Outdoor Education is not exempt. To better ensure transference of pro-environmental attitudes and behaviors, EE and SE must be adapted and infused into wilderness-based learning. As David Orr so eloquently puts it, “We must situate disciplinary knowledge within a more profound experience of the natural world while making it relevant to the great quandaries of our age” (2004, p.98).

Conclusion

Thoreau’s words reveal the paradigm shifting impact made possible within the heart of wilderness-based learning, “I went to the woods because I wished to live deliberately, to front only the essential facts of life, and see if I could not learn what it had to teach, and not, when I came to die, discover that I had not lived” (Thourou, 1854, p.81-82). We must not only possess an understanding of environmental and sustainability issues, but also have experiences that inspire personal commitments towards true quality of life (Fein,
2003). In this commitment lies a paradigm shift that values sustainability. And until the ideas and values of sustainability are deeply desired, we will continue on a path of disconnection which is propelling social injustices, and declining ecological health (Callenbach, 2008).

Wilderness experiences can induce profound changes in value systems (Borrie & Roggenbuck, 1996) and create clarity of one’s life meaning, purpose, and priorities. Take a moment to imagine that today happiness, simplicity, personal and environmental health, close relationships to self, others and the environment, and deep meaning and purpose in life were priorities directing our behavior. These qualities are undeniably foundational to both the environmental and sustainability movements. Ultimately and almost unbelievably “The very things that make life worth living are infinitely sustainable” (Winter, 1996, p.107).
CHAPTER III

METHODOLOGY

Introduction

This project provides the faculty and instructors of The California State University, Chico Department of Kinesiology’s Outdoor Education Program with a resource guide for environmental education and sustainability education. This resource guide provides lessons, activities and resources for implementing Environmental Education (EE) and Sustainability Education (SE). Links to other educational resources in EE and SE are also included.

Population

This resource is to be used by the faculty of the Department of Kinesiology’s Outdoor Education Program. It will support these educators through relevant and applicable curriculum and educational strategies for approaching EE and SE.

The populations ultimately served by this project are the students of CSU Chico enrolled in Outdoor Education courses. Because many Outdoor Education courses do not require prerequisites, students across disciplines have access to Outdoor Education during their college careers. Also, there is a 27 unit Outdoor Education Certificate Program open to all majors. Finally, students who have declared the Outdoor Education option in Kinesiology as their major will benefit the most from this resource.
Description

The resource guide is designed to be easily navigated and used. It is divided into five sections:

1. How to Use the Environmental and Sustainability Curricula.
2. Lessons and Activities.
3. Environmental and Sustainability events and organization list.
4. Environmental and Sustainability Education Resources.
5. Feedback and Use Form.

Theories and Influences for the Content and Structure of the Learning Strategies

The learning strategies were influenced with the research of Dr. Peter Martin (2004), David Moskowits (2003) and Blanchard and Ford (1993).

Dr. Martin (2004) created pedagogical frameworks for outdoor education to improve human relationships with nature. This concluded that increased comfort in nature through involvement with nature and exploration of the personality of a place is highly foundational to build relationship with nature.

Blanchard and Ford (2003) also recommend establishing environmental comfort before building environmental knowledge of topics such as ecology, weather, biological concepts and identification and geology. Once these foundations are built, they explain that understanding the human dependence on the environment will be easier to understand and action on behalf of the environment will be more meaningful. According to Mosckowits (2003) along with intellectual comprehension, connecting to the natural world on physical, mental, emotional and spiritual levels are also important in creating
environmental literacy. The learning progression he established in Citizens of the Earth: Environmental literacy on an Outward Bound Course begins with lessons which build personal relationships to the environment and awareness of immediate surroundings through sensory awareness activities and natural history. This progression then moves toward understanding connections through ecology and is followed by topics in environmental issues through human impacts. Finally, learning of personal responsibility and the possibility for transference are created through service projects, value identification and reflection.

Once the learning strategies were created, the curriculum has was constructed with several goals in mind to be most effective:

Relevancy-

The curriculum is as pertinent to the activity and location of the course as possible. For example, Rock Climbing courses have environmental and sustainability activities and lessons related to climbing gear, geology, climbing organizations with stewardship practices. Water based courses have curriculum related to hydrology, local watersheds, and water issues.

Havlick & Hourdequin (2005) point to the necessity of skills and concepts that are applicable to living. Relevancy to everyday thought and action away from the wilderness is often integrated onto the lessons transferable to the content.

Place Based-

Lessons, activities, and information concentrate or incorporate the course areas and Chico, California. By visiting, learning about or reflecting on local places and issues, development of an appreciation for these places and an active citizenry to protect
these places are more likely (Sobel, 2004). Also, with an emphasis on the issues close to home, students will be learning about matters that are within their reach.

In Progression-

Lessons build upon each other and in accordance to the Outdoor Education Program structure. Beginning and introductory Outdoor Education courses will approach lessons and activities with discovery, and foundational concepts. Lessons of more depth and involvement are written into upper level courses. When appropriate, some lessons designed for Methods of Teaching courses will include ways to teach about environmental and sustainability topics.

Student Centered-

Through student centered learning which allows emotions, values and ethics are formed. This is a central part in any educational effort towards sustainability (Eilam & Trop, 2011). To facilitate emotional learning, reflection, introspection and discussion are incorporated into the curriculum when appropriate. Value forming and value clarifying opportunities are expected outcomes in many of the lessons.

Accessible-

This resource guide is meant to be useable by faculty and instructors regardless of their environmental ethic, knowledge, or background in environmental sciences, environmental literacy and sustainability related issues. Pertinent information was included in order to reduce the need to research the curriculum topics.

Inclusive-

As author and longtime educator Knapp (1999) states different teaching styles react differently to learning styles. In this resource, an assortment of teaching and
learning styles has been considered and the lessons are presented through a variety of educational strategies.

Keeping the above goals in mind, the content of the resource guide was gathered and created. In creating this project, numerous resources in environmental and sustainability education were researched. Most EE and SE curriculum available is designed for grade school ages, heavily emphasize content and knowledge, or were designed around course areas not transferable to this program. These three obstacles affirmed the need for a resource guide to be created for the CSU Chico Outdoor Education Program.

However, there is relevant and useful information available. The books Coyote's Guide to Connecting with Nature (2010), Sharing Nature with Children (1998) and In Accord with Nature (1999) were helpful. Also, two of the premier wilderness based schools Outward Bound (OB) and National Outdoor Leadership School (NOLS) have resource guides available for their instructors. Fortunately, Citizens of the Earth: Environmental Literacy on an Outward Bound Course, Earth Book and NOLS Environmental Educator Notebook include lessons that related to or provided inspiration and content for lessons and activities created in this project for the CSU Chico program. At a minimum, lessons were adapted slightly to fit into the lesson plan format of this resource guide and framed in a way that was more specific to the students which these lessons are intended for.

Lessons and activities adapted from Citizens of the Earth include:

- Thanks-giving was adapted from “Thanksgiving Address” (p. 33-34). Life compass was adapted from “Compass Rose” (p. 23).
Being Ecologically Minded was adapted from the section, Exploring Connections.”

Lesson and activities adapted from Coyote's Guide to Connecting with Nature include:

- Life Compass was adapted from Chapter 9-“Orienting to the Natural Cycle” & the lesson Four, “Directions” (p. 197-207, 356-358).
- Sit spot (p.292-295) “Meet a Tree” (p. 456-459).

Format

This resource guide has a total of 39 lessons and activities. For usability, all the lessons and activities are displayed with a consistent lesson plan design. The lesson plans are compact in their presentation to prevent paper waste. In the fall of 2012, the entire guide will be displayed in a three ring binder and through electronic PDF format. It will be accessible to every CSU Chico Outdoor Education faculty member, instructor and teaching assistant. The electronic PDF files will be located in the CSU Chico Blackboard Outdoor Education Community File.

Conclusion

This Resource guide was created to facilitate integration of EE and SE into the field based courses of the Department of Kinesiology’s Outdoor Education Program at CSU, Chico. Many educational philosophies and strategies were considered in creating this EE and SE resource guide. Teaching is incredibly personal and great effort has been made to promote and encourage a variety of teaching styles and philosophies. It is with
great hope that the educators of CSU, Chico will find inspiration and support from its pages.
CHAPTER IV

RECOMMENDATIONS AND CONCLUSIONS

Recommendations

The next step in this project is its utilization. The major work lies ahead in the teaching and using of this resource. Second, it is recommended that the faculty and instructors of the outdoor education program adapt it. Take this information, and the ideas presented in this resource and turn it into something better. Make it more applicable for your students and your way of teaching. Add to this resource and keep it up to date. Collaboration is needed to improve teaching even in higher education (Sachs, Fisher, & Cannon, 2011). There is no need for future educators to have to create this wheel. Any modifications or updates on this resource should be shared. The user form in the last section is designed to help facilitate the growth and development of this resource guide.

It is also recommended that this resource is shared. Every part of this resource (except for the work of Lin Jenson) is encouraged to be passed on. The more EE and SE is shared, a higher likelihood of change in attitudes and actions towards pro-environmental behavior can be expected.

Further on, it is recommended that EE and SE resource guides are developed for all the disciplines across California State University Chico. With more resources,
educators will have a greater ability to incorporate EE and SE into their courses. As students gain more exposure to these topics, the necessity of living within earth means will be better understood.

Conclusions

The earth’s vast sustainability challenges are increasingly urgent as the rates of change are accelerating (Stephens, Hernandez, Román, & Graham, 2008). Meanwhile, the unfortunate trend in specialization within academic disciplines remains and most college and university students will graduate with very little or no academic coursework in sustainability (Calder & Dautremont-Smith, 2009). However, sustainability concept integration is on the rise (2009). This Environmental Education and Sustainability Education Resource Guide is a step in the process of bringing EE and SE to CSU, Chico Department of Kinesiology’s Outdoor Education Program. There is much importance tied to building our relationship with the environment through time in the wilderness. Through this relationship and experience, we may be able to grow perspective and understanding towards sustainability (Schroeder, 2007).
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REFERENCES


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Environmental and Sustainability Curriculum in Outdoor Education

An Outdoor Educator’s guide for teaching Environmental Education and Sustainability Education at California State University, Chico.

Liliana Wood
2012
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Section 1

How to use the

Environmental and Sustainability Curricula

“There are three ways of trying to win the young. You can preach at them—that is a hook without a worm. You can say, you must volunteer—that is of the devil. And you can tell them, you are needed—that appeal hardly ever fails”.

-Kurt Hahn (Gookin, 2003, p.45)
How to use this resource guide:

This resource guide provides each outdoor education course with curricula that encompasses four different learning strategies of environmental education (EE) and sustainability education (SE). The learning strategies include:

~Building Appreciation
~Developing Connection
~Gaining Knowledge
~Understanding our Responsibility

Description of the Learning Strategies:

Building Appreciation-

Lessons and activities within this strategy are meant to inspire curiosity and wonder of the natural environment which will help develop application of the natural environment. Natural history and basic ecological concepts are central to this learning strategy.

Developing Relationship-

Sensory awareness and sense of place activities and lessons involving reflection and value clarification about the natural environment were designed to develop and/or strengthen a connection and relationship with the natural environment.

Gaining Knowledge-

Through basic ecological concepts, political history, information on current issues in environmental and sustainability topics and human influences on these topics, knowledge will be gained.
Understanding Our Responsibility-

Lessons and activities which help connect our personal actions and thoughts to current environmental and sustainability trends are the focus of this learning strategy. They are also aimed at techniques and vision building for solutions to environmental and sustainability issues.

This curricula is designed and intended to be used in progression. Ideally, one lesson from each learning strategy will be taught in each course. If you are not choosing to employ lessons from every learning strategy, it is recommended to use the first three learning strategies, which develop appreciation, knowledge and the human-nature relationship. These sections are foundational to creating an environmental ethic.

Asking people to be responsible for and take action for the environment before they have an appreciation and understanding of basic environmental conditions, will likely lead to feelings of guilt and/or apathy. When there is inspiration and understanding there is more likely to be a change into an environmentally conscientious lifestyle. This has a much greater impact than a one-time service project that a student may feel she or he had to do for a grade.

When employing the lessons, feel free to break them up and revisit them. Mini lessons, in progression of the course will build interest, deepen thought and promote system thinking. When it comes to incorporating EE and SE one of the common flaws in Outdoor Education is a lack of transference of pro-environmental behavior into the front country. Through incorporation of EE and SE throughout the semester importance is placed on the necessity of everyday action. Though this resource guide provides lessons and activities, the students can and will learn from the unintended curricula. As David Orr says “All education is environmental education. By what is included or excluded we teach students that they are
part of or apart from the natural world.” (p.12). Creating small ways to incorporate EE and SE will help promote transference.

Lastly, in section five there is a list for documenting what lessons have been taught, from this resource, in each class. Use this to make sure that you will not be overlapping on lessons. Also, keeping this form up to date will inform the next person teaching this class. Fill out the comment section if there is any feedback or information you want to add. This resource is for you and it is also for you to make it better than you received it.
Section 2

Lessons and activities

“Almost everything you do will seem insignificant
But, it is very important that you do it”

-Mahatma Gandhi
(Knapp, 1999, p.50)
Beginning Backpacking
Appreciation Lesson: Go on a Hike

Desired Outcomes & Goals:
Discovery and appreciation of the local outside areas.
Self-decided, outside time.
Possibilities of fun/relaxation/outside physical activity.

Description:
This lesson starts with an assignment (students go on a hike) and ends with a debrief of the experience. The point is to promote enjoyment outside.

Activity:
To begin this activity - Ask for a show of hands for who has been to:
-Upper Bidwell Park
-Table Mountain
-Feather Falls
-Sacramento River Wildlife Refuge

Then let them know they have an opportunity to check out some of their local sweet spots!

Give the class a Homework assignment.
1. Go on a hike-
   Parameters:
   -Hike must be a minimum of two miles in length or the duration of an hour.
   -Go solo or with anyone you like.
   -Bring essential items as needed.

2. Reflect about the hike - A short write up (½ to 1 page).
   Possible topics to write about:
   -Where they went. Why?
   -Who they went with. Why?
   -What was the hike like?
   -What did they think about?
   -Do they go on hikes regularly? Why or Why not?
   -Would they like to do this hike again?

3. Let the class know that on the day the writing assignment is due they will be asked to share about their hike.

Content/Information:
Information on local hiking spots:

Bidwell Park

Chico Hiking Association
http://chicohiking.org/

Bucks Lake hiking association
http://www.buckslakehiking.org/index.htm

Table Mountain
http://www.dfg.ca.gov/lands/cr/region2/northtable.html

BCCER day Hike schedule
http://www.csuchico.edu/bccer/public_use/hikes.shtml

Closing:
On the day the writing assignment is due - debrief it with the class.

Option 1. Ask each student to briefly summarize their hike.
   Where did they go?
   Why did they choose that hike?
   What did they think of it?

Option 2. Break the class into small groups and ask them to share about their hike.

Option 3. Pull up an online map of the greater Chico area, project it onto the white board
and ask the students to show where the location of the hike was.

Assessment:
The writing assignment portion of this assignment would be easy to attach a grade to.

Adaptations & Related information:
This would be a great time to give a plug for organizations/programs that facilitate day hikes:

Local Sierra club chapter
http://motherlode.sierraclub.org/yahi/

Chico Nature Center
http://www.bidwellpark.org/page/calendar/events.php

Adventure Outings
http://www.aschico.com/adventureoutings

Information on hiking essentials:

The 10 essentials according to REI

*Be sure to point out that REI is a business and these “essentials” are not set in stone. This is a great opportunity to talk about the marketing of outdoor products.
Closing:
Sharing of the letters will help students share in their love/ appreciation of the river.

If the students know they will be asked to share prior to the activity, some of the students may give it more of an effort.

It is recommended that the students are given an opportunity to read their letters but are not required.

Assessment:
This activity can be turned in for completion points. If you plan on doing this, set parameters on how long you expect it to be.

Materials:
Students will need a journal/ paper and writing utensil.

Adaptations & Related information:
This activity can be done on a field day, a take home assignment or a closing activity on campus. Don’t forget, Big Chico Creek runs right through campus.

References:


Lesson: Having the Lake to Ourselves

Desired Outcomes & Goals:
Understanding the importance of sharing the environment
Awareness of the need to create less of an impact so that others may enjoy more.
Examination of the power of a different outlook.

Description:
This lesson includes a reading with discussion. The topic of the reading is finding a way
to enjoy nature and share nature with others. It is especially recommended for MT. Eddy
when there are other folks camping there and a Lake!

Activity:
Get the group close, preferably with a view of the lake. Read or pass out copies of the
reading: Having the Lake to Ourselves. *Located under section four of this resource guide.

Closing:
You may choose to leave it as a reading only or you may want to facilitate a discussion
-How do you relate to this reading?
-What is the importance in having a place to yourself?
-What can we do to help other folks camping here enjoy the natural setting?
-How do minimum impact strategies relate?

An alternative discussion topic could be – How to enjoy nature with others....

It seems that many view the value of the places they visit by the number of other people around. However, there are more and more people in the world every day and outdoor-recreation is on the rise. This means that the likeliness of having the lake to yourself is becoming less and less.

The anxiety Jenson describes when he and his daughter spotted the couple.
-Has anyone else experienced a similar feeling?
-What do you think most people think when they see a group this size?
-What are some of the positives of more people going outside?

Content/ Information:
Lin Jennings is a Chico author & in 2012 he turned 80 years old. This reading came from
his Book Deep Down Things- it is a collection of short & powerful stories.

To learn more about Lin check out his blog:
http://linjensen.com/

Materials:
The reading Having the lake to ourselves, LNT information (optional)

Adaptations & Related information:
This reading could also be done to front-load to the weekend visit to Mt. Eddy.

References:
Jensen, L. (2010). Deep down things: The earth in celebration and dismay. Somerville,
MA: Wisdom publications.
Knowledge Lesson: Make Your Own Stoves

Desired Outcomes & Goals:
Knowledge on how to build a low-cost backpacking stove.
Experience self-reliance.
Insight into approaches of how to go backpacking without spending a ton of money.

Description:
Students will be challenged to research and build their own backpacking stoves.

They will turn in a write up about the stove, present their stove to the class and attempt to boil water.

Activity:
This lesson is recommended for pairs/ small groups.

Front Load the lesson by dispelling the myth that backpacking needs to cost a fortune.
Then hand out the assignment including a classroom date where
Requirements/ Parameters

- Pair/ groups must turn in a write up including:
  -an itemized list of stove parts and their costs.
  -advantages and disadvantages of the stove.
  - instructions on how to use the stove.

- Stoves may not cost more than $10 – including fuel.

- A “working” stove must bring a liter of water to a rolling boil.

On the day of stove presentations, take the class to the storage shed area next to the tennis courts. Let each group present their stove, light it and see if it works – one at a time.

Content/ Information:
Sites for backpacking stoves-

http://zenstoves.net/Stoves.htm

http://jwbasecamp.com/Articles/SuperCat/index.html

http://www.thesodacanstove.com/stove/

A site that sells recycled material alcohol stoves:
http://www.whiteboxstoves.com/
Closing:
Follow up or begin this lesson with: The topic of the 4R's (reduce, repair, reuse, recycle) and Patagonia's common threads initiative: http://www.patagonia.com/us/common-threads/

Assessment:
On the day that the students bring in their stoves you can assess them on three topics:

1. Does their stove work?
2. Did they present the stove well?
3. How complete is their write up?

Materials:
This is up to the students

Adaptations & Related information:
Before implementing this activity- ask yourself if you are willing to let the students use these stoves on your backpacking trip, the question is going to come up.

* Be prepared that students may try to use hard alcohol – be sure to mention that it is not allowed on campus or school related trips, even as fuel.

The outcomes of this lesson are transferable to making:
- Gaitors
- Biveys
- Gloves
- School tarps?
Activity: Ecological Footprint Quiz

**Desired Outcomes & Goals:**
Introduction to the concept of ecological footprint.
Develop understanding of one's own actions and choices resulting in the size their ecological footprint.

**Description:**
This lesson introduces the concept of an ecological footprint, and then the students actually take the footprint quiz. The lesson concludes with reflection about one’s ecological footprint.

This lesson can easily grow into a follow-up lesson. See below in related information.

**Activity:**
1. Bring the class to the computer lab.

2. Discuss-What does the expression live within earths means mean? Then, Introduce the concept of an ecological footprint and break it down with a basic definition.

3. Let the class know that you will be taking a quiz to measure your ecological footprint amount. Then, get some background information-ask how many of your students have heard of this or have taken the quiz.

4. Front load the quiz as a tool that provides an opportunity for learning not as something they are going to be judged on. Be sure to ask the class to choose that they are living in the U.S.A. in a Mediterranean climate (ask them to use the info from their current home)- so that things are consistent.

   **After all the students have taken the quiz -**

5. Take a poll to see what the range of footprint size in your class is like. They could stand in order of the amount of earths used or show hands.
   *Consider taking the quiz yourself so you can participate.

6. Discuss-
   Possible discussion questions-
   First off-Does this quiz make sense to you?
   What was the most surprising thing in this quiz?
   What can we do about this?

What area created the most footprint?-Take the information with this question and expand on it. Do most folks have the same area with the largest footprint? Why or why not? Exploring this topic provides a clearer awareness of behaviors that can be changed. It is less daunting than trying to change all behavior.
*** It is not a good idea to make the class feel guilty – there is enough of that in environmental education. It is important to end this activity with an opportunity for individual knowledge and empowerment to reduce the size of their footprint. There is a reduce your footprint link: http://myfootprint.org/en/take_action/reduce_your_footprint/

Closing:
Use the principle of Universality- What if everyone in the world lived like this?
Talk about fairness, social justice, environmental health....

In class or as a homework assignment
Ask the students to reflect on:
Three big things they can change to lessen their footprint.
Or-The three easiest things they could do the lesson their footprint.
Bring it up at the next class- see how things are going, ask for further thoughts.

Follow up with these goals later in the semester.

Content/ Information:

Footprint quiz
http://www.myfootprint.org/

About
Ecological footprint is explained simply in the About the Quiz section of the website. Check it out before doing this lesson so that you are more ready to teach about this topic. The direct link is below.
http://myfootprint.org/en/about_the_quiz/what_it_measures/

Materials:
A reservation to the computer lab.

Adaptations & Related information:
Topics to discuss with the class:
What does this have to do with Backpacking?

What do you enjoy to do that does not create much of a footprint?

*Before the backpacking weekend: Employ a carpool challenge to the class.

References:

Basic Rock Climbing
Lesson: Natural History of Bald Rock

Desired Outcomes & Goals:
Introduction of the indigenous people of this area.
Curiosity in Maidu culture and customs.
Introduction to native plants in the area and some of their uses.

Description:
The lesson is lecture based. It is meant to be a quick lesson providing a brief introduction to The Maidu people and more specifically the Maidu-Konkow tribe who resided in the area around Bald Rock climbing area. By showing the plants that they used the lesson gets a sneak plant identification/plant appreciation lesson.

This lesson can be a short and sweet 5 minutes or you can spend an hour and really take a look at all the plants.

Activity:
Take your time with this and show all the plants that you can find. * This would be especially appropriate if you go to Bald Rock twice.

or

Make this a mini lesson by only introducing the fact that Maidu-Konkow people lived in this area and do not incorporate the plants.

Provide back ground information into the Maidu Native Americans then walk around showing some of the plants that they used.

Give this talk in the parking lot- where there are plants that can be identified.

Step 1. Start with a big picture of the Maidu people.

According to Boul’è (1992) there exists no written history of the Maidu before the arrival of Euro-Americans. The Maidu had major groups divided by linguistics cultures and geographic locations. The Maidu near the Feather River were the Maidu-Konkow tribe.

Their calendar year was divided into 9 months and four seasons. The names of the seasons-

To make this interactive- See if they can guess which season goes with each name? It should be pretty easy.

Flower month- Spring
Dust earth-Summer

Snow month-Winter
Seed month- Fall
Step 2
Try to identify some of the plants that they ate and used and provide some information.

Step 3. Optional
Explain some of the animals that they ate (which you likely will not identify).

Content/ Information:

FLORA

Bay Laurel- This was used in many ways. The nuts were heated then eaten and used as beads for necklaces. The leaves were steamed to help relieve colds. (Hill, 1972)

Douglas Fir- Resin was used to heal cuts, burns wounds sprains and sore throats & coughs.

-Green bark was used to improve digestive problems. (Schar, 2010)

Grey Pines- The pine nuts (out of the pine cones) were eaten.

Madrone- Berries were eaten

Manzanita- Berries were eaten and used for tea.

Manzanita tea- The manzanita berries were crushed and mixed with water to create dough. This dough was then placed inside a sieve made of willow. Then when they poured water over it – it dissolved into a tea that tasted close to apple cider. (Boule, 1992, p.42)

Oak Tree (Valley Oak, Tan oak, Canyon Oak etc.) - The Acorn from the oak tree was the staple food of the Maidu. After grinding and leaching (soaking the acorns in water to remove the tanic acid) the acorn meal could be used similarly to flour. That’s right they had bread.

FAUNA

Porcupine- They were eaten and their tails were used as combs (Hill, 1972)

Rattle Snake- Venom was mixed with deer liver and dried for poison (Hill, 1972)

Other fauna that were eaten:
Grey Squirrel, Dove, Western Pond Turtle, Earth Worm, Deer, Salomon & Red ants (the eggs were eaten).
Links:
Mechoopda Maidu
http://www.cr.nps.gov/history/online_books/5views/5views1h51.htm

Mechppoda Maidu
http://www.mechoopda-nsn.gov/history/

A website for medicinal plants
http://doctorschar.com/

Closing:
Out on the rock keep your eyes peeled for grinding holes made by the Maidu-Konkow while grinding their acorns!

Materials:
Optional - Gather images of the plants (if you need help with identification or if you want the students to identify them).

Adaptations & Related information:
Consider bringing pictures of the plants and try to get the students to identify them. This could also be modified to turn into an each one teach one lesson.

Pine nuts-
There are Grey Pines on the eastern stretch of Durham-Pentz Rd. (on your way to Bald Rock). If you can find some pine cones – bring them up and start your lesson by smashing them on the ground and getting Pine Nuts out of them. Here is a description of a Grey Pine to use to identify-

If you have any students that seem really interested in eating acorns, here is a link-

References:


Connection Activity: Meet a Tree

*This Lesson was modified from Meet-A-Tree, an activity from the book Coyote's Guide to Connecting with Nature (Hass, Young, & McGown, 2010).

Desired Outcomes & Goals:
Sensory awareness
Plant identification
Trust building
Beginning the development of a sense of place.

Description:
This is an exploration based, sensory awareness activity. It involves trust and guesswork. It can be modified to bring in plant identification. It can offer a break in the classic progression of trust leans and a chance to go outside.

This can be done on the Chico State campus -in front of Kendal Hall, or Butte Hall.

It can also be done in the Bald Rock parking lot or at the approach to Loading Zone.

Activity:
Depending on your group you may want to begin with a demonstration - choose a student from your group. Blindfold this person, and then demonstrate the proper way to guide him or her:

Grasp their wrist and their elbow, stand at their side, and talk them over or around obstacles. It’s important to demonstrate the proper behavior, as well as warn against anyone treating their partner in a distrustful way. Then, lead this person to a tree, you can take a roundabout way so as to confuse them, and then lead them up to the tree. Allow them to feel, smell, listen, and even taste the tree. You want them to memorize every detail they can about this particular tree. When they feel they’ve created a picture of the tree in their mind, lead them back to the starting point and take the blindfold off.

They now must find their tree, with only support from their partner.

Give each pair of students a bandana. After the first partner has found his or her tree, allow the other partner to try as well.

Closing:
Facilitate some kind of debrief of this activity. Here are some options:

See if anyone could identify their tree and how? Does anyone know what kind of trees are around?

Ask students to discuss in pairs or discuss ass a large group
-What was it like to be led around blindfolded?
-What was it like to lead their partner around?
-Why is it important to pay attention to other senses besides sight in climbing?
Re-group at the end and discuss if, how or why senses awoke. What were some strategies that participants used to find their tree.

Starting a discussion about the experience of being blindfolded may help bring up the topic of trust, partnership etc.

It may also be worthwhile to discuss that some people like lots of information when they climb and others like to ask for beta.

**Materials:**
Blindfolds/bandanas (enough for half the class)
Naturalist guides or tree identification cards (optional)

**Adaptations & Related information:**
This lesson can also be helpful to introduce the different senses that can be used to benefit both the experience of climbing and abilities during climbing.

It can be used in place of a trust fall or in progression with other trust activities.

Bring a few naturalist guides so the students can look up their new tree friend if they are really going into it have a group introduce and share about their trees.

**References:**
Lesson: What is Bald Rock?

Desired Outcomes & Goals:
- Understanding of geology terms such as igneous & exfoliation.
- Awareness and appreciation in the geologic history of the Bald Rock Climbing area.
- Some sense of place for the area.
- Inspiration for exploration of the neighboring areas of Chico.

Description:
This quick, informational lesson provides a basic introduction of the Bald Rock Dome's geology, geologic history and geography of the surrounding area.

Activity:
On the walk from the parking lot to the climbing area, stop once you are all in an exposed area.

Orient the class to what is around -
- You are in Plumas National Forest, in the Sierra Nevada Mountain Range.
  - East is the Middle fork of the Feather River.
  - Curtain Falls are worth hiking to (5 miles round trip, 2,000 feet elevation gain)
  - West is the North Fork of the Feather River.
  - Oroville Lake (which they passed on the way up) is South West.

*After this big picture introduction - You can pause the lesson until later and continue on towards the climbing site or take the lesson into the topic of Bald Rocks Geological history.

The rock that you are all standing on and will be climbing on is granite.

- Ask if any of them can reach back into their 8th grade geology class and recollect what kind of a rock Granite is (igneous).

Then explain what igneous means- It forms from the slow crystallization of magma either above or below earth’s surface.

Next, explain why this dome is this shape- The bald rock formation here is formed this way due to a weathering process called exfoliation. This granite dome is literally unraveling layers of rock.

Explain the difference between weathering and erosion
- Weathering - breaks down rocks & helps erosion.
- Erosion - moves rocks -with or without the help of weathering.

Explain the two types of weathering

1. Chemical weathering - changes the composition of the rock and new chemical compounds form.
Examples of chemical weathering:
The brown, yellow or red color of soil and many kinds of sedimentary rocks (such as sandstone) is often due to iron in the soil and rocks, becoming exposed to air. Rain is a form of chemical weathering. It picks up carbon dioxide from the earth's atmosphere and transports it to the ground. This will wear some rocks faster than water alone. (Carlson, McGeary & Plummer, 2003)

2. Mechanical weathering - breaks rocks into smaller pieces.

Examples of mechanical weathering -
Frost action - freezing water on or in between rocks.

Pressure release - reduction of pressure on a body of rock, causing it to expand. When a large mass of rock forms with great pressure of several miles of rock above it, then many years later, through erosion and uplift of the rock mass it then reaches the earth's surface. Now there is significantly less pressure on the rock formation. The rock formation will then expand upward. (Carlson, McGeary & Plummer, 2003)

Finally- Bald rock brings these concepts together

* Bald Rock Dome is an example of pressure release, mechanical weathering. Over millions of years this granite formation has come to the surface, the rock is expanding upward because there is less pressure. The upward motion is causing cracks called sheet joints to develop. They form layers of the granite dome in concentric rings and they are now peeling of like onion layers. This is called exfoliation. *Half Dome in Yosemite is another example of an exfoliation dome, but it lost half of its dome to glaciation (Carlson, McGeary & Plummer, 2003)

Materials: Optional - An onion would make a fantastic visual for the exfoliation process at Bald Rock.

Adaptations & Related information:
Here is some information is you want to expand on Granite/ igneous rocks -
Igneous rocks are formed from the solidification of molten rock material. There are two basic types:
Intrusive igneous rocks solidify below Earth's surface.
Extrusive igneous rocks solidify on or above Earth's surface.
Granite is an intrusive igneous rock.

Also - Granite always consists of the minerals quartz and feldspar, which give granite a light color ranging from pink to white. The darker speckles are because of accessory minerals such as the black mica biotite and the black amphibole hornblende. Classic granite usually has a salt-&-pepper look (Alden, 2012).

References:

Responsibility Lesson: Let the Lichen Live

Desired Outcomes & Goals:
Basic knowledge of Lichens
Nature Appreciation

Description:
This lesson provides information on the pure awesomeness of Lichen then makes the case to love the lichen and let it be.

Activity:
Gather the class around some Lichen- Welcome them to your public service announcement about the love lichen campaign.

Then give a few quick facts about why they should love lichen too.
  *facts retrieved from (Campbell, Mitchell, & Reece, 1997).

1. Lichens are not plants or individual organisms. They are associations of millions of cyanobacteria (green algae) that are held in a network of fungi. Consider telling the story of Alice Algea and Fred Fungi and how they took a lichen together.

2. Lichen communities can take hundreds of years to develop. And some lichens are the oldest organisms on earth, living thousands of years.

3. Lichens are so tough that they can live in in severe cold such as the arctic tundra and in extremely dry conditions like the desert. They are wimpy when it comes to air pollution, when they disappear it can be a symptom of pour air quality.

Make a pitch about letting lichens live. When looking for new climbing routes consider the vertical ecosystem going on before you.

Content/Information:
Write up about how climbing harms cliff ecosystems.
http://www.conservationmagazine.org/2008/07/rock-climbing-harms-cliff-ecosystems/

BLM write up about lichen and climbing.

References:
Beginning Whitewater Canoeing and Kayaking
Information Lesson: Know Your Watershed

Description: This is a quick lesson introducing the concept of a watershed, and its ecological significance. Watersheds significant to Chico will be the focus.
   - This lesson is lecture and discussion based.

Desired Outcomes & Goals:
Developing knowledge about the definition of a watershed.
Knowledge of the watersheds the students live in and boat on.
Introduction to the geography of the local rivers and water systems.
Introduction to river/hydrology terms such as tributary, fork and confluence.

Activity:
Step 1. Ask if anyone can explain what a watershed is and try to have someone draw a picture.

   See if anyone knows which watershed we live in, in Chico?

   Show the map of Big Chico creek watershed. Define a watershed if needed, then trace
   Big Chico Creek from its headwaters near Colby Mountain down into Chico. Point out
   and explain awesome hydrology terms such as tributaries and confluences.

Step 2. Go big picture- explain that Big Chico Creek watershed, along with other watersheds
near us such as Butte Creek watershed and little Chico Creek are tributaries to the
Sacramento River. Show an image of this. All these watersheds are connected systems of
water.

   Divide the class into groups and ask them to discuss- where Butte Creek gets its water
from. They should try to find its headwaters, any tributaries and where it ends up. They
should also consider if it is fed from snow melt or just precipitation. There is a link to a
map of the Butte Creek Watershed below. Optional-Open up the Butte Creek write up
(below) to clarify the groups answers.

   **At this point consider going down to Big Chico Creek, especially since it goes through our
campus. Have the class re-trace where this water flowing has been in order to get here.

Step 3. Why is this important?
   Explore the expression “We all live down Stream”. What does this mean?

   We all live in a watershed too. Ask if anyone would like to elaborate on those topics.

Closing:
Later, consider showing the image of the Chico storm drain tributaries. If a drop of water falls on
a house in Chico, it will travel to one of the creeks and eventually make its way into the
Sacramento River. Be sure that they understand that the same principle goes to all the oil and
trash that can get flushed into storm drains will end up in the local watershed.

At the end- Introduce some of the local watershed non-profit groups (info below).

Ask the class why there are so many groups dedicated to watersheds instead of the river itself?
This will hopefully help them thinking in terms of systems.
Content/ Information:

The Big Chico Creek Watershed Alliance-provides an existing conditions report which has lots of information ranging from geology, hydrology, wildlife, history, and recreation of the Big Chico Creek Watershed. It is a great resource.  
http://www.bigchicocreek.org/nodes/library/ecr/

Friends of Butte Creek – gives a write up about the Butte Creek Watershed. It will be useful for summarizing the activity for exploring Butte Creek.  

EPA site-surf your watershed  
http://cfpub.epa.gov/surf/locate/zip_search.cfm?value=95928

Maps/ Visuals

Big Chico Creek Watershed  
http://www.bigchicocreek.org/nodes/library/ecr/maps/bigchico_3d_dem_s.jpg

Butte Creek Watershed Map  

Chico storm drain tributaries  
http://www.ci.chico.ca.us/building_development_services/forter/documents/Storm_Drain_Tributary_Areas.pdf

Feather River watershed map  
This map is really useful for seeing how close the headwaters of Big Chico Creek are (Colby Mountain) to the headwaters of the Feather River. The Feather River is also a great example for explaining “forks” of a river. As the feather has a West fork, North Fork, East branch of the North Fork, Middle fork and a South fork- which all drain into Lake Oroville. The river that comes out of the Oroville Lake is simply called the Feather River.  
http://www.sanlamarca.ca.gov/maps/mapgallery/Feather%20River%20HUC.png/image_viewfullscreen

Maps of Sacramento River watershed  
This would be really great to show to go big picture  
http://pubs.usgs.gov/circ/circ1215/summary.htm

Definitions:

Watershed- Where ever you live you are in a watershed. A watershed is a geographic area, defined by the movement of water draining to a common point such as a creek, river or lake. Another way to look at a watershed is communities connected by water.

Confluence- The area where two rivers, creeks or streams meet.

Tributary- A stream or river that flows into a larger stream or river.
Assessment:
Later in the semester-Ask the class the name of three creeks that flow in and around Chico.

*Revisit this topic by showing maps of watersheds before you visit different rivers.

Materials:
White board
Power point to show map images

Adaptations & Related information:
For more information on watersheds and/or groups protecting watersheds look into:

-Sacramento River Watershed Program
http://www.sacriver.org/aboutwatershed/reportcard/section1/15-sacramento-river-basin-reportcard

-USDA site for California watersheds (lots of interesting stuff)

-Big Chico Creek Watershed Alliance
530-892-2196
www.bigchicocreek.org

-Friends of Butte Creek
Mission: To conserve and educate the public about the natural resources of the Butte Creek Watershed and it's tributaries.
530-879-0887
http://www.buttercreek.org

-Butte Creek Watershed Conservancy
530-893-5399
www.buttercreekwatershed.org

-Little Chico Creek Watershed Group
530-892-1227
ranibay@hotmail.com

-Trinity Watershed Center:
(530) 628 – 4206
http://www.thewatershedcenter.com
Connection Activity: Letter to the River

“A personally meaningful environmental ethic requires a fundamental sense of affection for and identification with nature, and a related capacity to perceive oneself as an integral and obligate member of the ecological community”

(Kellert, 1987, p.19)

Desired Outcomes & Goals:
Growth in personal relationship with nature.
Reflection and introspection.
Articulation and clarification of values related to nature.

Description:
In this activity, students will take some quiet time next to the river and write an appreciation/thank you letter directed to the river. Sharing the letter or processing the activity are both options.

*This activity is recommended to do later in the class, once the students have had more river time and personal experience with the river.

Activity:
In a scenic area near a river or creek, set the tone for this activity.

Ask for a show of hands for anyone who has ever written a thank you letter. Ask why thank you letters are important.

Explain that you want to give the class an opportunity to convey what the river means to them, through a thank you letter. Yes, they will write a letter to the river.

Ask them to spread out and find a spot with a view of the water and write their letters there. Depending on the group you can add more structure by giving them specific questions (below) for them to answer in writing the letter.

Content/Information:
Optional framing questions for the letter:

- What do you love about the river?
- What has the river taught you?
- How does the river make you feel?
- What do you respect or admire about the river?
Man-made water storage systems.
The other reservoirs of water determining the storage capacity of water for California are the man-made. California’s water storage facilities (reservoirs) were built in the early 20th century and designed to:
1. Capture and hold the early season rains.
2. Provide water during the winter months.
3. Fill again with the warm season snow melt, providing water for the summer and early fall.
4. They also discharge water in anticipation of flooding, lessening the impacts of floods.

Ultimately they were built in the anticipation of snow melt happening at approximately the same time every year and were designed to only hold a fraction of California’s water (Kapnick & Hall, 2010).

Climate Change
The rising temperature in the Western United States due to Climate Change will continue to significantly influence water issues in California (Maurer, 2007). Two major implications for change in the Sierra Nevada snowpack have been presented:

First, more precipitation is falling as rain and less as snow (Mote et al., 2005; Knowles et al., 2006).

Second, snowmelt is occurring earlier in the spring and at faster rates (Fritze et al., 2011; Hamlet et al., 2007; Knowles et al., 2006).

Thus, the total amount of snowpack and the timing in the melting of the snowpack is being altered.

What this means
As more precipitation falls as rain (not snow) during the winter, there will be less water stored as snow. Without as much snow stored for the summer there is opportunity for increase in droughts, forest fires and increases in ground water withdrawals.

Then in the spring, with snowmelt occurring sooner and in faster rates, the man-made water storage facilities cannot hold the large amounts of water.

Shifts in snow melt timing such as melting quicker and sooner in the year effect the ability of storage facilities to hold enough water for use in the dry months and increase their ability to become overwhelmed which create a risk of flooding (Kapnick & Hall, 2010). Ultimately, “the combination of greater flood risk and reduced natural storage threatens to exacerbate the tension between flood control and storage priorities that many western reservoir managers face” (Knowles, et al., 2007, p.4558).

Links and Resources:
California climate change center. Observed changes in the sierra Nevada snowpack: potential causes and concerns. 

Climate change in California facts sheet
http://www.water.ca.gov/climatechange/docs/062807factsheet.pdf
Knowledge Lesson: Auburn Dam

Desired Outcomes & Goals:
Knowledge of the political history surrounding the American River.
Curiosity in Dams and reservoirs.

Description:
This is a short lesson to take advantage of the visual which the Foresthill Bridge provides.
By simply taking a look at this bridge and giving a brief history onto the proposed Auburn Dam the students are able to get a new perspective of Dams.

Activity:
On your way to the South Fork of the American River, take a quick stop.
Instead of taking HWY 49 over the North Fork of the American River, take a quick detour on the Old Foresthill Drive. There is a pull-out on the left in about 100 yards. Ask your class to meet there. There is a portable toilet and a great view of the Foresthill Bridge.

Orient the class to where you are- The North Fork of the American River.
The NF American was designated a wild and scenic river in 1978. This area is used commonly for hiking, fishing, mountain biking and of course boating. There are some class V sections up river from where you are standing.

Then ask if anyone knows why the Foresthill Bridge was built?
The bridge was built to provide transportation across the giant reservoir that would have been where you all are now standing.

Give them time to visualize how different that area would be.

Then provide information about the Auburn Dam.

Content/Information:
The Auburn Dam was approved by congress for hydropower, water supply and flood control. Upon completion is would have been approximately 700 feet high and 4,000 feet long.

In 1975, construction was underway until a large earthquake initiated deeper investigations and a fault was found. The area had earlier been considered inactive. (Slovensky, Taggart, Stroppini, & Firenzi, 2008). The construction was stopped and decades of politics followed.

In 2007, the State Water Resources Control Board revoked the Bureau of Reclamations rights to the water- creating an end to the Auburn Dam. (Auburn Dam Project Finally Abandoned, 2009).
Closing:
It is not often that people get to see the size and perspective of a reservoir from this angle. Dams have huge benefits but there are also costs that come along with them.

Get a brief discussion going about the pros and cons of Dams.

Adaptations & Related information:
The next time you all meet in class, consider checking out websites that are for and against the building of the Auburn Dam.

Pro- Auburn Dam websites

Sacramento County Taxpayers league

Auburn Dam council
http://www.auburndamcouncil.org/pages/faq.html

Anti-Auburn Dam websites

Auburn Dam Watch
http://www.auburndamwatch.org/

The American River

References:


Lesson: Sacramento River Ecology

Desired Outcomes & Goals:
Knowledge of Sacramento River natural history.
Awareness in the ecological significance of the Sacramento River

Description:
This activity involves the sharing from every student about connections to the Sacramento River.
*Consider doing this lesson after they have learned about our drinking water.

Activity:
Step 1. Explain that you have an activity that will help to build knowledge in the ecology of the Sacramento River.

Step 2. Then put out index cards on the table. Each index will have a topic on it. Ask each student to take a card.

Their homework is to find 2 ways the Sacramento River is connected to this topic and one way this topic is important. Then write the information on the back of the card and bring it on the river.

At the river and on the shore-
Ask the class to get out their cards and get into a small circle. Ask for a volunteer to start the activity off by sharing the information on their card. If someone can see a connection between the topic on their card and the topic that was just read, they can go next.

Closing:
After the activity if it is possible, point out the coastal range and the Sierra Nevada Mountains. All that water flowing in this area ends up in the Sacramento River. This watershed is 26,548 square-miles (Carle, 2009).

This valley is a floodplain, historically the Sacramento River would regularly swell and flood most of the valley. Today there a 147 dams in this watershed, which greatly reduce flooding (Carle, 2009).

Content/Information:

Websites:
Sacramento River watershed program
Among other things, this website shows the correlation of the Sacramento watershed with everything http://www.sacriver.org/

The Sacramento River library website- Lots of great articles!
http://www.sacmentoriver.org/SRCAF/library/library_portal.php
Optional list of card topics that are connected to the Sacramento River

<table>
<thead>
<tr>
<th>LA resident</th>
<th>Rose mallow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sacramento resident</td>
<td>Steelhead Trout</td>
</tr>
<tr>
<td>Chico resident</td>
<td>Great-blue heron</td>
</tr>
<tr>
<td>Farmer</td>
<td>Osprey</td>
</tr>
<tr>
<td>Almonds</td>
<td>Turkey vulture</td>
</tr>
<tr>
<td>Rice</td>
<td>Coyote</td>
</tr>
<tr>
<td>Chinook Salmon</td>
<td>Stellar’s jay</td>
</tr>
<tr>
<td>Green Sturgeon</td>
<td>Tiger Salamander</td>
</tr>
<tr>
<td>Mosquitofish</td>
<td>Red-legged frog</td>
</tr>
<tr>
<td>Cottonwoods</td>
<td>Elderberry Longhorn Beetle</td>
</tr>
</tbody>
</table>

**Materials:**
Index cards
Throw bag (optional)

**Adaptations & Related information:**
If you want to include a web visual, pass the throw bag around as each person talks.

Consider showing a map of the Sacramento watershed before or after visiting the river.
Responsibility Activity: Your Personal Water Use

Desired Outcomes & Goals:
- Awareness of one’s personal water usage.
- Empowerment to lesson ones water usage through knowledge of tools and techniques.
- Knowledge of less obvious ways water is consumed.

Description:
The students and maybe you- will take an online water footprint quiz. This lesson provides an opportunity to let each student take a personal inventory on their water usage, compare their water use to the average American, explore tips for reducing their water use and also introduces the many different ways we use water without realizing it.

Activity:
- Hand out a form with questions to answer before and after taking the water footprint quiz.
- Take the water footprint quiz.
  *Note about the foot print quiz- make sure the students enter in their Chico zip code and ask them to pay attention to the water meter as they answer questions during the quiz.
  This will allow them to understand more about the consequences of each of their choices.

  Anticipate the quiz to take 15 minutes and 10 minutes for students to find and reflect on realistic ways that they can lower their water usage.

  - With the class back together, take a poll.
    - Have the classroom divided into 4 sections (Home, Diet, Energy & Stuff).
    - Writing signs and pasting them to the walls will help make this easier to follow directions.

  - Ask each student to stand near the section that they thought they used the most water on before taking the quiz.
    - Once the class is in their section, consider asking:
      - What made them think they used the most water in this area?
      - What activity causes you to think most of your water use?

  - Then ask the class to stand in the section that they actually had the largest water footprint.
    - Possible questions:
      - Were they able to pinpoint what caused them to use the most water in this area? See if anyone is willing to share.
      - How many of you are standing in a different area than you thought you would be, prior to the quiz. (raise of hands)
Closing:
After all are back in their seats, ask each student to share two things they can do to lower their water usage. Ask them if they would like to re-visit this at the end of the class to see what has really been changed.

Content/ Information:
Water footprint calculator-

Questions for handout:
Answer prior to taking the quiz:

1. How do you think your water usage compares to the average American?

2. Where do you think you use the most water?
   - In your home and yard.
   - On your diet.
   - Through your energy use (transportation & electricity)
   - In the material things you buy such as paper, electronics clothes etc.

3. Do you consider yourself a conservationist?

Post Quiz:

4. How many gallons per year did the calculator estimate for you?

5. Where do you use the most water? (Home, Diet, Energy or Stuff)

6. What was the most surprising aspect to this quiz?

After answering these questions click on the link Water conservation tips.

7. Find two relatively easy things you can realistically do to lower your water use.

8. Find the two things that you could do that would create the highest impact of lessening your water use.

Assessment:
- If the class is really motivated they could take the quiz again at the end of the semester to see if there is a difference.

Materials:
A computer for every student.
Handout of questions/ or write the questions on a white board.
Signs to create the four areas of water use (Home, Diet, Energy & Stuff).

Adaptations & Related information:
This assignment can be done independently as homework or during class.
Methods of Teaching Rock Climbing
Appreciation Lesson: Yvon Chouinard

**Desired Outcomes & Goals:**
- Knowledge of the transformation in climbing protection in relation to environmental impact.
- Knowledge of some climbing history.
- Familiarity in climbing protection.

**Description:**
This is an undercover environmental education lesson meant to provide a small success story. It is recommended to teach as an introduction to climbing protection. It is lecture based with some discussion.

**Activity:**
Hold up a nut or set of nuts- see if anyone knows what it is. Provide some basic information such as the basics concept of how it is used and that it is commonly used today.

*Optional:*
Do the same for a Hex or set of Hexes. And with a cam or set of cams- depending on how much information and time you want to put into this.

Then hold up a Piton. Again see what the students know. Explain how it was used.

Ask if they know anyone who uses them.

Then ask: Why do you think pitons are not used anymore?

Explain the rise and fall in the popularity of the pitons partly thanks to Mr. Chouinard.

*Info below.*

Explain the term “clean climbing”. Which is not really used anymore because our equipment doesn’t damage the rock like it pitons did.

**Closing:**
Today, Yvon Chouinard is the owner of Patagonia clothing company.

This company donates 1% of sales or 10% of profits, whichever is greater, to environmental causes. From 1985 to 2005, the amount donated was up to 22 million (Hopkins, 2005).

**Content/ Information:**
In the mid 1950’s Chouinard made pitons which he sold out of his truck for $1.50. He was able to live off this money and climb (Bucaro, 2007). He went on to begin his own company- Chouinard Equipment.

As time went on the number of people climbing increased and the hammering in of the pitons began to become visible. The rock and the cracks were being damaged.
Yvon Chouinard along with Tom Frost, John Stanard, and Douglas Robinson formed an unofficial committee to change the piton situation (LaFollette, 1983). They adopted aluminum nuts similar to the British style of protection – chalk stones. In 1972, the Chouinard Equipment catalog dedicated 13 pages to “clean climbing”. It explained piton-less climbing and described the environmental benefits.

Within three years the U.S. shifted from pitons to nuts. (LaFollette, 1983).

Materials:
- Nuts & Hexs
- A piton or a picture of a piton
- Cams -optional

References:


Relationship Lesson: Weather and Climbing

Desired Outcomes & Goals:
Introduction to key points in weather forecasting in the backcountry.
Building a relationship with weather through old weather proverbs.
Knowledge of tips for predicting and planning for Orographic weather.
Knowledge in thunderstorm safety.

Description:
This lesson does not focus on what causes weather. But, it gives points into how to identify indicators of foul weather and how to plan to avoid it. This is mostly lecture based.

Activity:
Step 1.
Compare and contrast cold fronts and warm fronts and clouds that come along with each.
*Information below

Step 2.
Share tips in predicting and planning for orographic (mountain) weather.

In the mountains, storms are most common in the afternoons.
   To avoid the foul weather, many will plan to start climbing early to summit before noon.

Mountain weather can change rapidly.
   Watch the sky and keep assessing the clouds.

Lenticular clouds (look like space ships or saucers) form over mountain summits and indicate high winds and cold air (Powers, 2000).

Step 3.
Give a primer in lightning.
Signs of approaching lightning:
   -Feel for a rise in humidity. Moisture is a key ingredient for lightning storms.
   -As moisture increases, visibility will decrease.
   -Check out the clouds.

Explain: How to measure the distance a thunderstorm is from you:

   Light travels much faster than sound and so you can measure the distance between you and the lightning by counting the seconds between the flash of lightning and the boom of thunder. Every 5 seconds = 1 mile
   *Keep doing this to determine if the storm is coming closer or moving away.

Consider giving the class a practice run at this. –Turn on and off the lights –let the students count, then make a BOOM noise–have them figure out the distance.
Provide Thunderstorm safety- the 4A's
by Jeff Renner, 2005.

Consider the experience of your group, this could be review material. In that case, change this section into more of a conversation.

**ANTICIPATE**
Check the weather
Ask locals for typical weather patterns.
Remember the thunderstorms usually happen in the afternoon.

**ASSESS**
Watch the sky.
What are the clouds doing? Can you see lightning?
If you can see lightning and cannot hear thunder- it is likely 15 miles away.
If you hear thunder, start counting.
If you are within 10 miles you are within striking distance.

Then assess where you are.
Avoid: open areas, high points, isolated & tall objects, being on or near water or drainages.

**ACT**
Seek out: Lower elevation, descend to areas below the tree line.

Remove all metal, even your harness if it has buckles. Metal can burn you.
Insulate yourself with a backpack, dry ropes, or your sleeping pad.
Crouch keeping your feet together and if you can, keep your hands off the ground.
*Avoid rappelling if your ropes are wet, because they can conduct current.

Do you hear any buzzing? Feel any tingling? Is your arm hair standing up? Any of these signs mean you should move very quickly.

Keep counting to measure the thunderstorm distance and if is coming closer or leaving.
The strike danger is highest at 3-5 miles. This is when you should be in lightning position.

**AID**
If your partner gets hit don't create another victim. Make sure you can minimize your exposure from another strike first.

The victim will not hold a charge- help by performing CPR. Treat for possible hypothermia.

**Content/ Information:**
Indicators of a Warm Front

If high and wispy clouds that look like horse tales (Cirrus) come, precipitation may follow in 24 hours.

If you see a halo around the sun or moon- these are Cirrus clouds.

Watch for thick, sheet-like clouds form (altostratus) then blanket like clouds move in (stratus).
If you see a rainbow around the sun or moon (called a corona), precipitation is probable and likely to come very soon.

Feel for an increase in air temperature.

If you have an altimeter - the air pressure will lower.

**Indicators of a Cold Front**

White, cotton ball looking clouds are likely harmless – fair weather clouds (cumulus).

If they start to turn dark, thicken, come closer to the ground & don't look very harmless they could be thunderheads (Cumulo-nimbus).

Notice an increase in winds, usually from the east or southeast.

If you have an altimeter - watch the air pressure drop rapidly.

**Cold Front and Warm Fronts - a break down.**

<table>
<thead>
<tr>
<th>Cool Front = High pressure</th>
<th>Warm Front = Low Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heavier &amp; Sinks</td>
<td>Lighter &amp; gets pushed up by cool air</td>
</tr>
<tr>
<td>Travels Fast</td>
<td>Moves slow</td>
</tr>
<tr>
<td>Shorter duration of precipitation</td>
<td>Longer duration of precipitation</td>
</tr>
<tr>
<td>strong likelihood of lightning</td>
<td>low probability for lightning</td>
</tr>
</tbody>
</table>

**Closing:**

*This activity can be a closing or a way to revisit weather later in the semester.*

Share some old proverbs. See if students can figure them out.

The proverbs and explanations are from (Garrison, 1966, p. 35-36).

*When the sun is in his house, it will rain soon.*

*A halo around the sun is often formed by cirrus clouds. Cirrus clouds are a sign of a warm front. Also, cirrus clouds carry moisture droplets or ice crystals. As they get pushed up, higher in the atmosphere (around 20,000ft) the temperatures are above freezing.*

(Renner, 2005)
If the moon rises haloed around,
Soon you’ll read on deluged ground.

*A halo around the moon is cause from the reflection of the moonlight off of ice crystals in the atmosphere. These ice crystals are in the high altitude, thin cirrus clouds.

Trace the sky with a painter’s brush
The wind around you will rush.

* The painter’s brush is alluding to high wispy cirrus clouds. Sometimes wind will come with an advancing front.

**Assessment:**
Keep revisiting this topic. Every field day take a look at the sky with your class. Ask them to identify the clouds and then ask for some weather forecasting.

**Materials:** Optional-
Creating visuals of cloud types will greatly help with cloud identification.

Writing out the major points of warm fronts and cold fronts will make the information easier to explain.

***One interesting way to do this is to write each point out on a small sheet of paper. Give the sheets out to the students and when you explain about fronts you can have them go into the group they belong in.

**Adaptations & Related information:**
Computer animation of fronts-
If you start this lesson on campus- this link has animations of cold fronts and warm fronts interacting. It even shows the clouds involved.
http://www.classzone.com/books/earth_science/terc/content/visualizations/es2002/es2002\_page01.cfm?chapter_no=visualization

**References:**


Lesson: Geology in relation to Climbing

Desired Outcomes & Goals:
Introduction to basic geology.
Understanding in the characteristics of sandstone, limestone & granite as it relates to climbing.
Knowledge of the geology found in local and famous climbing sites.

Description:
Lecture and discussion based

Activity:
Step 1. Cover basic geologic classifications.

Ask the class to reach back to their 5th grade science class.

What are the three major classifications of rock?
Sedimentary, Metamorphic, Igneous

Now go through the basic formation of each and give them an example rock for each.

-Sedimentary rocks are formed by sedimentation of material at the Earth's surface and within bodies of water. (Sandstone, Limestone, Shale)

-Igneous rocks are formed through the cooling and solidification of magma or lava. (Basalt, Granite)

-Metamorphic rocks are either sedimentary or igneous rock that have changed chemically and re-formed through heat and pressure. (Slate, Marble, Quartzite)

Step 2. Rock identification with climbing sites.

Check to see how well the students know their climbing site geology. You could break the class into teams if you want to create fun competition.

Name a place and see if they can name the dominate type of rock and its formation type.

Red Rocks-Sandstone
Yosemite- Granite
The shredding near Redding- Limestone
Bald Rock - Granite
Upper Bidwell Park- Lovejoy Basalt
Eagle cliffs- volcanic granite
Bishop- Granite and “volcanic”-a typed of igneous rock
J-tree- monzo granite
Castle Crags- Granite
Loading Zone-Volcanic?
Ask if anyone has climbed on any of these types of rocks- Then ask if they can describe the feeling of the rock.

Then- Highlight major characteristics of the types of rocks in relation to climbing. But first – Tell this little joke-
  Q. You know what they say about Limestone and/or sandstone? (pick one) 
  A. Don't take it for Granite!

Sandstone & Limestone are softer rocks- which means they should be climbed with that in mind. They have fine grain crystals and they are more slippery when wet than larger grain rocks (Allen, 1998).

Granite is a harder rock with large crystals. But it is important to keep in mind that climate can change the strength of the rock- Granite in the Wind River range, goes through more weathering, lots of freeze thaw activity compared to the granite in Yosemite. And therefore the granite in the Wind Rivers area is much more loose and broken (Powers, 2000).

Adaptations & Related information:
Providing images of each kind of rock would greatly enhance the learning.

Talk about approaches. As you approach a climb you often must deal with loose rock. What are names for these different kinds of loose rock? This will give the students more vocabulary.

  Talus- bigger fragments- ones that you can step on individually.

  Scree- smaller than talus, its size ranges between that of large course sand to small rocks.

Assessment:
Follow up-When your class goes to a cite- ask them to identify the basic, dominating geology in that area. Then ask how that will relate to their climbing.

References


Responsibility Lesson: Climber Environmental Responsibility

**Desired Outcomes & Goals:**
- Introduction to the climbing organizations involved in environmental stewardship, conservancy and education.
- Introduction to environmental issues related to climbing.
- Introduce minimum impacts techniques for climbing.

**Description:**
This is an informational and discussion based lesson. By highlighting the good that is happening and the importance of climbing minimum impact techniques, the expectation of stewardship is passed on.

*Consider that students taking KINE 224 may not have much back-country experience and could not be aware of minimum impact techniques.

**Activity:**
Step 1. Explain that there has been an unfortunate history of friction between climbers and environmentalists. *Areas of contention have been mostly around access and environmental degradation in climbing areas.

Step 2. Discuss-Who should take care of climbing areas? Why?

Step 3. Provide inspiration into the great people and programs in the climbing community which are helping the environment. Highlight three causes. *info for causes shown below.


**Content/ Information:**
Causes to highlight:

Alpine Conservation partnership-Founded by the American Alpine Club (AAC) and the Mountain Institute (TMI). The long term goal of the partnership is to protect and restore alpine ecosystems.
http://www.americanalpineclub.org/p/acp

Leave no waste a photo graphic progression of human waste management on Denali. This is provided by AAC and Access Fund.

Rock and Ice article about climbers using their skills to help monitor pollution.

This highlights Access Funds victories in 2011.
http://www.prana.com/blog/2012/01/07/access-fund-top-10-victories-for-climbers-in-2011/
Access Fund Announces 2011- Adopt a Crag and TeamWorks Awards. This gives an overview of the success of the Adopt a Crag Program. [link]

Crew 5.14 – A group that started a conservation project. [link]

Access Fund [link]

Strategies and techniques for minimum impacts climbing:

Climbing Impacts by Super topo- This article on climbing impacts breaks down minimum impact from a realistic, climbing perspective. It focuses on Yosemite, but the principles can be applied at any climbing site. [link]

LNT for Climbing webpage [link]

The two following links cover how climbers can be seen to create a negative environmental impact.

[link]

[link]

Great article looking at facing climate change from a climber’s perspective. [link]

Closing:
Create discussion of the responsibility of climbers to keep access to climbing through environmental stewardship.

Materials:
A computer- if you are using visuals that require the computer.

Adaptations & Related information:
Consider showing The Climatology photo-pairings of Glaciation changes. This is a good example of seeing how climbers are taking action to bring attention to climate change. This showing was made for a fundraiser for the Alpine Conservation Partnership. [link]

The Himalayan Stove Project- Sponsored by the American Alpine Club and many others this project aims at helping the health of the people and the environment of the Himalayan Mountains. [link]

Adopt a crag program -Organize a cleanup & Check out the calendar for Crag clean up events [link]
Methods of Teaching Wilderness Living
Appreciation Lesson: Thanks Giving

*This lesson has been adapted from the activity Thanksgiving Address by David Moskowitz (2003).

**Desired Outcomes & Goals:**
- Building connection and understanding of our relationship and dependence on the environment.
- Articulation of one’s appreciation and gratitude toward the natural world.
- Gaining perspectives of others appreciation of the natural world.
- Community building.
- Experiencing a modified cultural tradition.
- Creating a new context for the Thanksgiving Holiday.

**Description:**
This activity involves reflection and sharing of gratitude towards the environment.

It can be done on any day but it would be especially powerful on Thanksgiving.

**Activity:**
A few days before the main activity, during an evening meeting or a morning meeting, plant seeds to get the students to think about the gifts of the Earth, their connection with the earth, and what they value about that connection.

Some possible questions to pick from that you could ask the students to think about as they hike, or as they go to bed are:
- What is your relationship with the Earth?
- How do you connect with the Earth and living things?
- How does your relationship with the earth look at home?
- What role of the Earth do you value most?
- Do you have to be in the traditional idea of wilderness to experience the Earth?

You may choose to revisit and dialogue about some of these questions in order to understand the variation within the group in their Human-nature connection. This will also help the students in clarifying their values and concepts about their Human-nature relationship.

**Main activity**
Form a sitting circle.

Explain that you would like to facilitate an opportunity for gratitude to the earth.

Tell the group that there is a traditional Iroquois Nation Thanksgiving address that honors and gives thanks to different aspects of the environment and what you all will be doing is in a similar style to that.

Ask everyone to think about one piece of the environment that they would like to focus on. Then ask them to think of a ways to give thanks to that piece. Give some time for them to think.
Start off the gratitude circle with the first part of the Iroquois Thanksgiving address:

“Today we have gathered and we see that the cycles of life continue. We have been given the duty to live in balance and harmony with each other and all living things. So now, we bring our minds together as one as we give greetings and thanks to each other as people.”

“No our minds are one.”

Then share your piece of the environment that you would like to give thanks for and share how you give thanks. *(If you need examples, check out the links to the Thanksgiving Prayer)*

After each time someone shares the group will say “now our minds are one”. Then pass the floor to the next person so that they can share.

**Closing:**
Once it has gone all the way around share the traditional closing:

“We have now arrived at the place where we end our words. Of all the things we have named, it was not our intention to leave anything out. If something was forgotten, we leave it to each individual to send such greetings and thanks in their own way.”

“Now our minds are one”.

**Content/ Information:**

This link provides a shortened version-[http://www.vedanta-atlanta.org/provisions/ProVisionsNovDec08.pdf](http://www.vedanta-atlanta.org/provisions/ProVisionsNovDec08.pdf)

**Materials:**
The first and last parts of the Thanksgiving address, at a minimum.

**Adaptations & Related information:**
Read the entire Thanksgiving address to the group.

You could also ask each person to write their piece down then have the group collaborate to write their entire Thanksgiving Address down. They can make copies of when they go home. Some may want to share the address with their friends and families in during thanksgivings in the future.

**References:**
The origins of the Iroquois prayer or address are not known.


Relationship Activity: Sit Spot

*This has been adapted from the activity Sit Spot found in the book Coyote's guide to connecting with nature (Hass, Young & McGown, 2010).

**Desired Outcomes & Goals:**
- Reflection
- Nature appreciation
- Connection with nature
- Sense of place

**Description:**
Students get to know one spot well by returning to it several times over the course of the semester and simply sit there.

**Activity:**
- Students will find a spot outside that they can safely go to and sit for a minimum of 15 minutes.
- Ask them to do this once a week, every week, before leaving Escalante.
- Encourage them to go to this spot at different times of the day and different days of the week.
- This activity does not need to include writing to be worthwhile. But here are some options:

  * They could do a free write.
  * Every week you could assign a new topic for the students to write about in their sit spot.
    - Why did you pick this spot?
    - What do you get from this spot?
    - How do you feel? (upon first arriving to their sit spot)
    - How do you feel? (before leaving their sit spot)
    - What do you think this place was like 10 years ago? 100? 1000?
    - How will natural processes, such as erosion, change this place in 100 years?
    - What signs of life are in your area?

**Closing:**
On the day the paper is due or after every week - divide the class into small groups so they can share about their spot and their thoughts.

If you do not feel the students will process without you there, this could be a large group discussion or maybe ask for a reflection paper.

**Assessment:**
A reflection paper is one way to assess the learning/ participation of this activity.

**Adaptations & Related information:**
This exercise can also be done in the field.
- As a daily activity or if you will be in one area for a full day, the students can go to one spot two- three different times during the day.

*Follow-Up: Encourage students to continue back to their sit spot after returning from the Escalante, which they can visit in different weather and seasons.*

**References:**
Knowledge Lesson: Political History of Escalante National Monument

Desired Outcomes & Goals:
-Awareness of the controversy and the political history of establishing of the Grand Staircase Escalante National Monument (GSENM).
-Understanding of our right as US citizens to go to public lands.
-Appreciation for the impact of conservation.
-Knowledge current events in conservation such as the Red Rocks Wilderness Act.
-Inspiration to go to Escalante.

Description:
This covers the controversy around the designation of the GSENM. It also covers the topic of public land and wilderness designation. This lesson is mostly informational based with some discussion. Reflective questioning can also be incorporated. There is lots of information to follow up on this topic provided in the Adaptations & Related Information below.

Activity:
-Ask the group if they understand and can explain the major differences in Public Lands and Wilderness designated lands.

Public lands can be used in general for recreation including off-roading, energy and mineral commodity extraction, livestock forage use, timber harvest.

Wilderness designated areas, used to be public lands. The major difference is that a wilderness designation keeps human influences to much smaller scale on the environment. Recreation is allowed but not motorized vehicles.

*An easy way to remember is just by looking at the titles- Public land is more for the use of people and Wilderness land is more to keep it like wilderness.

-Inform the class that National Monuments are not the same as a wilderness designation but more like a wilderness designation then a public land.
-Where you all are going is the -The Grand Staircase Escalante is a National Monument.

-Explain that you are going to give an overview of the political history of how this place became a national monument but first you have to go way back in time to explain the Antiquities Act.

-Give a Brief description of the Antiquities Act.
-Established in 1906 by Congress and signed by President Theodore Roosevelt.

-This act allows the President to use executive decision making power to restrict the use of public lands. * The land must be a public land first.

-The president does not need Senate approval to employ the Antiquities Act.
- There have been over 100 National Monuments established. Some are then converted into National Parks (like the Grand Canyon).

- President George W. Bush established the Northwestern Hawaiian Islands Marine National Monument in 2006. It is the largest National Monument.

- Now take the class to 1996. President Clinton is running for his second term of office.

  Most of Utah's citizens and elected officials are in favor of the establishment of a coal mine. There are some environmentalists who are against it.

Class Discussion:
Without knowing much about the specifics- Why would you guess many were in favor of coal mining? What are some of the benefits to allowing mining for coal?

Why were environmentalists against the coal mining? What are some of the negatives to coal mining? What are some of the benefits for establishing the area into a wilderness designated area?

*After the discussion give more details into the size and scope of the proposed coal mine, from both perspectives.*

Pro-coal-mine
Proponents of the mine included most of Utah's state and local government officials, who felt that the mining would bring higher paying jobs and higher tax revenues to the citizens of Utah (Grahame & Sisk, 2002). According to the Utah State Geological Survey (1996), the Kaiparowits Plateau, which is now part of the GSENM, contains an estimated 11.375 billion tons of recoverable coal. If this coal were mined the royalties to the State of Utah were estimated at $9.25 Billion.

Anti-coal-mine
Many environmentalists are against coal use in the first place as it is a fossil fuel with many negative environmental impacts. Then the size and scope of the distribution of the coal didn't help. According to Grahame & Sisk (2002), it was estimated that double and triple trailer trucks, would be leaving the mine every 5-10 minutes, 24 hours a day. A 22-mile stretch of road would need to be built for these trucks. The trucks would deliver the coal 220 miles or more to shipping stations in Moapa, Nevada or Cedar City, Utah which would then ship the coal to southern California and out of the U.S.

-Bring it back to 1996- Ultimately by presidential decree- Just before the election. President Clinton announced the designation of the GSENM, which at the time was the largest National Monument ever designated.

He announced it in Arizona, in front of the Grand Canyon, there were no Utah State elected officials there. President Clinton a close win in the AZ election, which is usually a republican state and lost in Utah by approx. 20%.

The GSENM extends across 1.7 million acres, which is 3% of Utah (Petzet, 1997).
*Be sure to point out that the GSENBM is managed by the BLM.
Most National Monuments are managed by the National Park Service. But the
GSENBM is managed by the Bureau of land Management (BLM) which is is a
multiple use agency. That is why there is cattle grazing and hunting.

**Closing:**
In the field-Ask the students to imagine what this area would be like if 4x4ing and
drilling was allowed in Escalante.

-Talk about Red Rock Wilderness act

**Content/ Information:**
Information about the proposed coal mine-

Andalex Resources was moving forward on plans to mine coal until stopped by the
designation by Clinton. Andalex Resources Inc. had been working to gain permission
from the BLM for around 11 years and spending millions on environmental impact
reports and according to the Utah Geological Survey (Allison, 1997).

Land use history of North America-Colorado Plateau
http://cpluhna.nau.edu/Places/gsenm3.htm

Utah State geological Survey of the Kaiparowits Plateau coal
http://geology.utah.gov/online/c/c-93/gsekcoa.htm

Southern Utah Wilderness Alliance & the Red Rock Wilderness Act
http://www.suwa.org/issues/arrwa/

Red Rock Wilderness act video-Wild Utah
http://action.suwa.org/site/PageServer?pagename=SUWA_Slideshow

**Materials:**
-If you choose to create a time-line visual, a white board or large piece of paper will be needed.
-Note cards or a print out of this lesson will be beneficial because it is such a large topic.
-If you choose to show videos then you will need a computer with projecting capabilities.

**Adaptations & Related information:**
Discuss thoughts about wilderness designation.

For specifics about wilderness designations visit the SUWA website
http://www.suwa.org/about/

Q.1 What are reasons (other than coal) that many people have against wilderness designation.
Q.2 What is the importance of wilderness?
Q.3 What are you feelings on wilderness designation? Why?
Consider showing a video about The Red Rocks Wilderness Act. The link below is to a 15 minute video narrated by Robert Redford.
http://www.youtube.com/watch?v=FUumoEKsi2I&list=UUQ7dJKPYgD3ANEZZdSIizNA&index=8&feature=plcp

Discuss- The issues around wilderness designation are usually very controversial. Examine the political battle going on along the Rogue River, much closer to home.

Pro- Wilderness designation-Wild Rogue alliance
http://wildroguealliance.org/Wild%20FAQ.pdf

Anti-Wilderness designations-Josephine county Republican Committee
http://pionpolitics.com/?p=8128

Politics continue- There is currently legislation to turn GSENM back into State control:
Article by Salt Lake tribune

There is also a new proposal for a coal mine near Bryce Canyon.
https://secure.sierraclub.org/site/Advocacycmd=display&page=UserAction&id=7945

References:


Lesson: Wants vs. Needs in Outdoor Education

Consider teaching this lesson prior to handing out the gear list.

Desired Outcomes & Goals:
- Students will contemplate how consumption is tied to Outdoor Education.
- Students will reflect on their own buying practices.
- Higher awareness in needs versus wants.

Description:
This lesson addresses the topic of consumerism. Through discussion, watching a short video, research on gear & clothing companies and doing personal inventory of one’s own gear the class will dissect consumerism in outdoor education.

Activity:
Start off the class with the song Two Little Feet by Greg Brown.

Ask for thoughts about the song.

If the class needs more prompting here are some guiding questions:
What is the main topic in this song?
What are some of the main messages that Greg Brown getting at?
Are there any lyrics in this song that speak to you or that you can relate to?
Do you think our culture values knowledge over stuff?
What was the culture of generations before around stuff?

Optional: Stop the lesson here and begin the rest of the lesson during the next class.

Bring in some outdoor gear/ clothing catalogs & pass them around.

Challenge the class to find the implicit messages found in the catalogs.

Discuss the topic of consumerism.
What does this topic have to do with outdoor education?
How do you differentiate between needs and wants with outdoor gear?
Why is there such a thing as pro deal?
What are you telling your students by what you wear?
Does anyone have any personal conflicts on this issue?
How much money do you think you have spent on your outdoor gear?

Show Visualizing a Plenitude Economy – a 5 minute video adapted from the book Plenitude by Juliet B. Schor and produced by New American Dream.

Then ask the class to decide on 3-5 topics that are important in deciding to buy a product from a business, from an environmental or sustainable point of view.

***Inform the class of their homework assignments.
Homework:

Assignment 1. Research gear companies

Using the 3-5 topics that the class came up with:
Research one company that they admire and who thinks we should support.
or
Research one company of which you own a product from.

*This assignment should be presented to the class so that findings can be shared or turned into vista if you do not have the class time.

Assignment 2. Make a personal gear list inventory

* Because many do not have all of their gear until the day before the field portion, this assignment should be turned in after the field section.

Keep a record of how much money it took to gain everything needed for the gear list of this class. This involves doing the best that they can to try and find out how much things cost that they already have and keeping track of all that they do spend. They will turn in an itemized sheet with every piece of gear, its cost how they got it and if it is owned when they received it (approx.).

Short example:
Boots, $150, purchased on sale at Chico mountain Sports. Jan/2010
Backpack, $25, rented from adventure outings
Insulating top layer, $4, purchased used from Salvation Army. Fall, 2009
Rain Jacket, $0, borrowed from mom.
Bowl, $2, purchased from

Total: $179

This assignment can be debriefed in a lot of different ways. At a minimum the class should figure out the highest, lowest and average amount spent on gear. This way the next year’s class of students will have better idea in the range of cost for the class. Be mindful to not let this turn into a contest, blame game, or guilt fest. Providing a paper for everyone to write their totals down on could minimize the attention for each person.

Factors such as durability of products and how things were obtained should be discussed.

A reflection paper about their gear worked during the course and their thoughts on their purchasing choices could also be included in the assignment.
Content/ Information:
Visualizing a Plenitude Economy- Video

Two little Feet by Greg Brown
This is a youtube video of random people hiking the PCT. *If you think the video will be distracting just turn on the audio.
http://www.youtube.com/watch?v=EzGZ5_iEmCs&feature=results_main&playnext=1&list=PL1A8EDFC3482FA58A

The Common Threads Initiative store on eBay has in stock hundreds of used Patagonia jackets, shirts, pants, and even dresses that anyone can purchase online.

Closing:
Encourage the student to keep their gear inventory going. That way they will know how long their gear is lasting, what is working/ not working and how much they are spending.

Assessment:
Points could be attached to the research assignment and personal expenses inventory.

Materials:
Ability to watch video and/or play audio (optional)
Catalogs and or magazines of outdoor gear & clothing.

Adaptations & Related information:
Prior to handing out the gear list, consider giving an overview of the 4r’s (reduce, re-use, re-pair, recycle).

No impact project presents- Environmental Education Curriculum
This website provides free lessons on creating less material and energy impact.
http://noimpactproject/educators-middle-high-school-environment-curriculum-html/

Possible readings to introduce before this lesson:

Articles on consumerism in the outdoor field provided by WEA-
Genuine Sustainability in Outdoor Programming. By Paul Van Horn
Towards True Sustainability: Overcoming the Effects of Consumerism in the Outdoor Field, Part II. By Paul Van Horn
http://www.weainfo.org/attachments/wysiwyg/1/JWEA_Winter_08.pdf
Responsibility Lesson: Wants vs. Needs in Outdoor Education

Consider teaching this lesson prior to handing out the gear list.

**Desired Outcomes & Goals:**
- Students will contemplate how consumption is tied to Outdoor Education.
- Students will reflect on their own buying practices.
- Higher awareness in needs versus wants.

**Description:**
This lesson addresses the topic of consumerism. Through discussion, watching a short video, research on gear & clothing companies and doing personal inventory of one’s own gear the class will dissect consumerism in outdoor education.

**Activity:**
Start off the class with the song *Two Little Feet* by Greg Brown.

Ask for thoughts about the song.

If the class needs more prompting here are some guiding questions:
- What is the main topic in this song?
- What are some of the main messages that Greg Brown getting at?
- Are there any lyrics in this song that speak to you or that you can relate to?
- Do you think our culture values knowledge over stuff?
- What was the culture of generations before around stuff?

Optional: Stop the lesson here and begin the rest of the lesson during the next class.

Bring in some outdoor gear/clothing catalogs & pass them around.

Challenge the class to find the implicit messages found in the catalogs.

Discuss the topic of consumerism.
- What does this topic have to do with outdoor education?
- How do you differentiate between needs and wants with outdoor gear?
- Why is there such a thing as pro deal?
- What are you telling your students by what you wear?
- Does anyone have any personal conflicts on this issue?
- How much money do you think you have spent on your outdoor gear?

Show *Visualizing a Plenitude Economy*—a 5 minute video adapted from the book *Plenitude* by Juliet B. Schor and produced by New American Dream.

Then ask the class to decide on 3-5 topics that are important in deciding to buy a product from a business, from an environmental or sustainable point of view.

***Inform the class of their homework assignments.
Homework:

Assignment 1. Research gear companies

Using the 3-5 topics that the class came up with:
Research one company that they admire and who thinks we should support.
or
Research one company of which you own a product from.

*This assignment should be presented to the class so that findings can be shared
or turned into vista if you do not have the class time.

Assignment 2. Make a personal gear list inventory.

* Because many do not have all of their gear until the day before the field portion,
this assignment should be turned in after the field section.

Keep a record of how much money it took to gain everything needed for the gear
list of this class. This involves doing the best that they can to try and find out how
much things cost that they already have and keeping track of all that they do not
spend. They will turn in an itemized sheet with every piece of gear, its cost
how they got it and if it is owned when they received it (approx.).

Short example:

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This assignment can be debriefed in a lot of different ways. At a minimum the
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way the next year’s class of students will have better idea in the range of cost for
the class. Be mindful to not let this turn into a contest, blame game, or guilt fest.
Providing a paper for everyone to write their totals down on could minimize the
attention for each person.

Factors such as durability of products and how things were obtained should be
discussed.

A reflection paper about their gear worked during the course and their thoughts on
their purchasing choices could also be included in the assignment.
Content/ Information:
Visualizing a Plenitude Economy- Video

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The Common Threads Initiative store on eBay has in stock hundreds of used Patagonia jackets, shirts, pants, and even dresses that anyone can purchase online.

Closing:
Encourage the student to keep their gear inventory going. That way they will know how long their gear is lasting, what is working/ not working and how much they are spending.

Assessment:
Points could be attached to the research assignment and personal expenses inventory.

Materials:
Ability to watch video and/or play audio (optional)
Catalogs and/or magazines of outdoor gear & clothing.

Adaptations & Related information:
Prior to handing out the gear list, consider giving an overview of the 4r’s (reduce, re-use, re-pair, recycle).

No impact project presents-Environmental Education Curriculum
This website provides free lessons on creating less material and energy impact.

Possible readings to introduce before this lesson:


Articles on consumerism in the outdoor field provided by WEA-

Genuine Sustainability in Outdoor Programming, By Paul Van Horn

Towards True Sustainability: Overcoming the Effects of Consumerism in the Outdoor Field, Part II. By Paul Van Horn
http://www.weainfo.org/attachments/wysiwyg/1/JWEA_Winter_08.pdf
Winter and the Mountain
Appreciation Lesson: Honey Bees and Thermal Regulation

Desired Outcomes & Goals:
- Introduction to the evolutionary forces of winter.
- Introduction to winter ecology.
- Inspire fascination and inspiration from honey bees.
- Appreciation of the different adaptation strategies for animals in the winter.

Description:
This lesson is part exploratory and part lecture based. The large subject of winter adaptation is introduced and then moves to the more specific story of the honey bees adaptation to the winter. The way they work together to thermal regulate is an inspiring example of Expedition Behavior.

*This lesson is recommended to do before the field portion of Winter and the Mountain.

Activity:
Introduce the forces of winter that shape evolutionary responses: SCREW

One way to make this more interactive is to list each letter on the board and ask the class to guess what each letter stands for. What could each letter mean that could really screw them if they are not prepared when they are snow-camping?

SCREW factor:
- Snow- Precipitation is more likely to fall as snow in the winter.
- Cold- temps are colder due to less radiation received from the sun.
- Radiation-Less radiation is received from the sun, because of earth's tilt.
- Energy- There is less energy available as food in the winter.
- Wind- Windy conditions are higher in the winter.

The SCREW factor of winter affects every level of biological organization from molecules to ecosystems (Halpheny, Ozanne, 1989).

Ask the class to brainstorm adaption strategies animals and insects have for surviving the winter. If they need help provide more specific examples like what do bears do in the winter, what do geese do in the winter, what do deer do in the winter etc. There will likely be a big list of random things, write them down on the white board.

Here are some more interesting facts to help build intrigue:

Birds- will fluff up their feathers to trap more heat.

Pikas- remain active and will lay their ears down flat to their heads to reduce heat loss.


Elk and Mule deer- are considered altitudinal migrants because they move to areas lower in elevation in the winter.

Mountain goats- move to more south or southwest facing slopes where the winter sun melts snow more quickly and exposes their food of lichens and vegetation.
Next, explain that animals adapt to the winter in three ways: Migrate, hibernate or confront. When they do not migrate they either remain active and confront the winter or become inactive and hibernate.

Then ask the class to identify which adaption strategies that they listed are under migration, hibernation or confrontation. They could use different colored markers to circle the topics.

There may be some debate- but the point is to get them thinking about the fact that there are a variety of different adaptation strategies that are pretty cool.

The next part of the lesson is the lecture portion which narrows in on insects and especially the Honey Bees.

Info on the Honey Bees:

Insects adapt to the SCREW factors of winter differently because they have very different bodies. Their small bodies have a high surface to volume ratio, so they lose heat much faster and they cannot generate their own heat internally (endothermic) and they must receive heat from external forces (ectothermic).

Honey Bees have two unusual loopholes for being “cold blooded” or endothermic creatures:
- They have hair which helps to trap their heat.
- They have large wing muscles which they use to generate heat.

So, they are also endothermic. However, if they stop moving their body temperatures would quickly drop to the surrounding temperatures.

Honey Bees confront the winter because they do not migrate or hibernate. If it gets cold enough they cannot create or trap enough heat to fly around on their own. So they gather in the hive and bunch up. This is considered communal behavior. The colder it is the closer that they will get together. In the cluster the bees move their wings just enough to generate heat in their muscles but not too much so that they do not move air (That would cause heat loss through convection).

When a bee gets tired it will stop moving its wings and head to the middle of the cluster, where it is warmer and rest. If a bee is feeling hungry and far away from where the honey is, it will send a message to the other bees- who will send the message along until it reaches a bee near the honey. That bee will then gather the honey up and the honey will then get passed along until it reaches the hungry bee. If it isn’t too cold outside bees will go outside to go to the bathroom. These strategies allow the hive to thermo regulate and survive together through the winter (Winston, 1987).

Closing:
What can we learn from honey bees about Expedition Behavior?
Content/ Information:

A winter ecology resource guide made by the National Park Service:

Links with more information on bees and other insects:

http://westmtnapiary.com/winter_cluster.html

http://lancaster.uml.edu/nebline/2001/dec01/page03.pdf

http://reptiles.net/cold-blood.html

Materials:
A white board and three colors of markers.

Adaptations & Related information:
Consider starting a dialogue about similarities and differences between the human animal and other animals in regards to winter adaptation.

What do humans do in the winter environment? What have they done?
-“snowbirds” go to Florida every winter.
- Alter the environment. How?
- Gain weight?

References:


Relationship Lesson: Ecological Benefits of Avalanches

**Desired Outcomes & Goals:**
Understanding in the ecological role avalanches play.
Appreciation into ecological systems.
Knowledge in a few ecological vocabulary terms.

**Description:**
This is a short lesson that will help students identify avalanche terrain through an ecological perspective. The class will watch a video about the ecological benefits of avalanche. The video is about 3 minutes long.
*This lesson would be a great opener to teaching about avalanche terrain assessment.*

**Activity:**
Ask the class to brainstorm all their thoughts about avalanches. There will be likely be lots of fear and catastrophe associated with this subject.

**Then** offer them an ecological perspective on avalanches.

**Define a few key words:**
Succession- If you dump a pile of dirt in a parking lot – it will not stay that way for too long.
When plants begin to grow, bugs move in, you have got a case of succession. When an ecological community of an area is changed, sometimes due to disruption such as a fire succession will follow. It is a continuing process.

Nutrient transfer- The transfer of nutrients such as carbon, sulfur, nitrogen and phosphorus are important in succession. This transfer can happen through animal feces, urine and decomposition. It can also happen when plants are moved, then decompose.

Biodiversity- is the diversity of species of every kind (Viruses, bacteria, fungi, mammals, plants etc.). An ecosystem is stronger when it has higher biodiversity. Interestingly enough it is not known how many species and organisms there are in the world and estimates range from 3-70 million (Kormondy, 1996).

**Lastly** visit the Forest Service National Avalanche Center website and watch a 3 minute video on the ecological benefits of avalanches.

**Content/ Information:**
Avalanches remove trees and reduce growth rates of vegetation through repeated disturbance (Knight & Patten, 1994). However, this fragmentation creates an ecotone or transition area in the forest and has presented to be an ecological benefit. In dense forests this can contribute largely to the growth of a diversity of plants that are often smaller in diameter and height, and have slower growth rates. This leads to an area with more sun exposure. This affects the biodiversity in animals and birds which are drawn to such areas because of the complexity in vegetation and habitat (Bebi et. al., 2009).

Also, avalanche paths can act as a fire break, changing the range and impact of forest fires (Malanson and Butler, 1984).

It is important to note that forest structures also influence avalanches. The relationship is dynamic (Bebi et. al., 2009).
Link to video
Forest Service National Avalanche Center
http://fsavalanche.org/Default.aspx?ContentId=28&LinkId=6&ParentLinkId=

Closing:
What other major natural disturbances occur that can have ecological benefits?

It is important to look at what is natural in ways that are not harmonious such as the benefits of fire, flooding and avalanches.

Also, with growing climate change, more extreme weather events are anticipated. This relates to avalanches because extreme weather can trigger a Class 5 avalanche, it is estimated that this will become more common, due to climate change (Fagrel & Peitzsch, 2010). This is another example of the vast ways climate change is going to alter the environment in variations that are difficult to predict.

Materials:
a computer and projector to watch the video.

Adaptations & Related information:
Be sure to re-visit this topic in the field. If avalanche danger is low the class could spend time in a forested area that has not been disturbed by avalanche then spend time in avalanche terrain to see if they notice a difference in flora and fauna.

References:


Desired Outcomes & Goals:
- Appreciation for the fauna in the winter of the Eldorado National Forest.
- Knowledge of what animals will try to eat their food.
- Development in sense of place.
- Intro to basic tracking.

Description:
Information and images of animals in the Eldorado national forest will be made into note cards by the students.

These cards can be whipped out at any time or they could be an afternoon activity where students make informational stations which other students and instructors rotate through.

Activity:
Ask every student to create a note card of a plant or animal of the Eldorado National Forest. They will bring the note cards with you in the field and use them to teach a mini naturalist lesson.

Information to include on the card.
- an image of the plant/animal.
- an interesting fact.
- what they eat.
- how they adapt to the winter.
- image of tracks, (when applicable)

If the class size is too large have the students create & team-teach their cards.

*Note cards are most easily used when they are 5x7 in size and made out of a card stock or thick backing. Providing 5x7 index cards to the class is recommended. Be sure to remind the students that their cards must be waterproof and accessible so that they can be used and do not fall apart.

Content/ Information:
Fauna in Eldorado National Forest:

<table>
<thead>
<tr>
<th>Animals</th>
<th>Birds</th>
<th>Rodents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Porcupine</td>
<td>Stellar's Jay</td>
<td>Pika</td>
</tr>
<tr>
<td>Mule Deer</td>
<td>Mountain Chickadee</td>
<td>Yellow Bellied Marmot</td>
</tr>
<tr>
<td>Coyote</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wolverine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black Bear</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Badger</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Link:
   Animals of the Eldorado National Forest
   http://www.fs.fed.us/r5/eldorado/recreation/wild/moke/gen/critters/

Materials:
5x7 index cards

Adaptations & Related information:
- This lesson correlates nicely to the lesson on animal adaptations in the winter.
- When talking about minimum impact camping, incorporate the animals that call Carsen's Pass their home.
- If the class is ok with it, the cards could be donated to the program and passed to the next class.
Relationship Lesson: What Causes Winter

Desired Outcomes & Goals:
- Big picture of what causes seasons.
- Understanding of the relationship of the Earth's tilt to aspect, snowpack and vegetation.

Description:
This lesson is part demonstration and part experiential.

Activity:
Step 1. Ask: What is the longest day of the year here in Chico? (June 21st).
   What is the shortest day of the year? (Dec. 21st)
   Why is that?

   *Explanation* In the Northern Hemisphere in the summer months, we receive the sun's rays for longer in the day and at a stronger intensity. In the winter it is the opposite.

Explain: This is because of the variation of the Earth's tilt.

Step 2. Demonstrate: The earth's path around the sun.
   For this demonstration there are two options. The first option is described, and
   the second option can be done following and adapting the directions for the first
   option.

Option 1. Use the class to move around and pretend to be earths in orbit, and the tilt of the Earth. An area
   where the whole class can move in a circle is needed.

Option 2. Use two balls or something similar to demonstrate the sun and the earth. The class will be
   watching you or helping you to use the balls to show a visualization of the earth in orbit and in tilt. More
   information for this option is located under adoptions and related materials.

Ask everyone stand and make a circle. Imagine that the sun is in the middle of the circle
and that our torso's are the earth. If we spin around once it is like what the earth does in a
day.

Spin around.

   If we walk around in a circle and spin 365 times that is equivalent to a year. This
   trip around the sun is called the elliptical orbit. Interestingly enough, this track
   that we do around the sun is not made in a perfect circle and the closest the Earth
   gets to the sun is in early January and the farthest the Earth gets away from the
   Earth is in Late July.

Walk around in a circle. Spin a few times.

Then provide a simple drawing to show how the Earth gets closer to the sun in Jan and
further away in July.
However, what causes changes in the seasons and what makes summer and winter happen at opposite times of the year in the Northern and Southern Hemispheres is the TILT of the Earth!!!

STEP 3. Demonstrate the earth’s tilt.

Ask everyone to imagine that the tops of their heads are the North Pole and their hips and butt are the South Pole, belly button area is the equator. They should also imagine that they have really, really, big belly’s. Consider drawing a picture.

In the Northern Hemisphere’s winter, the Earth tilts away from the sun in the North and toward the sun in the South.

Ask everyone to push their hips towards the middle of the circle and their heads away from the middle of the circle. Now spin around keeping that tilt.

As the earth rotates around the sun the tilt changes, creating season changes.

Ask the class what the tilt of the Earth would look on the opposite side of the sun?

Designate the directions of seasons then-Ask them to actually place their body on the other side of the circle and tilt their body in the way they think it should look.

*Their bodies should be doing the opposite- facing their heads toward the middle of the circle- this is how the Earth tilts during the summer months of the Northern Hemisphere.

Explain that this tilt not only affects the amount of sunlight that is place on the earth, which makes for different lengths of the day but also the intensity of the radiation in sun’s rays. In the winter, the sun’s rays hit the earth at a lower angle: A sunbeam must cover a larger area and because of this its radiation is not as strong.

STEP 4.
The next part of this lesson covers how the tilt of the Earth effects the angle of which the sun's rays hit the Earth more in depth. Effects of the angle of the sun on southern and northern facing aspects will also be covered.

For this part of the lesson, show some visual examples of the earth's tilt and the variation of influence that effects different latitudes of the Earth. This will help reinforce what was just learned and help explain the new topic of aspects.

Explain what an aspect is.

Ask the class if they can figure out which aspect of a mountain in the Northern Hemisphere would get more sunlight.
The Earth's tilt has more or less significance in the difference of shade or sun depending on a place's Latitude. Show the diagram on the Forest Service National Avalanche Centers Page. Discuss why aspect is more and less important depending on the Latitude.

Things to point out.

Snow:

The difference of sun exposure on northern and southern facing aspects is greater during the winter and less in the spring because the sun gets higher in the spring. Because a southern facing slopes in the N. Hemisphere receives more sun exposure,

Vegetation:
- Because northern facing aspects in the N. Hemisphere receive less sun exposure,
- it gets more shade,
- holds onto snow longer,
- stays moist longer,
- which effects the type of vegetation that grows.

*Show images of vegetation variation on Northern and Southern facing aspects.

Content/ Information:
Links about the Earth's tilt- with a great visual.

Solar calendar
http://www.solarecalendar.org/newstuff/5_75DownloadableActivities/2ReasonsforSeasons.jpg

weather questions
http://www.weatherquestions.com/What-causes_the_seasons.htm

Here is a link that has great diagrams for how a places latitude influences a of sun exposure in aspects.

Forest Service National Avalanche Center
http://www.fsavalanche.org/encyclopedia/aspect.htm

A link that shows how aspect can effect vegetation

Central Washington Native Plants
http://www.cwnp.org/naturalist/aspect.html

'This link relates aspect to avalanches
http://www.sld.ch/lawineninfo/zusatzinfos/interpretationshilfe/info_gefahrenstelle
n/index_EN
Assessment:
Summarize:
Q. What creates winter? A. The Earth's tilt.
Q. If you are in an area near the equator which aspect will receive more sun? A. Neither.

Materials:
Have a way to show visuals.

If you choose to do the second option of this activity you will need:

Two balls of different size. A grapefruit and an orange could work.
One is bigger (to represent the sun) and one is smaller (to represent the earth),

On the smaller ball draw a dotted line across the middle-representing the equator.
Then draw a N. for the northern hemisphere and a S for the southern hemisphere on opposing sides of the ball.

Adaptations & Related Information:

The Latitude at Lake Tahoe is 38°. This is important because it means that a difference of snowpack between Northern and Southern facing aspects is noticeable. This provides an experience for the students to explore the differences in the field. Once in the field bring a few compasses so that students can check it out.

References:

Desired Outcomes & Goals:
- Awareness and appreciation of the Sierra Nevada snowpack.
- Knowledge of how climate change is affecting the snowpack.
- Perspective in the breadth of climate change, such as increased risk of flooding and drought.

Description:
Lecture based, informational lesson with discussion at the end.

Activity:
Step 1: Cover the important role the Sierra Nevada snowpack plays in California’s water supply.

Step 2. Explain how the man-made water storage systems are designed to work.

Step 3: Explain the two major ways climate change is affecting the snow pack:
- Precipitation falling as rain later into the winter and spring snowmelt happening earlier and quicker.

Step 4: Cover the ramifications of these changes by drawing a Venn diagram with:
- Precipitation falling as snow later into the fall - In one circle
- Snowmelt occurring earlier in the spring - In the other.

- Help the class brainstorm other issues that are related to these changes that are altering the snowpack in the sierras and see how many topics can spawn off of it. This should help to build understanding of the big picture of the effects related to climate change.

Topics to cover
- water supply
- flood danger
- recreation
- less energy gain through hydroelectric plants because there will be less total water and reservoirs will not be able to store all the water from the snowmelt.
- feedback loops (less snow means less reflective land area = more heat absorption = rising temperatures).
- increase in wildfire activity (Westerling et. al., 2006).

Content/ Information:

**Importance of Sierra Nevada Snowpack**
The Sierra Nevada snowpack is extremely influential in California’s water supply. It functions as the most important natural reservoir of water in California, storing water for the spring and summer when rainfall is scarce.


doi: 10.1126/science.1128834


Closing:
Further discussion points.
What are the major contributors to Climate Change?
What can we do as outdoor enthusiasts and educators to slow/stop these trends?

Adaptations & Related information:
When air temperatures rise there is a greater capacity for the atmosphere to hold water. As the
land temperatures rise, evaporation into the air will increase. With these changes the chances of
variability in weather such as intense precipitation and increased droughts will increase
(Kundzewicz et. al., 2007).

References:


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doi: 10.1175/BAMS-86-1-39

doi: 10.1126/science.1128384
Methods of Teaching Canoeing and Kayaking
Lesson: Life cycle of the Spring-Run Chinook Salmon

**Desired Outcomes & Goals:**
Understanding in the ecological significance of the Salmon.
Knowledge of the native and threatened Spring-Run Chinook Salmon (SRCS).
Practice in teaching.

**Description:**
This activity provides the students with information about Salmon and asks them to present it in an interesting way.

**Activity:**
Begin with asking if anyone has been to Butte Creek.
Then, ask if anyone has seen salmon in Butte Creek.

Tell them that you have some interesting information about the salmon in Butte Creek and they are going to get practice in teaching by presenting the information.

Divide the class into three groups.

Each group will be given a topic about SRCS to present to the class. Consider giving parameters for their presentation. Use some or all of the options listed below or ask the class to brainstorm some parameters that would help make their presentations more interesting and meaningful.

Here are some options:
- presentation time must be between ____ and ____ minutes.
- include a visual aid
- include participation from every student.
- include one visualization exercise.
- include something that requires participation from the class.
- present the topic with 3 main points.

The three topics are:
- Ecological significance of SRCS.
- Life cycle and interesting facts of SRCS.
- Major threats to SRCS.

*There is synthesized information broken up into the three topics below. It can be given to each group so that the focus of the lesson is more on teaching and less on researching.*
1. **Life Cycle & Interesting Facts:**

Eggs- Are deposited in stream or river bed gravel.
Alevins- Hatch out of the eggs, hang out in the gravel and eat their yolk sacs.
Fry- Move out of the gravel and eat insects.
Smolts- Migrate downstream and prepare for the ocean.
Adult Salmon – Spend years in the ocean. Then return to their home rivers and creeks to spawn.
Spawners- Lay eggs in redds (egg nests in the gravel) in the fall and then they die.

There are five different kinds of Pacific Salmon: Chinook, Chum, Coho, Pink & Sockeye. There are also genetic variations in Chinook Salmon based on what time of year they swim upstream. Fall-run, late fall-run, winter-run, and spring-run Chinook Salmon all travel through the Sacramento River, entering and exiting the ocean through the San Francisco Bay.

Salmon are anadromous: They are born in freshwater, migrate to the ocean, and return to their natal streams to spawn and die.

Chinook salmon can live to be seven years old and they can weigh up to 120 pounds (Goldseal, 2012). They are often called king salmon because they are the largest of the Pacific Salmon (National Marine Fisheries Service, 2009).

2. **Threats to Spring-Run Chinook Salmon:**

According to U.S. Department of the Interior Bureau of Reclamation (2008) SRCS once inhabited every major river system in California's Central Valley. In these rivers and streams they traveled all the way up to any natural barrier. Today approximately 82% of their former habitat is no longer available and they are mostly limited to Mill Creek, Deer Creek and Butte Creek. Butte Creek is where two thirds of the population are spawned from (2008).

The SRCS populations in Butte Creek have had huge variations. There were 10 in 1975 and in 1998 there were 20, 259 (2008). Today SRCS are listed on the threatened species list for California and federally. *This listing means that it could become endangered in the foreseeable future but currently they are not.*

Wild Pacific Salmon at large, are in decline in part due to over fishing, water quality, habitat degradation, and barriers to migration. A substantial issue leading to the decline of the Chinook Salmon is due to the hydraulic systems in California Rivers and streams. Today, because they cannot access as many rivers and streams, they have a much smaller range which increases their vulnerability. (Thompson et al, 2011)

Climate change scenarios for California predict warming atmospheric temperatures which bring, reduced snow pack and snow melt runoff, earlier and quicker snowmelt and lower dry season flows (Hayhoe et al. 2004). Climate change also predicted to brings warmer waters, especially in the hot summer months.

The SRCS- that return to Butte Creek swim up in the spring and spend the summer in its lager pools over the summer, then spawn in the fall. Pools in Butte Creek must be sufficiently deep, cool, and oxygenated to allow over-summer survival of Chinook Salmon. Ultimately, SRCS are not expected to have long-term survival in Butte Creek due to the warming caused by climate change (Thompson et al, 2011; University of California, 2012 ).
3. **Ecological significance**

Butte Creek is one of the last streams in the Sacramento Valley that has a sustaining population of SRCS. There are SRCS sporadically found in Big Chico Creek, Feather River, Antelope Creek, and the Yuba River. Deer Creek and Mill creek also harbor a genetically distinct, sustaining population of spring-run Chinook salmon (Vogel, 2011).

Keystone species are highly central to the functioning of an ecosystem.

According to Hilderbrand, Farley, Schwartz, & Robbins, (2004) salmon are considered a *keystone species* partly because they transport nutrients from the river to the ocean and from the ocean to the river. When salmon grow into adulthood in the ocean, they accumulate carbon, nitrogen and phosphorus into their tissue. When they return to rivers and creeks and spawn they spread these nutrients through their eggs. Also, after spawning they die and their carcasses also spread these nutrients. Salmon are a predictable, protein rich source of food for many wildlife including bears, eagles, & mountain lions. These consumers then spread their nutrients through urine, feces and decomposition.

This nutrient cycling is measurable and positively affects the productivity of riparian vegetation, and growth rates in juvenile fish (2004).

**Closing:**

Pull up the friends of Butte Creek website and check out the salmon cam. Maybe there will be a fish on there to check out.

If the students get impacted by the bad news of the decline in the SRCS, consider giving homework or encouraging follow up to find out how citizens can help.

**Assessment:**

Consider ahead of time if you want to incorporate feedback into these lessons.

**Materials:**

If you want to show video, you will need to have a computer.

White boards may be needed.

Print out the information of the three topics.

**Adaptations & Related information:**

If you want this lesson to extend out of class and have a research component you can decide to not share the provided information.

What can you do to save the salmon?

http://www.goldseal.ca/wildsalmon/help_conserve.asp

Write up of Butte Creek salmon recovery.

http://www.wholeearth.com/issue/2104/article/117/nice.boulders.but.where's.the.fish

Friends of Butte Creek salmon cam website

http://www.buttercreek.org/


Relationship Activity: Silent Paddle

**Desired Outcomes & Goals:**
Sensory awareness
introspection
Nature appreciation

**Description:**
Silent paddle...

**Activity:**
This activity can be frontloaded but I think it is better to simply ask the group to be silent for 10 or 15 minutes.

This is best done in especially scenic and should only be done in non-technical sections.

**Closing:**
Do you think the river can speak for itself or are you going help to process it?

If you are going to process it - I recommend doing it at a natural time to take off the river, such as lunch. Or with the boat next to you in casual conversation.

**Adaptations & Related information:**

To build sensory awareness specifically on the sound of the river, consider asking the students in bow and stern take turns closing their eyes or wearing blindfolds.

If your students seem to dig silence, begin traditions with silence, such as taking a silent minute before leaving the river or putting on the river.
Knowledge Lesson: Our Drinking Water

Desired Outcomes & Goals:
Gain knowledge of the local water supply.
Re-visit and build upon watershed lesson.
Practice in systems thinking.

Description:
This lesson provides a big picture of where we get our drinkable water, issues related to our drinking supply and where it goes when we are done with it. This lesson is lecture based.

Activity:
Start this off by drinking some water. Let this turn into a surprise lesson.
Ask the class really nonchalantly -Does anybody know where we get our water from in Chico?

If someone in the class knows that we get our water from ground water – they are correct.

Show the map of the Tuscan Aquifer. (link is below)

Provide some information about the Tuscan Aquifer.
- Its size exact size is unknown but it spans below multiple counties in the Sacramento Valley, including Butte.

- The Tuscan Aquifer is fed from The Big Chico creek watershed, the Little Chico creek watershed, The Butte creek water shed and others (see map of Tuscan Aquifer).

- The exact amount of water in the Tuscan Aquifer is unknown. Recharge rates are also unknown.

Optional
Provide some information about the water that we drink.
-water scorecard link below

Then go on to explain some the path of our drinking water from there.

1. It is pumped out of the ground- According to the California Water Service Group (1998-2012), 65 wells are pumped to bring Chico water.

2. It is Chlorinated

3. It is transported -This water travels through an average of 355 miles of pipeline to get to our homes, schools, offices and every other faucet in Chico. (Water Service Group, 1998-2012)

4. We use it- An average of 27 million gallons of groundwater is pumped daily to Chico (Water Service Group, 1998-2012).
5. When this water goes down the toilet, sink & shower it is then piped to the water pollution control plant (treatment facility). There are many steps in this process.
   - The big items such as tampons are sorted out and go to the landfill.
   - The sludgy stuff that sinks and greasy stuff that floats (use your imagination) is collected.
   - This matter then goes to a digester where micro-organisms break it down. After this process it is now considered safe for the landfill.
   - The water or effluent goes through the holding tank which removes the sinking and floating matter twice.
   - Then it is chlorinated to kill any pathogens.
   - Then it is treated with Sodium Bisulphate (a chemical compound often used as a food additive – look for it in instant mashed potatoes) to counter act/ neutralize the chlorine.

6. This water is then released into the Sacramento River and or added to the wetlands near the treatment facility.

Now that the class has a big picture of where their water comes form and goes – introduce the concept- we all live downstream. Ask the class what that means to them.

Then follow with some examples.
   There are ingredients in our water that are not removed with treatment. Chlorine kills pathogens but it doesn't remove things.

The water from the watersheds that fill the Tuscan Aquifer is what we drink. Any chemicals introduced such as pesticides and fertilizers that make it into the aquifer and are pumped out, are likely in our drinking water.

Optional-
Also, there is a growing concern about Pharmaceuticals in our drinking water. And they have been found in American drinking supplies.

Play a NPR program on pharmaceuticals in our water. It is from 2007 and it is seven minutes long.
http://www.npr.org/player/v2/mediaPlayer.html?action=1&t=1&islist=false&id=9515272&m=9515275

Interestingly enough the Chico Water Pollution Control Plant (WPCP) does not test for pharmaceuticals or have any way to remove them.

Closing:
Ask if anyone is from Sacramento?

The city gets its drinking water from the same place we put our treated effluent- the Sacramento River...... We all live downstream....
Content/ info:
Butte County watershed image
http://www.buttecounty.net/Water%20and%20Resource%20Conservation~/~/media/County%20Files/Water%20Resource/Public%20Internet/Watersheds/small_lookup_watershedashx

Tuscan Aquifer map
http://www.landconservation.org/UserFiles/File/tuscan_map_03_21_08.jpg

Chico's Tap water report card-
Information provided by California Water Service Company
http://www.ewg.org/tap-water/whatsinyourwater/CA/Cal-Water-Service-Co-Chico/0410002/

Pharmaceuticals in our drinking water. An article by MSNBC.
http://www.msnbc.msn.com/id/23503485/ns/health-health_care/t/pharmaceuticals-lurking-us-drinking-water/#.TuCgV7frNsQ

Environmental Working Group on toxins in U.S. Tap water:
http://www.ewg.org/tap-water/home

A simple write up about where we get our drinking water from by Chico resident Jeremy Miller- On Nor Cal Blogs

California Water Service Group- Chico District.
http://calwater.com/your_district/index.php (530) 893-6300

Materials:
A computer to play the audio for the NPR program.

Adaptations & Related information:
If your students are interested in this topic consider giving a little information into the Big picture of global water supply.

The EPA has provided is a breakdown of where all the water in the world is located

Go on a field trip! The WPCP gives free tours on most Tuesdays, Wednesday’s and Thursdays! If you want to arrange a field trip call the WPCP at (530) 894-4300.

City of Chico. (2009). Water Pollution Control Plant (WPCP). Retrieved from
http://www.chico.ca.us/general_services_department/operations_and_maintenanc e/water_pollution_control_plant.asp

References:
Responsibility Lesson: The Energy-Water-Connection

**Desired Outcomes & Goals:**
Big picture of the complex relationship of water and energy.
Examination of hydro-power as a “clean” energy source.
Insight into Hydropower reform and dam deconstruction.

**Description:**
This topic starts broad then distills down to the topic of hydro power. This lesson is mostly informational based.

**Activity:**
Consider assigning the book *Introduction to water in California* by Carle, D. (2007). This read will provide a much deeper and broader understanding of water in California.

Introduce the topic of this lesson - The water-energy connection.

**Step 1.** Ask: What is the energy water connection?
*Water is used to get us energy and energy is used to get us water!*

**Step 2.** Explain: Water is used in many kinds of energy production.
- To extract and refine oil
- To process natural gas
- In coal mining and in the process of turning coal into a liquid
- To grow bio-fuels
- In thermoelectric cooling
- And also for its use in creating hydro-power.

*Not only is water used in energy production but energy is used to make water available.*

**Step 3.** Cover the topic of energy use in the human use of water.
Ask: How is energy used to make water available to humans?

Explain: Energy is used to:
- Pump water from wells
- Transport it
- Bottle it
- Treat water
- In desalination processing

One example of a high human energy use of water is in the transport of water from Northern to Southern California in the California Aqueduct. Along this journey in the longest aqueduct in the world, this water is pumped up a 2,000ft elevation gain as it goes up and then over the Tehachapi Mountains. (Green, 2007; World Economic Forum, 2008, p.23).

The California State water Project which includes the California Aqueduct, 32 reservoirs and 25 power and pumping stations is California’s single biggest user of electricity (Green, 2007)!!

Not only does this consume tremendous amounts of energy but 116 billion pounds of carbon dioxide (CO2) is estimated to be released each year because of it. This is the same amount of CO2 that 10 million cars in a year release (Natural Resource Defense Council, 2009).
To summarize: Break down this next point-

*If you save water, you are saving much more than that physical water.
You are also saving:

1. The energy to get the water to you.
2. The water that didn't need to get used to make the energy that you didn't use!

*Check for understanding
by asking for a student to explain that concept again. Or - consider asking the class to
draw a diagram of the energy-water-connection.

Step 4.
Now bring their attention to the category of hydropower and provide a brief summary.

According to the California Energy Commission (1994-2012) hydroelectric power plants
produced about 14.5 percent of the California's energy in 2007. This amount fluctuates
based on the amount of precipitation and the timing of snow-melt.

*Explain - How hydropower works.
There are three main types of hydroelectric facilities: Dams, run-of-river facilities, and pump
storage facilities.

Dams: Think of Shasta dam is one of the larger hydro plants in California. Dams are usually built
at narrow area on the river with a large change in gradient. They raise the water level of a river
(often creating a reservoir like Shasta or Oroville lakes). Oroville dam is the tallest dam in the
country. The dams have gates down at the bottom and when the gates are raised and water is
released from the dam, the water flows past a turbine propeller, causing it to spin. The turbine is
connected a generator, this produces the power.

*Dams can also provide flood control, recreational opportunities, and water storage.

Run-of-river or water diversion facilities, channel water off its natural course. After the water
runs through and spins a turbine (where hydro-power is generated) the water then returns to the
main channel.

Both of the above methods rely heavily on precipitation rates and snowmelt timing.

The pumped storage method of hydropower is not as dependent on runoff. This system stores
water in two reservoirs. It uses energy to pump the water to the higher reservoir then the water is
released from the higher reservoir. As the water flows downhill it generates electricity. This
system actually uses more energy (pumping the water uphill) than it generates (with the water
flowing to the downhill reservoir). But it earns a profit because it is used to generate energy in
peak-hours, when energy is needed most and costs the most and it uses energy in the low use
hours when energy is the lowest in price.

Step 5
Explain pro's and cons to hydropower, especially around dams. Or- Divide the class into
two groups. One group will research the Pro's of hydropower dams and the other will
research the cons. The two groups will then present their information.

Environmentally related Pros:
Explain- The public commonly perceives hydropower as a clean and renewable energy
source. There are reasons that this is true:
Water, is a renewable resource. The water cycle will continue to bring rain. Fossil Fuels are non-renewable, they were created a very long time ago and what is in the earth is all that is left.

Hydropower does not use fossil fuels. As the water turns the turbines and thus provides energy that we can use. In this process there is no Carbon Dioxide added to the atmosphere.

Environmentally related Cons:
Summaries- Most hydropower dams were constructed before there was an understanding of their potential environmental impact and before the establishment of our environmental laws. When a river is dammed, it no longer has a natural seasonal flow variation which changes the speed of the water, the temperature of the water, and water levels. Also, there is less total water supplied below the dam or sometimes none at all. These dramatic changes can create environmental impacts such as:

- Fish migration decreased or stopped
- Decreased nutrient cycling
- Habitat loss
- Erosion of riverbanks
- Decreased oxygen in the water- which effects river flora and fauna
- Beach erosion because due to the loss in transportation of sediment

A few more topics worth covering or discussing:
- Positives and negatives of Dams on recreation...

- The pervasiveness of Dams:
  - There are very few rivers in California that do not have dams.
  - The Smith River and the South Fork of the Trinity River are two of the largest wild running rivers left (in CA.).
  - In the Sacramento River watershed alone, there are 147 dams (Carle, 2007, p.59).

Step 6. Where to go from here-
Whether the class presented the pros and cons or you did-It should be clear at this point that this is a complex issue.

On a positive note the pros and cons of hydropower are understood more now than they used to be.

Next: Introduce the Hydropower Reform Coalition (HRC) and provide their mission.

"The Hydropower Reform Coalition is an association of more than 150 organizations representing more than one million conservationists, anglers, boaters, and homeowners that have effectively reduced the footprint of hydropower dams on rivers" (Knight, 2011, p. 2).
"The mission of the Coalition is to protect and restore environmental and recreational values at rivers affected by hydropower projects and to reform hydropower policy to guarantee needed environmental protection measures in hydropower regulations" (Knight, 2011, p. 2).

According to the organizations Friends of the River and the California Hydropower Reform Coalition: The Federal Energy Regulatory Commission regulates over 300 hydropower dams in California. When dams are constructed they receive federal operating licenses that last 30 to 50 years. During this time, the licenses protect the dam owners from having to obey new environmental laws. The HRC has mapped out the licensing dates for all the hydropower dams in California and over 150 of these rivers licenses will expire by 2020.

*So Dams can be managed differently and or be physically altered to have less negative impacts on the environment and recreation.

Step 7.
Show some success stories (links are located under the Content/Information section).

This shows the removal of two dams in Washington.
Bring up link to our local river: the North Fork Feather River, Rock Creek-Cresta Project. This is a license reform success story.

Bring up link to the success of the Goose Creek conservation initiative.
The Smith River is one of California's last remaining undammed rivers. Goose Creek is the Smith's largest tributary. The Western Rivers Conservancy conserved 9,500 acres to keep that area pristine.

Closing: Bring this lesson full circle-
Explain and summarize:
We live in a complicated world with a need to balance things like energy production, water use, and environmental systems. Hydropower is often framed as a clean energy source, however, there can be environmentally harmful ramifications if it is not developed and run responsibly. With research comes knowledge that other renewable energy sources such as solar and wind turbines can also have large environmental impacts.

Rather than thinking about these issues in simplistic good or bad, dualistic terms, it is important to try to understand the costs and benefits of systems such as dams.

The ultimate responsibility goes to each one of us to do our best to understand these systems. As educators we can share our understandings and as citizens we can get involved in the organizations that we think are doing the most good.

Energy and water conservation in our own lives are a way to make change every day.

Ask for a sharing from the students-
*Is anyone inspired to do anything with this information?*
*Does anyone feel impelled to get more information?*
Let this conversation continue throughout the semester. Create a space for the students to share any further findings they have or actions that were taken.
Consider sharing some of the links, documents and other resources provided below with the students.

**Content/Information:**

**Year of the River** by Andy Maser - HIGHLY recommended!
This 8.5 minute video shows the two dam removal projects on the Elwha and White Salmon Rivers in Washington.
http://vimeo.com/34169308

**Hydropower Reform Coalition Success Story Rock Creek-Cresta North-Fork Feather River, CA.**
http://www.hydreform.org/sites/www.hydreform.org/files/RockCreekCresta_FINAL.pdf

The success of the Goose Creek conservation initiative. The Smith River is California's last remaining undammed river. Goose Creek is the Smith's largest tributary. The Western Rivers Conservancy is purchased 9,500 acres from Green Diamond Resource Company (formerly Simpson), conserving 13 miles of river frontage and the vast majority of the Goose Creek Watershed.
http://www.westernrivers.org/pages/pr2008goose.html

Reducing global warming through water use strategies.
A document by the National Resource Defense Council (NRDC).

How hydro-electric dams works- provided by USGS, & it even has an animation.
http://ga.water.usgs.gov/edu/hyhowworks.html

10 reasons dams are harmful for rivers
This summary is presented by American Rivers Organization
http://www.americanrivers.org/our-work/restoring-rivers/dams/background/10-ways.html

Information about the pros and cons about dams and dam removal

Rivers of Power: A citizen's guide to river restoration through hydropower reform.
Provided by Friends of the River & the California Hydropower Reform Coalition.

**Materials:**
If you choose to show any videos you will need the proper equipment to do that.

**Adaptations & Related information:**
Explore: Where does Chico get its energy from?
sharing the video, websites, or online documents below.
Show the Small Hydro dam parity.
This 3.5 minute long animated parody shows the irony of the huge cost and environmental impacts that “green hydropower” can create. This is definitely an agenda driven, one sided video. Watch it before you show it.
http://www.hydroreform.org/news/2011/01/06/small-hydro-animated-parody

Friends of the River (FOR) Event Calendar. This is a California State Wide – River conservation organization. The event calendar includes volunteering opportunities, benefits, guiding trainings, river trips, gear swap and awards ceremonies.
http://www.friendsoftheriver.org/site/PageServer?pagename=FORcalendar

Restore – Responsibly reviving Americas Rivers. A publication by the Hydropower Reform Coalition. This showcases many success stories, and the issue of aging dams.

Citizen tool kit for effective participation in hydoreform. This resource is put together by the Hydro Reform organization.
http://www.hydroreform.org/hydroguide/hydropower-licensing/citizen-toolkit-for-effective-participation

Possible Dam removal on the Klamath- An article by LA Times -2009
http://articles.latimes.com/2009/sep/30/local/me-klamath30

Flows and recreation: A guide to studies for river professionals. This is intended to facilitate decision-making to define flows for recreation on regulated rivers. It is an interesting look at into the value of recreation.

References:


Immersion Semester
Lesson: Being Ecologically Minded

*This lesson has been adapted from David Moskowitz's (2003) educator resource: Citizens of the earth: Environmental literacy on an Outward Bound course. It is from the Exploring connections: Ecology and living in community section.

Desired Outcomes & Goals:
- Developing basic fundamentals of ecology.
- Gain understanding ecology in relation to sustainability.
- Application of Barry Commoner's four “laws” of ecology into the immersion semester.
- Student driven strategies for “immersing” with a mindful approach of sustainability.

Description:
Thru a reading by local author Lin Jensen and the examination of Barry Commoner’s four “laws” of ecology this brain-storming activity is designed to help the immersion group understand sustainability from an ecological perspective. From there the students will be asked to create meaningful practices and strategies to become more sustainable, with the ecological laws as a framework.

*This activity would be best introduced early in the semester or in the semester prior to their immersion semester.

Activity:
Step 1.
To opening up for this lesson, share the reading Earth: An Introduction from the book Deep Down Things by Chico author Lin Jensen. If a discussion naturally follows, let it continue. *This reading is located under section four of this resource guide.

Step 2
Front load: All the ways the Immersion has incorporated sustainability into the program. (service projects in Utah and in Chico with GRUB, the food purchased). It seems every year there is more work towards sustainability

Step 3.
Provide a brief overview of Barry Commoner’s four laws of ecology.
Divide the class into four groups. Ask each group to pick a law or just allow the groups to form based on what law they are most interested in.

Step 4.
Then ask each group to brainstorm ways that their law of ecology answers the questions below. Suggestion: Give the groups a minimum of an hour and allow them to go outside if they desire.

- What are some examples of this?
- How does this relate to the Immersion semester?
- What can we do to live with deeper consciousness of this law?
- How can being mindful of this law help us behave more sustainably?
- How could more thought and application of this law effect our relationships?
- Other thoughts? Ideas? Concerns?
Step 5.
Once the class is back together ask each group to present their law and the thoughts they had. Ask them to also make two lists- a list that describes examples of their law and a list of ideas of ways the immersion group can be mindful of this law.

Once all groups have presented ask a student to take notes of all the thoughts.

Closing:
Ask the group of they are especially excited about any of the ideas that have come out of this brainstorming session.

At this point it is up to you to see how much facilitation the group needs. They may have ideas that they want to execute, goals for their immersion class that offer service to sustainability. Let them know that you will do your best to support them.

Things to think about in order to set them up for success-
- Empower the students as much as possible to work towards their goals.
- Find ways to add structure:
- Encourage the group to focus and things they have control over.
- Prioritize a list of goals (short term, long term, goals to set up the next year’s immersion or the Outdoor Education Program).
- Ask students to volunteer to spearhead different initiatives.
- Ask a student to organize the notes from this activity and post it on the vista.
- Provide resources if possible.

Content/ Information:

*Everything is Connected to Everything Else.*
*Everything Must Go Somewhere.*
*Nature Knows Best.*
*There Is No Such Thing as a Free Lunch.*

Adaptations & Related information:
If you want to provide the students with the original work, the laws can be found on pages 16-24. Commoner's writings on the four laws are provided in a link:

References:


Relationship Lesson: Life Compass

This lesson is adapted from The Four Virtues of Chávez (Casal, 2005) and The Compass Rose (Moscowitz, 2003)

**Desired Outcomes & Goals:**
Knowledge of the environmental activism of César Chávez.
Awareness in the connection in Environmental and Social Justice.
Practice in creating metaphors with the cardinal directions.
The creation personal metaphors for life directions.

**Description:**
This lesson provides an example of how meaning can be made from the cardinal directions through an example of the César Chávez memorial. Once the example is provided, the students will then be given strategies for making their own “life compass”. A life compass is similar to creating ones coat of arms or personal shield.

This lesson also provides a success story by giving informative about the life of César Chávez especially in relation to his environmental and social justice work.

**Activity:**
Draw out information about César from the students. They are likely to know a lot about him. Provide any other information that you think they should know about him especially in relation to his work with the environment and social justice.

Next, tell the students about the memorial that was created for him in the Berkley César Chávez Park in 2007. The memorial took the cardinal directions and attached a virtue of César’s fitting to each direction. When telling about the memorial, make some sort of visual to demonstrate the memorial.

North
TOLERANCE

West COURAGE East HOPE

South DETURMINATION

Clearly, Cesar was a purpose driven human. Now it is time to challenge the students to create their own guiding compass.
Step one- as a group, brainstorm metaphors which correlate with each direction. Below are some commonly used examples:

**North**
- Midnight
- Winter
- Wisdom

**West**
- Evening
- Fall
- Reflection

**East**
- Morning
- Spring
- Inspiration

**South**
- Afternoon
- Summer
- Growth

Step 2-
Once they have a good idea of what metaphors they have to work with it is time for the students to create their own life compass. This compass is for them as a reminder of their direction and purpose.

You could choose to give them guiding questions to help them come up with their own virtues (provided below) or give them time to go off on their own to think.

What challenges you?
What value do you place the most weight on?
What are you committed to?
What inspires you?
What do you believe in?
What is value is necessary for your dreams?

*Here is an example of a life compass-*

**North**
- I will expand my compassion

**West**
- I will treat failure as feedback

**East**
- I will be open to newness

**South**
- I will live with health as a priority

*Closing:*
These directions can now have a personal meaning for the students. When they face north, south, east or west, what will they be reminded of?

Revisiting the student’s life compasses is an important part of transference. At some point, allow time for them to share their thoughts.
One way this could be made powerful is by having everyone face each direction together and one by one, stating their life direction.

Before the end of the course, incorporating an opportunity for them to come up with specific actions that fit with their life compasses, could serve as a powerful tool.

**Content/Information:**
Chávez & the Environment:
Through heavy concerns over chemical use in farming, Chávez made the connection between farm worker rights, health and the environment. Farm workers were having health issues ranging in respiratory issues to miscarriages. One of the largest links between environmental issues and social justice today, is the disproportionate amount the poor are affected by environmental issues. Today, some chemical use in agriculture still affects both the health of Farm Workers, consumers and the environment.

Links about Chávez, the environment and social justice.
http://www.solarcalendar.org/02_chavezmemorial.html

Ecology Center
http://www.ecologycenter.org/chavez/environmentalism.html

Links about the monument for César Chávez
http://solarcalendar.blogspot.com/

http://www.solarcalendar.org/02_chavezmemorial.html

Article about the César Chávez sundial memorial

**Materials:**
To create a visual of the César Chávez memorial, have a white board, or draw in the sand/dirt.

**Adaptations & Related information:**
César Chávez's birthday is a California State holiday—celebrated March 31. It is recommended to do service to best celebrate and honor him. This would be a great day to do this lesson. This could also be a day of optional fasting to commemorate the sacrifices he made.

Using the direction can work to bring in metaphors of the earth. Check in with the group about what directions you are heading both physically and metaphorically with

**References:**

http://www.ecologycenter.org/chavez

Lesson: Climate Change for Outdoor Educators

**Desired Outcomes & Goals:**
Simplify the topic of climate change.
Understanding of Climate Change at a level that can be explained to others.
Obtaining strategies and techniques for teaching climate change.

**Description:**
Through discussion, information, activities and videos- major points of climate change are addressed.

This is framed as a 'how to teach about climate change' lesson specifically for future or current outdoor educators. It could even be framed as a workshop.

This lesson can be done in two hours. However to really go in-depth it should be broken up and spread out over multiple days.

**Activity:**

Step 1. Ask every student to write down at least two questions they have about climate change.

Next, ask for a sharing of the questions, having a student write down the questions on the board will help demonstrate the variation and similarities of questions. Also, they need to know they’re level of understanding and the questions they have will likely be the questions of their students.

Challenge the students to answer each of their questions through the reading or this climate change lesson.

Step 2. Assign- Rapid Climate Change: Causes consequences and solutions. It is recommended that the students read this book (especially the first and last chapters) before this lesson.

Step 3. Disclaim any expectations that you are a Climate Change specialist. You are an educator with some information. Then, explain why you believe this is an important topic.

Step 4. Explain that this activity approaches the topic of climate change from an educator point of view. You are going to facilitate a framework of 4 topics of climate change. This framework is designed to simplify learning and teaching about the giant topic of climate change and provide some tools and techniques for teaching.

Step 3. Cover the 4 major points of climate change.

-This section can be done in one sitting or it can be broken up into 4 different sessions, with each section covered more in depth.

-There are recommended activities and video's to help explain some of the points. Doing the activities and watching the movies will help to reinforce the points and provide new tools/resources for teaching about climate change. However, if you do everything listed under each point this lesson will take much longer.

-Treat this section as an opportunity for dialogue and clarification of opinions and also the sharing of interesting facts.
Four major points - The Climate Change Framework:

1. Climate change is the most far reaching and important issue today.

Discussion points:
- What deserves more attention than climate change?
- Why is attention towards climate change important?
- Brainstorm some of the effects climate change has and/ or will create.
- Pull up random topics and see if they can be connected to climate change.

Recommended activity -
- The System game or the Triangle game

*See directions under content/ information

Recommended video - A Sea Change: Imagine a world without fish.
- This 2.5 minute trailer is about species loss due to ocean acidification, a byproduct of climate change. It is only a tease - bit it brings up an important topic.

Recommended reading - The triple injustice of climate change *See under information

Interesting facts:
- Human migration, environmental refugees, conflict -
  - Mass migrations and/ or conflicts are likely to arise as people are faced with food scarcity, health impacts, and environmental stresses due to climate change. (Karl, Melillo, & Peterson, 2009)

- Health -
  - Climate change will continue to deteriorate health and add to mortality through increases and geographical spreading of drought, heat waves, floods, harmful algae blooms, diminished air quality, which create environmental infectious diseases such as dengue fever, West Nile encephalitis, Lyme disease, and human hantavirus (English et al. 2009)

- Social Justice -
  - Economically disadvantaged countries are projected to be disproportionately affected by the negative impacts of climate change and vulnerability to climate change is larger for those with few resources and few choices. (Karl, Melillo, & Peterson, 2009)

- Environmental Disturbances -
  - The oceans are considered a carbon sink. They have absorbed approximately 30% of the carbon dioxide emitted by humankind out of the atmosphere. This high amount of CO2 absorption is actually changing the Ocean's pH. This acidification is has far reaching consequences such as changing ocean plants (primary producers) ability to photosynthesize, inhibiting coral from growing or resisting erosion, to a decrease in ocean sound absorption (Logan, 2010).

2. What is climate change?

Discussion points:
- The importance of the greenhouse effect to provide life on earth.
- The difference between the greenhouse effect and climate change.
- The difference between weather and climate.

*Take home point - climate is average weather over a period of time.
Recommended outside activity:
The Co2 game *See directions under content/ information.

Recommended writing activity:
As an educator it is important to have an easy to understand definition/ explanation of things. End this section by asking everyone to: Write down their own definition of climate change.

Interesting thought:
When combined with other environmental factors such as pollution, population growth, and overuse of resources, climate change creates larger impacts.

3. The human role in climate change.

Discussion topics:
What are the major, non-human induced causes of climate change?
What are some of the major, human induced causes of climate change?
Discuss some of the positive feed-back systems such as:
The albedo effect-
Albedo- the ability to reflect light & heat is greater in light or shiny surfaces such as snow. As the earth's temperatures rise, amounts of snow and ice will decrease. This will replace high albedo surfaces with low albedo surfaces. The earth will then absorb more heat, which makes warming happen even quicker. (Miller, 2004)

Ocean carbon sink-
The oceans are the world's largest carbon sink, and absorb about 30% of the atmospheric carbon. Due to climate change they have become increasingly unable to do this. As they get warmer they cannot absorb as much Carbon Dioxide. (Crueger et al, 2008)

Recommended videos: CO2 & the Atmosphere & Ice core samples

Recommended activity:
When you come to this point, if you are near a computer – go to this website http://oilprice.com/free-widgets . This website has a bunch of widgets that show totals of energy, oil usage. There is one that will count the number of barrels of oil that have been used since you opened the website.* Make a point to look at this as you begin this topic and then return to it when you are done with the topic.

Interesting facts:
Since the start of the industrial revolution, the amount of carbon dioxide (the most prevalent heat trapping gas) in the atmosphere has increased by roughly 35% (Karl, et. al., 2009).

“Globally, over the past several decades, about 80 percent of human-induced carbon dioxide emissions came from the burning of fossil fuels, while about 20 percent resulted from deforestation and associated agricultural practices.”(Karl, et. al., 2009).

4. The two responses to climate change: MITIGATION or ADAPTATION.

With every doom and gloom subject it is important to provide room in the 'what now' category. These two responses provide a realistic framework for our options.
Mitigation – Reduce & remove human contributions of climate change.

*Adaptation* – Discover ways to cope with or avoid harmful impacts of climate change and/or take advantage of beneficial changes.

“Both of these are necessary elements of an effective response strategy. These two types of responses are linked in that more effective mitigation measures reduce the amount of climate change, and therefore the need for adaptation” (Karl, et. al., 2009 p. 8).

Discussion points:
- What is the significance of these responses?
- What are some examples of these responses?
- Are you facing either of these responses?
- What are most of your peers doing?
- What about the do-nothing response?
- What are some examples of the do-nothing response?
- What would happen if we all just do nothing?

Closing:
Remember the questions the students wrote down in the beginning of this lesson? Bring the lesson back around by asking if there are answers that have not been answered.

If there are any un-answered questions (and there likely will be) give them time to find them out. Ask for them to share.

Ask the students to form their own philosophy of the importance in teaching about climate change. Consider asking for this to be shared.

**Content/ Information:**

The triple injustice of climate change
[http://www.unesco.org/education/tlsf/mods/theme_c/popups/mod19t04s01.html](http://www.unesco.org/education/tlsf/mods/theme_c/popups/mod19t04s01.html)

Links to Video's recommended above:

A Sea Change- Short version
Go to bullfrog films- then look for the link to A Sea Change.

CO2 in the Atmosphere

Ice core samples show human induced climate change
[://earththeoperatorsmanual.com/segment/5](http://://earththeoperatorsmanual.com/segment/5)
Info for activities

**The System Game – AKA the Triangle Game:**

This activity involves running, a large space is needed. Once the group is in a circle, ask each person to select two other people in the circle, they will keep the two peoples' names to them self. Next, tell participants to move so that they are the same distance from the two people as the two people are from each other. Once everyone does this, it will make triangle shapes of every group of three.

Once the group understands, count to three to let the game begin.

As the group begins to slow, you may choose to move, which will create reactions and movement. All sorts of interesting patterns may emerge for discussion. This activity is really great to process. It was chosen to highlight the interconnectedness of climate change, but there is much to pull from.

*Adapted from: *Coming Back to Life* by Macy and Brown, p. 119

**The CO2 game**

This is an interactive, run around game that demonstrates how CO2 traps heat in the earth’s atmosphere.

You will need rope or chalk in order to make circles on the ground and a print out of the carbon cards if you choose to run the activity similarly to the way it is presented.

This activity was developed by Sashi Kaufman and can be found online at: [http://www.greenteacher.com/articles/Carbon%20Dioxide%20Game.pdf](http://www.greenteacher.com/articles/Carbon%20Dioxide%20Game.pdf)

**Other information/ resources:**

Teaching and learning for a sustainable future- A resource provided by United Nations Educational, Scientific, and Cultural Organization (UNESCO).

What's with the weather? - An interesting article about climate change and weather.
[http://e360.yale.edu/feature/whats_with_the_weather_is_climate_change_to_blame/2388/](http://e360.yale.edu/feature/whats_with_the_weather_is_climate_change_to_blame/2388/)

End of Coral. - An article about climate change effects on ocean life.
[http://e360.yale.edu/feature/is_the_end_in_sight_for_the_worlds_coral_reefs/2347/](http://e360.yale.edu/feature/is_the_end_in_sight_for_the_worlds_coral_reefs/2347/)

Can vulnerable species outrun climate change?
The California Newt is one of the species looked at in this article.
[http://e360.yale.edu/content/feature.msp?id=2460](http://e360.yale.edu/content/feature.msp?id=2460)

**Other Videos:**

Earth: The operator’s manual
This offers a variety of short videos relating to climate change:
[http://earththeoperatorsmanual.com/for_educators](http://earththeoperatorsmanual.com/for_educators)
TED Talk by Lewis Gordon Pugh – swam across the North Pole to bring attention to Climate Change. This is a 18 minute video, light hearted. 

NOAA has many videos on Climate Change
http://www.climatewatch.noaa.gov/Videos

Facing the Future - Climate Change Connections and Solutions - a resource for teaching for grades 9-12. This could be good to pass on to your students.
https://www.facingthefuture.org/Curriculum/PreviewandBuyCurriculum/tabid/550/CategoriaID/16/List/1/Level/a/ProductID/16/Default.aspx

Materials:
A computer with projection capabilities is necessary of you are going to show any videos. Materials for the outside activities are listed within the activities.

Adaptations & Related information:
Consider showing the Global Climate Change Impacts in the United States Report - This report created by the United States Global Change Research Program - is comprehensive and easy to understand. It integrates federal research on climate change. It can be downloaded for free at:

References:


Responsibility Lesson: Who's job is it?

"Evolution is optimism in action." (Hawkin, 2007, p. 25).

**Desired Outcomes & Goals:**
- Application of critical thinking
- Reflection of groups without designated leadership
- Reflection of one's role in sustainability
- Discussion in the topic of environmental issues.

**Description:**
This lesson includes short a reading followed by discussion.

The reading *Who's job is it?* is a common a tool used to explore leadership styles and group dynamics, however it has great metaphor for many things including sustainability and environmental issues.

**Activity:**
To avoid confusion, prepare a visual of the reading (write it out, make copies, put it up on PowerPoint etc.)

Read the short story then discus it.

**Possible Discussion Questions:**
- What is the root cause?
- What are some of the problems?
- What does this group need?
- Have you ever experienced something like this?
- Can you relate this to your life?
- Do you relate to any of the four characters? Why?

**Questions for making connections to the environment and sustainability:**
- How do you see this played out in the front country?
- How does this relate to the environment or sustainability?
- Have you ever felt helpless about topics such as climate change & sustainability?
- Who should be taking responsibility/ action for sustainability issues?
- What should you take responsibility for?
- How can you take action?

**Optional:**
Consider sharing in the work of Northern California resident, Paul Hawkins (2007).

His book *Blessed Unrest: How the largest social movement in history is restoring grace, justice, and beauty to the world*, revealed that there are over one million environmental and social justice groups in the world. He believes it is the largest social movement in all of human history.

~Discuss the relation between social justice and environmentalism.
Content/ Information:

Who's job is it? Reading:

This is a story about four people:

Everybody, Somebody, Anybody and Nobody.

There was an important job to be done and Everybody was sure that Somebody would do it.

Anybody could have done it, but Nobody did it.

Somebody got angry, because it was Everybody’s job.

Everybody thought Anybody could do it, but Nobody realized that Everybody wouldn’t do it.

It ended up that Everybody blamed Somebody when Nobody did what Anybody could have done.

Adaptations & Related information:

This lesson can be applicable before going into the field or in the back-country.

Transference- This reading is important to bring up again to encourage accountability and responsibility in the front country. Discussing the difficulty of doing so in a sea of everybody's, somebody's, anybody's and nobody's with seemingly less locus of control could be worthwhile.

Adaptations-
As a group experiment –Challenge the class and yourself to be extra aware of this of the scenario in the reading. Then, if possible, find a way to help.

-Instead of seeing trash and saying somebody should pick that up- pick it up.

-If you see someone in need of help offer it or find someone that can help.

or

Each student picks one thing that they are going to take responsibility for, (it does not have to be related to the environment) tries it out and reflects on it.

*If you decide to go into the more action oriented part of this lesson – be sure to have some sort of follow up so that the students can hear about each other’s experiences and thoughts.

*Further information on the size and scope of the environmental movement.


References:
The reading Who’s job is it does not have a known author. I have seen it circulate in outdoor educator resource folders.

Bonus Lessons & Activities
Activity: Haiku

Desired Outcomes & Goals:
Articulation of place.
Experience an expression of creativity.

Description:
The Haiku poem provides a chance for creativity within boundaries. It is a simple celebration, a small tribute or a powerfully little thing.

Activity:
Provide a broad theme for your class to create their haiku under.
Here are a few themes that relate to Environmental and Sustainability Education:
- The element that your course focuses on- snow, water, rock etc.
- Being Happy.
- What do you Value?
- Connection to the earth.
- Abundance

Or - Have the class brainstorm a theme.
Or- Go freestyle theme.

Then- Provide the parameters for making a Haiku.
A haiku has three lines,
   The first line has 5 syllables
   the second has 7
   and the last has 5.

Consider providing an example.

Closing:
Options for sharing the haikus:
- read the haikus out loud.
- share in small groups.
- write the haikus on a small piece of paper, then the papers get showcased on a piece of cardboard.
- Haikus could be turned in with their reflection paper.
- The class could vote for their favorite haiku and that haiku could be put on the Outdoor Education webpage? Your next class syllabus?

Adaptations & Related information:
Consider eliminating certain words. For example if your theme is climbing you may want to eliminate the word rock.
Lesson: Carpool Initiative

**Desired Outcomes & Goals:**
Participation in carpooling.
Enjoyment in carpooling.

**Description:**
By simply suggesting carpooling you are creating a space for students who do not know each other to engage in conversation and planning for carpooling. That is about all this lesson entails.

**Activity:**
Prior to the field portion of class-
- Brainstorm with the class: The benefits of carpooling.
- Give them time at the end of class to organize themselves into cars.

At the parking lot be sure to acknowledge the impressive amount of students who did carpool.

**Adaptations & Related information:**
When students carpool it gives them a chance to get to know each other and to feel like they have friends in the class.

If there is another field portion – be sure to provide planning time again.
Lesson: Sound Mapping

*This lesson is adapted from Joseph Cornell's Sharing nature with Children.

**Desired Outcomes & Goals:**
Quiet & Reflective time
Nature appreciation
Inspire curiosity

**Description:**
This is a sensory awareness activity. Students pay attention to sounds in their environment and try to draw the sounds on a map of the area they created.

**Activity:**
This activity can be done in 5 minutes or stretched out for half an hour.
I find that it is best when there is a large area to look at and listen to.

Ask your students to get out their journals and a pen/pencil.

Instruct them to loosely draw the environment that you all are in. Then – listen for any sounds and draw those sounds (through actual drawings, symbols, or scratches) in the context of the environment.

Depending on how quick you want this exercise to go you could ask everyone to sit close or you could ask them to really spread out. If they are going to spread out - be sure to mention that you will give them some sort of notice for them to come back.

**Closing:**
You may choose to ask your students to lay out their sound maps on the ground so that they can all see each other’s interpretations.

The simple question of - What did you think of this activity? - Could spark some good dialogue.

**Materials:**
Students will need their journals and a pen/pencil.

**Adaptations & Related Information:**
Ask the students to marking where they are on the sound map and don’t ask them to draw the environment.

You could also incorporate this into a mini solo by asking them to work on the sound map for a bit and then taking personal time for themselves.

**References**

Independent Project

Goals and Objectives
Service Learning
Creativity
Sense of place
Collaboration

Description
This project is student driven and experiential. It can be done in pairs, groups or solo. The part that makes it independent is that the students must decide, plan and execute the project on their own.

Considerations
In order for a student led, independent project to be successful- it needs structure, guidance and buy in.

Structure- Provide specific deadlines.
-A deadline to come up with an idea
-A deadline to have a plan for executing the idea.
-A deadline for executing the plan and submitting a summary/ reflection paper etc.

Guidance- provide specific feedback throughout the process.
Create time in the class for the students to present their ideas and plans so that peer review and collaboration can take place.

Provide room for creative freedom:
Decide on a theme for the projects with the class.
Allow the class to decide if they want to do one big project together, or multiple projects in groups or multiple projects in pairs, or many projects individually. But do not let some be in groups and some go independently if you think someone is getting left out.

Be flexible
Let them decide if they want to start something brand new or if they want to get on board with a project/ cause/ organization that is already going on.

Check in about deadlines. See if they are realistic.

Create student buy in- If the students are not invested they will learn to not want to serve or volunteer.
-Bring in class visitors to promote awareness on issues
-Take the class to EARC (environmental action research center) on campus. Make an appointment & get a tour.
- Provide inspirational stories.

Here is a video for inspiration - Yvon talking about activism

Lesson: Evaluating Leave No Trace

Desired Outcomes & Goals:
Evaluation of the root metaphors of LNT
Developing strategies for teaching minimum impact techniques
Introduction of root metaphors in teaching.

Description:
This lesson is designed for methods based or theory based courses. LNT will be evaluated as a teaching tool. Opportunity for students to create their own frameworks for teaching minimum impact techniques will be made.

Activity:
Assign reading prior to lesson: Three articles (listed in the references) that take a critical look at LNT.

In class discuss:
- Why was LNT created?
- What are some of the strengths/positives about LNT?
- What is a root metaphor?
- What are some of the root metaphors of LNT?
- What are negative consequences that can be created because of these Root Metaphors or dominating messages in LNT?
- What root metaphors are important when teaching about the environment?
- What are some of their personal thoughts on LNT?

Then break the class into small groups.

Challenge them to create specific strategies to teach minimum impact techniques that address some of LNT’s criticisms. *This could be homework.

Ask the groups to share their strategies and their thoughts behind them with the goal of collaborating to get one document of strategies to teaching minimum impact techniques.

Content/Information:
This is a summary into the articles recommended for this lesson-

David Moskowitz and Darcy Ottey (2006) point to three flaws in Leave No Trace:

1. It teaches inaccurate and disconnected environmental education because it does not teach ecological principals and claims that humans can leave no trace.
2. Its teachings often make students feel like everything they do is going to destroy the natural environments. This perpetuates a disconnection in the human-nature relationship.

3. It focuses on the immediate and visual human impacts and does not incorporate transference into the front country.

Also, Cachelin, Rose, Dustin & Shooter (2011) recommend that Outdoor Educators examine the problematic root metaphor presented in LNT: humans are separate from nature.

Lastly, Armstrong & LeHew (2011) explain the importance of examining the dominant issues driving the actions that create a negative environmental impact. Then, teaching in a way that addresses those underlying issues.

Closing:
Be sure that the document of strategies is made accessible to the students.

Materials:
A White board so the students can display their strategies.

References:


Section 3

Environmental and Sustainability Events
and Organization List

Environmental and Sustainability Events

CSU Chico related events:
This Way to Sustainably Conference
This three day, student led conference began in 2005. It is free to students.
This used to take place the first week of November -but it now is the first week of March.
http://www.csuchico.edu/sustainablefuture/conference/

Associated Student's sustainability event calendar
A great link for many of Chico's Sustainability events, beyond the campus:
http://www.aschico.com/sustain/calendar

Regularly occurring events-
Volunteer to clean up Bidwell park-
Every Thursday, Friday and Saturday
To see times and check calendar go to:
http://www.chico.ca.us/general_services_department/park_division/volunteer_calendar.asp

City of Chico Sustainability Task Force
The City of Chico Sustainability Task Force meets on the first Monday of the month, in the
Council Chambers (421 Main St) unless canceled or additional meetings are called by the Chair
of the Task Force. Meeting dates can be confirmed by calling the General Services Department at
836-7800.
http://www.chico.ca.us/government/minutes_agendas/sustainability_task_force.asp

Chico City Council Meeting
Chico City Council meets on every first and third Tuesday of the month at 6:30pm in the Council
Chambers (421 Main St). Meetings are open to the general public and can be watched online
either live or in video archives. Agendas and minutes online with the videos at
http://chico-ca.granicus.com/ViewPublisher.php?view_id=2

Other:
(BEC) Butte Environmental Council's Endangered Species Fair
http://endangeredspeciesfair.org/
BCCEER ecosystem calendar
This highlights biological changes during the year, such as wildflower blooming, newt migration & acorn production from oak trees.
http://www.csuchico.edu/bcccer/eco_calendar/index.shtml

Chico Creek Nature Center Calendar of Events
http://www.bidwellpark.org/page/calendar/events.php

Association for the Advancement for Sustainability in Higher Education (AASHE)
This site contains events of interest to the campus sustainability community
http://www.aashe.org/events/campus-sustainability-calendar

Calendar of Environmental Events

January
February
March
This way to Sustainability Conference-First weekend in March
César Chávez's Birthday-31st
April
John Muir Day-21st
Earth Day -22nd
May
Butte Environmental Council's Endangered Species Fair- First Saturday in May.
June
July
August
In mid-August, especially the 17th-view the night sky to see the Perseid meteor shower.
September
October
Eco-challenge sponsored by Northwest Earth Institute
http://www.ecochallenge.org/about_the_challenge/choose_your_ecochallenge
November
Buy Nothing Day- The day after Thanksgiving
December
Environmental and Sustainability Related Organizations

Local

Eco Directory- provided by Butte Environmental Council (BEC)
This is a long list!
http://www.beenet.org/nodes/resources/eodirectory.php

Inventory of EE programs by The Big Chico Creek Watershed Alliance
This list provides a long list of organizations involved with the schools of Chico Unified school district and water.

GRUB (Growing Resourcefully Uniting Bellies). When it comes to organic, local food, this non-profit does it all.
   -involve your class in a service project on their farm or in a Chico elementary school garden.
   -Purchase food from GRUB is a way to incorporate local food into the courses.
   -Work with grub to dehydrate food.
http://grubchico.org/

Kids and Creeks- A non-profit that works with Chico youth to improve local watersheds through education and restoration.
http://www.kidsandcreeks.org/

Friends of Bidwell Park
http://www.friendsofbidwellpark.org/

Abroad

International Dark-Sky Association- is a non-profit organization that is trying to preserve the night sky through education and lighting ordinances.
http://www.darksky.org/

Southern Utah Wilderness Association- has been dedicates to conserve the Redrock wilderness since 1993.
http://www.suwa.org/
Section 4

Environmental and Sustainability Education Resources

Educator links

The United Nations Educational, Scientific and cultural Organization (UNESCO) has created the teacher education program-Teaching and learning for a sustainable future. It contains professional development for use for the education of teachers, curriculum developers, education policy makers, and authors of educational materials.

http://www.unesco.org/education/lsf/mods/theme_gs.html

Center for Diversity and the Environment

This website is here to support and advance education for sustainable living. It has This non-profit organization – radically and ethically diversifies the U.S. environmental movement by developing leaders, diversifying institutions, and building community. Its website has links to articles and resources about diversity issues and environmentalism.

http://www.environmentaldiversity.org

Center for Environmental Literacy

This website provides publications, and resources in philosophical groundings, strategies, and principles for teaching about sustainability and the environment.

http://www.ecoliteracy.org

Association for the Advancement of Sustainability in Higher Education (AASHE)

AASHE provides resources, professional development, and support to enable institutions of higher education to model and advance sustainability.

http://www.aashe.org/

Northwest Earth Institute- provides resources for promoting sustainability. Many of the resources require purchasing. But - there is some good free stuff on there too. Be sure to check out the Eco-Challenge.

http://www.nwei.org/

Classroom Earth - is a national EE foundation program. It has an on-line library with a bunch of educator resources.

http://www.classroomearth.org/resources

La Trobe University

This link connects to articles and research by the La Trobe faculty. There are sections in Human Nature Relationship, Outdoor Education and parks Management and Interpretation.

http://www.latrobe.edu.au/education/research/outdoor-and-environmental/resources
The California Association for Environmental and Outdoor Education (AEOE)
This organization is for supporting EE education especially when it can be taught outside.
It provides a ton of resources and lessons.
http://aee.org

Action Bioscience is a website sponsored by the American Institute of Biological Sciences. It provided
peer-reviewed articles and information with links to educator resources.
http://www.actionbioscience.org/

Other

Yale Environment 360 is a website filled with articles on current environmental/ sustainability issues.
http://e360.yale.edu/

Old Farmer’s Almanac online- find out information on astronomy, weather and more.
http://www.almanac.com/

The Environment Dictionary-A search engine devoted entirely to environmental subjects.
http://www.webdirectory.com/

Videos

Bullfrog films
This publisher makes available over 700 films & videos covering a large range of subjects.
http://www.bullfrogfilms.com

The Colorado River: Running Near Empty.
A 12.5 minute film that follows the Colorado from its head waters to the sea. By Peter McBride
http://e360.yale.edu/feature/video_colorado_river_running_near_empty/2443/

Books on teaching:

The Orion Society’s Nature literacy Series Book #2
Available free on PDF
Stories from the Land: A Placed-Based Environmental Education Anthology.

147 Tips for Teaching Sustainability
By: William M. Timpson, Brian Dunabar, Gailmarie Kimmel, Brett Bruyere, Peter Newman, and
Hillary Mizia. 2006, Atwood Publishing

In accord with Nature: Helping Students form an environmental ethic using outdoor experience and
reflection.
By: Clifford E. Knapp.1999. Appalacha Educational Laboratory

Environmental Education Activities Manual
Backpacking

Oak Woodland learning Activity
This downloadable, depth lesson focuses on the relationships of the woodland ecosystem. It is provided by the Center for Ecological Literacy.

Winter

National snow and ice data center
Provides tons on information and links about winter
http://nsidc.org/snow/index.html

The Snow booklet: Guide to the science, climatology and measurement of snow in the U.S. by Nolan J. Doesken & Arthur Judson (1997). This downloadable PDF provides tons on info on winter.
http://ccr.atmos.colostate.edu/pdfs/snowbook.pdf

Rock

Access Fund Mission and Vision-The Access Fund is the national advocacy organization that keeps U.S. climbing areas open and conserves the climbing environment. Founded in 1991, the Access Fund supports and represents over 2.3 million climbers nationwide in all forms of climbing: rock, ice, mountaineering, and bouldering.
http://www.accessfund.org/site/ctmlL5KhNWlrH/b.48612533k.BDBB/About.htm

Water

USGS water science for schools- This interactive web page provided information on the water cycle,
http://ga.water.usgs.gov/edu/mearth.html

Book worth checking out
Water: Opposing viewpoints. Edited by Jacqueline Langwith, 2010
This takes many topics on water from the safety of drinking water to the possibility of oceans rising and offers two conflicting viewpoints. This could be a great resource for an in class debate.
HAVING THE LAKE TO OURSELVES

"We’ve caught fish and have buttered potatoes to go with it. Why don’t you join us?"

Sympathy is a consequence of inclusion, the affectionate result of an expanded identity that occurs when “self” and “other” is recognized as simply “self.” The presence of this newly inclusive sympathetic connection relaxes boundaries and discloses a frame of mind that lets more in. I can best explain this by example.

For several summers, my daughter Krista and I backpacked into the most remote areas of Sierra Nevada Range where we could be alone. We’d leave the trails and, traveling by compass, climb into some high glacial cirque where the topographical map indicated the presence of a lake. And if we found no one else there, we were pleased to have the lake to ourselves. We felt a little proprietary and even exclusive in a way, fishing the lake with no one but the two of us rippling the still waters, hearing only the sounds of our own voices, owning the whole view of the lake without a single intrusion of someone’s red, blue, or yellow tent anywhere to be seen with the exception of our own.
We liked the sense we had of entering an unoccupied wilderness and seeing it as if we were the first ever to come that way. Yet we never quite felt relaxed in our solitude until night had fallen because other campers could show up at any time and spoil our good fortune. We'd set conditions that couldn't be enjoyed even when met. A worrisome little distress invariably accompanied having the place to ourselves. And, in addition, it sometimes felt quite selfish to wish for ourselves what we hoped to exclude for others.

This came to a head on a late afternoon at a lake in the Kern River watershed. Krista and I had climbed to 11,000 feet that day and found there a perfect setting. The lake lay still as a mirror reflecting the granite peaks that encircled the basin. The shoreline was dotted with miniature firs and there, in the high altitude spring of late July, the basin grasses were freshly green. The skies were clear with a bright, slanting sun, and night promised a full moon. We were setting up our tent and laying out the supper things, when I saw the two of them with their packs, laboring their way up the outlet stream toward the lake. I felt just that first twinge of mixed disappointment and shame, but this time I was moved to do something I'd never thought to do before. They were a couple, husband and wife I supposed, and having seen our campsite, they veered away from us, straining under the weight of their packs to reach a stretch of shoreline distant from our own. Perhaps they thought to respect our privacy—or theirs. But I intercepted them on their way. "My daughter and I were just getting supper started," I told them. "We've caught fish and have buttered potatoes to go with it. Why don't you join us?"

They did. And when they were included, the distinction between "we" and "they" readily dissolved. These "intruders" on our solitude turned out to be such good companions that I drifted into an easy and natural sympathy with them. We ate together like one family and watched the full moon rise over the basin. Our evening together brought home to me how the pronouns we humans choose to use are indicative of how we identify relationships, and before the four of us crawled into our sleeping bags that night, we'd commented (without apparent perception of irony!) on how fortunate it was that "we" had the lake all to ourselves.

It's imperative that we learn to share the earth. The reluctance to share what we have with "outsiders" is an attitude that worsens the ecological crisis we find ourselves in now. It often manifests as an anxious concern regarding available resources, a worry that breeds competition between us, and erodes sympathetic concern for the needs of others. But it also erodes sympathetic concern for earth itself and distracts us from recognizing the cooperative nature of the ecosystem, a cooperation that sustains all earthly life. It's an irony of the behavior of those who hoard and covet, that it's inherent in the very nature of things that we best help ourselves by helping others.

I don't think most people intend to deprive others of their rightful place and share in the world; it's just that in wanting the lake to ourselves, we forget that there are only so many lakes to go around.
hours and days I sometimes spend at a computer when an outbreak
of writing has overtaken me. I also want to thank Josh Bartok, edi-
tor at Wisdom Publications, for his guidance in shaping this book
in its finished form. This is the fourth book of mine that Josh has
edited, and with each book my gratitude for his wisdom and insight
deepens. Josh believes in what I’m doing and, more importantly, he
understands what I’m doing. He knows where my strengths as a
writer lie and where they do not. And when I’ve strayed away from
the path I was meant to walk, he puts my feet back on home ground
once more. Where else would I find an editor with the affection and
courage to tell me to take a deep breath and hold on because he’s
about to suggest cutting three major chapters from a book of mine?
After the lightning quits flashing and the thunder recedes and the
wind dies down, and after I quit fretting over three months worth of
discarded paragraphs and sentences, I’m invariably grateful to see
that my writing is much the better for this tough love of his. Josh, I
can’t thank you enough.

Unfortunately, I have some unavoidably bad news to report regarding the state of the earth. It can’t be helped.

It comes with the facts. The truth is we’re poisoning the

planet with our industry, bringing uncountable other species to

extinction, and heating up the planet with potentially disastrous

consequences. It’s enough to break the heart. It’s not new. As long

as a century and a half ago the Jesuit poet Gerard Manley Hopkins,

residing in the coal-blighted suburbs of London, witnessed condi-
tions much like our own:

Generations have trod, have trod, have trod;
And all is seared with trade; bleared, smeared with toil;
And wears man’s smudge and shares man’s smell: the soil
Is bare now, nor can foot feel, being shod.
Hopkins didn't flinch from the harsh truth of what he saw, but he saw as well another truth that might easily be overlooked: 

And for all this, nature is never spent;  
There lives the dearest freshness deep down things . . .

I read these words here in a twenty-first century American town, and I take heart from the persistent tufts of grass and that inch their way up through cracks in the asphalt pavement of the street outside, and from the backyard dogwood tree that season after season ripens red berries for flocks of waxwings to feast upon. Everywhere I look, I see evidence of deep down things. I might never have become a Buddhist had I not first encountered Zen Master Dogen’s Tenzo Kyōkan or in English “Instructions to the Cook.” It was the first Buddhist text I ever read, and it engaged me in such a way that I entered the path of Zen and never looked back. It’s often said that while the Tenzo Kyōkan gives literal instructions on how to cook, it’s actually an analogue for how to live one’s life whatever one happens to be doing. I don’t doubt that Dogen’s instructions can be profitably read that way, but the Tenzo (as the chief cook of a Zen monastery is called) actually spends his hours and days, sometimes years, devoted to the duties of the monastery kitchen and garden. The gardening and cooking of the monastery cook isn’t metaphorical, it’s actual. If I respect, honor, and value the rice and vegetables that come to hand and know how best to prepare them for use by the body, then I know what I most need to know of life. My kitchen work stands as it is without adjunct interpretation. The Tenzo Kyōkan is earthy and rich with the growth, care, and use of living things. The work of kitchen and garden is a quintessential human exchange with land.

The nature of that exchange is of great concern to me, and this book was written in an effort to better understand the relationship between society and environment, between the people and land. A wealth of detail regarding specific interactions within an ecosystem is already being compiled through the systematic methods of inquiry utilized by the science of ecology. We humans are involved in that interaction, and what I’m after in this book is not so much the data but the condition of mind essential to a genuine human interaction with earth. What has been lost to us that we no longer know how to speak the language earth speaks? What have we forgotten to think or say or do that, could we but remember, would restore our acquaintance once more?

As both a Buddhist and a student of deep ecology, I’m struck by how much the two have in common, each exacting of the follower a genuine paradigm shift in perception. For the Buddhist the shift is an awakening to earth as an extension of one’s own body wherein the dichotomy of self and other dissolves. For the deep ecologist the shift is a similar awakening wherein earth is realized as one indivisible body comprised of all beings of any sort. In both instances, this awakening is of profound proportions arguing for a shared communal relationship with earth that is unknown in modern industrial society. Of the eight principles of deep ecology as set down by Arne Naess and George Sessions, the seventh principle states the extent of the change required:

The ideological change is mainly that of appreciating quality (dwelling in situations of inherent worth) rather than adhering to an increasingly higher standard of living. There will be a profound awareness of the difference between big and great.

For both the Buddhist and the deep ecologist, quality resides in dwelling itself. Anything that dwells—a stone, leaf, rabbit, the back
yard elm tree, my next-door neighbor—has an inherent worth not derivative of its value to others. The quality of dwelling resides in its own stead and can’t be valued on the market. The difference between big and great that Naess and Sessions cite lies in the fact that bigness is a comparative valuation based on quantity, while greatness comes large or small and its valuation exists outside comparison. In America, our higher standard of living is largely a matter of bigness, a standard external to the inherent quality of life itself. The insistence that the worth of a thing inheres in the thing itself and not in its value to others is what wedds Buddhism to deep ecology and distinguishes deep ecology from the science of ecology in general. It’s a perception that recognizes the right of all beings to exist simply because they do. Nothing is left out, nothing excluded.

In the pages that follow, I’ve written a great deal about farms and food because it is there in the orchards, fields, ranch lands, and kitchens of a nation that we humans enact an intimate and essential interaction with earth. But I also write a great deal about human culture and society itself. I can’t reason intelligently about the land without including the humans who inhabit the land, particularly since I’m interested in the impact of the exchange between the two. I suppose that what has driven me more than anything else to write Deep Down Things is that in our society, such as it is now, we are often attending to things that are less and less deep down.

Long before I discovered its expression in Buddhism I felt the body of earth as though it were my own, just as you did. Just as we all do when we set aside false distinctions to the contrary. It’s a love affair really, and one we need to take up again while the loved one is still responsive to our need. If such language seems excessively anthropomorphic, it might be that we’ve forgotten how reciprocal our relationship with earth actually is. We’ve forgotten that love of
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Methods of Teaching Wilderness Living (KINE 226)

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