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*The University of Montana*

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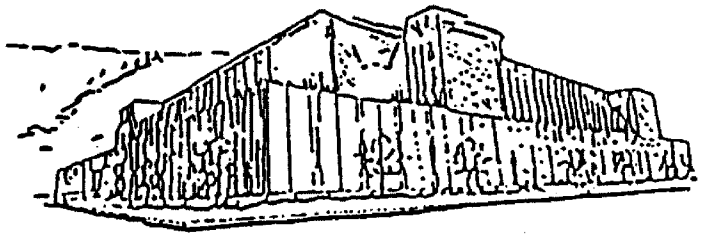
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**THE COMMUNITY NATURALIST IN THE  
SCHOOLS PROGRAM;  
Infusing Experiential Natural History  
into Secondary School Curricula**

by

**James F. Berkey**

**B.S. The University of Montana, 1998**

**presented in partial fulfillment of the requirements**


**for the degree of**

**Master of Science**

**The University of Montana**

**1998**

**Approved by:**

  
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Date

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**The Community Naturalist In The Schools Program; Infusing Experiential Natural History into Secondary School Curricula (100 pp.)**

Director: Fletcher Brown

**Executive Summary:**

A model for an education program, entitled “The Community Naturalists in the Schools Program”, is proposed which infuses experiential natural history studies into formal school curricula. The program is developed for schools in Missoula, Montana, but could easily be adapted to other communities with good access to wild lands. The program is coordinated through the Montana Natural History Center and involves students in regular studies of their local natural world through stewardship projects facilitated by naturalist mentors.

The Community Naturalist in the Schools Program (CNSP) is designed to cultivate ecological literacy and halt our culture’s rapidly eroding connection to nature. Our lack of awareness and knowledge of the more-than-human-world breeds apathy, ignorance and disrespect for the animate world and contributes to our current ecological crisis. This disconnection from nature is perpetuated by a formal education system which keeps students indoors, relies on standardized, generic curricula, separates life into isolated disciplines, and removes youth from participation in their broader community.

CNSP is founded on four key elements that will encourage a greater knowledge and awareness of the natural world. First, CNSP encourages frequent direct experience with wild places. By facilitating experiences in the natural world, instructors allow students a sensorial connection to their world which can serve as a springboard for more guided activities that interface with the standard curricula. Frequent immersion in wilder places will open a student’s perceptions beyond an anthropocentric reality and will foster a more inclusive understanding of community. Second, CNSP advocates for curricula and activities that focus on the local place and bioregion in order to reconnect youth with the local landscape. An emphasis on the local place will provide tangible links for abstract concepts and will promote an understanding of how our lifestyles effect our environment. This emphasis will encourage frequent local field trips that are infused into the curricula. Third, CNSP utilizes the study of natural history as the interdisciplinary bridge between traditionally isolated disciplines and the animate world. Natural history can apply to most traditional subjects and can bring these subjects into a more local and more-than-human light. The study of natural history allows for an inclusive perception of nature, and is a crucial tool for infusing studies of the natural world across the curriculum. Fourth, CNSP stimulates interaction between community members and students through

stewardship projects at local natural areas. These community mentors should be knowledgeable about the local natural world and be able to model an ethic of care and restraint. By participating in service projects, students will see the connections between their curricula and civic life and be empowered as they make a local difference.

There are significant barriers which challenge experiential natural history education in the formal school setting. These include an already full curriculum, the desire to prepare students for standardized tests, an inherently fragmented schedule, costs associated with field trips, and a lack of teacher competence and confidence in natural history. CNSP is designed to overcome many of these common barriers. CNSP uses a natural history curriculum infusion model that does not threaten to displace existing curricula. In so doing, students are exposed to the same content but often through experiences at local wilds and interactions with their community. By implementing an interdisciplinary curricula, class periods can be fused to create larger time blocks which allow for off-campus activities. Field trips to neighborhood natural areas will not incur high costs and will encourage regular visits. Finally, CNSP coordinators and CNSP naturalists work with teachers to implement the projects, and provide them with the training they need to initiate natural history projects.

This education model was piloted during the 1996-1997 academic year with two secondary school groups in Missoula, Montana. The program was based at the Montana Natural History Center and coordinated by the author. This pilot linked the management of Mount Jumbo, a conservation area recently acquired by the city, with life science curricula at two secondary schools through hand-on stewardship projects. Through a review of the district's curricular requirements and dialogue with participating teachers, a stewardship curriculum was developed that guided students through five learning modules. These modules began with a broad focus on Missoula's open space system and its relevance to biodiversity and stewardship and eventually focused on vegetation inventorying and restoration techniques. Activities cycled between the classroom and field trips and used field journals to encourage keen observation skills and allow for multiple modes of expression. The curricula culminated in a series of field trips on Mount Jumbo where students inventoried grassland plant communities on demonstration plots and gathered data on the diversity of native plants and the density of invasive non-native plants. This information will be used by City park managers to implement a long term native plant restoration/ noxious weed control program. Participating school groups will return to their plots each year to describe the plant communities and document changes over time. When a final management plan is approved for Mount Jumbo, these school groups will participate in treatment and restoration efforts.

An assessment of the CNSP pilot is based on feedback from participating teachers and the author's evaluation of whether the pilot achieved its initial goals. Participating teachers thought that project was a valuable contribution to their learning environment and wish to continue their involvement. These teachers would like to see more natural history study opportunities for their students. Based on the project's initial goals,

however, the CNSP pilot fell short in successfully infusing the natural history education into the existing curricula and in encouraging naturalists to participate.

Based on this assessment, recommendations are offered for future education efforts. First, CNSP should create more links with teachers through after school programs and field trip opportunities. A curriculum template for the natural history of local natural areas should be drafted and then introduced to teachers during in-service training workshops. The curricula should reflect the seasonal changes in local natural history and tie different local areas together thematically. Teachers should be asked to adapt this curriculum to their teaching environments and implement the curriculum within the following academic year. Second, a docent naturalist program should be instigated which will train a wealth of community members in local natural history. These docents will be trained by expert naturalists and will increase the pool of naturalist mentors. These docents would then provide mentorships for local school groups through stewardship projects.

Fundamental changes in our education system will come slowly. Persistent efforts to infuse experiential natural history curricula will gradually shift the status quo and help connect our culture to the more-than-human-world. Through these means we will cultivate communities where a common sense education provides a rich knowledge of home that will then receive the care and respect it deserves.



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# **INTRODUCTION**

## **THE ROOTS**

I have been hooked on the study of natural history since first introduced to the subject in a college field class. My curiosity and affinity for creatures, rocks and mountains, however, beckons back to the days of my youth when I explored the steep and dusty chaparral mountain sides of my home in southern California. Many subjects have since captured my attention, but no subject has been so captivating or so generous in its gifts as natural history. After years of formal education, primarily spent sitting indoors beneath fluorescent lights staring at lecturers and blackboards, I slowly began to realize that this type of education was not helping me become more familiar nor familial with the animate world beyond the classroom walls. I also realized how blessed I had been to experience a number of field-intensive courses on the natural history of wilder landscapes.

Through my familiarity with the natural landscape, I find my connection to place. And from this connection to place, arises my desire to promote an ethic of care and local stewardship of the land. Although we are members of the natural community, our modern society's loss of local knowledge has allowed us to abuse the land and to ignore our inherent obligations as members of a community. By recultivating and achieving local, place-centered knowledge people may be inspired to move towards sustainable practices and the responsible stewardship of home. In this project, I've turned to the potential of our school system to promote reinhabiting our homscape through local knowledge and stewardship. As M. G. Gilliam and Laurie John Lane-Zucker (Sobel 1996) of the Orion

Society explain, when a school works to cultivate local knowledge, it provides a common sense education.

One might call this common sense education---an education of personal experiences in the community (*communis*) derived through the engagement of all the senses (*sensus*). Starting on the student's home ground, where family, culture and natural history resonate in a personal, grounded manner, this education requires that students leave the confines of the classroom. Then, by blending scientific research, artistic response, and frequent interactions with a variety of members in the community---from conservation biologists, restoration ecologists, and others working at the grass roots level, to local historians, storytellers, artists and town elders---the student begins to learn how to read the world in an authentic, integrated way.

### THE PROJECT

The integrated and intimate educational approach described by those at Orion aptly characterizes the education program that I strove to create for my professional paper project. By introducing experiential natural history studies into formal schools, I hoped to develop a bridge between the classroom and the community and to cultivate a broader perspective of membership within the landscape of home. To do this, I designed the "Community Naturalist in the Schools Program", a program that that would stimulate hands-on natural history activities in middle and high schools in Missoula, Montana. Teachers and their students would be connected with community members who could help facilitate natural history projects at local natural areas.

By selecting the formal school setting, I had to reckon with a system that is slow to change and poses many hurdles for "outdoor education". It would have been easier to propose an after school program, summer camp, or another adventure-based program that did not as directly challenge the status quo in secondary education. Yet, I realized that,

slow as this progress may seem, it was important to affect as many students as possible, as often as possible. Educator and author David Orr (1992) contends that, “educational institutions are potential leverage points for the transition to sustainability.” In order to direct society in a more sustainable and nurturing path, however, this education must reach a critical mass of students. If we infuse school curricula with place-based studies in natural history, we will instill a deeper understanding of natural and human communities in a potentially broad segment of our population. A summer camp or extracurricular outdoor program would fall short of reaching the critical mass of lives necessary for social change.

To stimulate change and open a student’s eyes to their natural surroundings, this program would have to reach them daily. As author Bill McKibben (1997) states, “[W]hat you do every day is what forms you, shapes you”. An effective environmental education of home cannot be restricted to a special unit or to one field trip each year or semester; it must be an underlying theme that permeates the entire curriculum. Students need to learn from their world beyond the classroom walls every day. Regular contact with the natural world and community is essential if society is to move towards a more sustainable relationship with the earth.

This program was developed to take advantage of the ‘potential leverage’ of schools by regularly immersing children in their local community of life; with the ultimate goal of cultivating awareness, intimacy and respect for the earth.

## **TESTING THE IDEA**

The Community Naturalist in the Schools Program model was piloted during the 1996-1997 school year with two schools. The pilot study entailed getting students involved in stewardship activities for recently acquired conservation lands adjacent to the city of Missoula, Montana. This preliminary study helped to test the initial design of the Community Naturalist in the Schools Program and provided invaluable information on how to redesign a more effective program in the future.

## **INTEGRATION WITH MONTANA NATURAL HISTORY CENTER PROGRAMS**

In the Spring of 1997, the Montana Natural History Center (MNHC) began to develop and seek funding for a proposed Community Naturalist Program (CNP). Recognizing the similarities in the goals of the Community Naturalist in the Schools Project (CNSP), and the Montana Natural History Center's CNP proposal, I worked with MNHC to integrate the two proposals. Since the CNSP focused on secondary school groups and the CNP proposal had the broader goal of engaging a diverse group of rural and urban community members, including CNSP within CNP made sense.

As these two proposals merged, the Community Naturalist in the Schools Project became the formal education component of the Community Naturalist Program, and promised to focus curriculum and projects on stewardship activities at local natural areas near Missoula. Although the Montana Natural History Center has yet to secure long-term funding for the Community Naturalist Program, seed moneys were available to begin

limited stewardship activities, such as the pilot study described in this paper, with school groups in the spring of 1997.

### **OVERVIEW OF PAPER**

This paper is divided into five chapters. Chapter One introduces the reader to the Community Naturalist in the Schools Project as an educational program designed to encourage environmental sustainability in our culture by connecting students to the broader community of life near their homes. Chapter Two provides some necessary definitions of commonly used terms and presents the ideological and philosophical foundations for the Community Naturalist in the Schools Project by identifying four of its key elements. Chapter Three addresses some of the major challenges in implementing experiential natural history education in schools and suggests how CNSP works to overcome these challenges. Chapter Four describes the CNSP pilot effort undertaken during the 1996-1997 school year. Chapter Five provides an assessment of the CNSP pilot effort, offers recommendations for future efforts, and provides a conclusion to this project.

The paper is organized so that its readers may focus on sections which most interest them. Chapters One and Two are weighted more towards the ideological and philosophical roots of the project and develop a justification for my educational efforts. Chapters Three, Four and Five are more descriptive and include an overview of CNSP pilot, the educational barriers it attempts to overcome, and an assessment of the pilot.

These pages are primarily directed towards educators and administrators at secondary schools, as well as community naturalists, education-oriented non-profits, and education consultants. Indeed, an active network of these people and others should be involved in creating and nurturing education programs, such as CNSP, which improve the quality of our education system. This follows from the age-old African adage that “It takes a village to raise a child.” I hope that those who read on find these words useful and thought provoking as they pursue their educational endeavors.

More specifically, it is my hope that this paper and project will provide educators in Missoula and other communities with ideas and inspiration that will encourage them to engage their students in their community of life. I hope that this model will be used and refined by the Montana Natural History Center in their efforts “to foster understanding, appreciation, and conservation of natural systems in the Northern Rockies Region through natural history education” (MNHC 1997).



## CHAPTER I

### Reconnecting to the Community of Life

In a typical day, our lives are filled with stories of the global environmental crisis. From the depletion of topsoil resulting from industrial farming techniques to square miles of tropical rain forests destroyed daily, from the fouling of our groundwater by industrial wastes to the ever-accelerating rates of extinction of our fellow species -- each of these remarkable and disturbing occurrences are linked to the actions of “civilized” mankind.

As educators, our obligation to pass on the skills considered essential for literacy - - reading, writing, mathematics, and science -- must include the fundamental skills of nature literacy -- understanding our relationship with nature and ways to develop a sustainable future. Only then will we prepare our children for membership in a society pursuing a cultural evolution toward a sustainable future.

#### A CRISIS OF AWARENESS

Like never before in history, our dominant world culture has become entrenched in an anthropocentric paradigm which diminishes our awareness of a more-than-human-world (Abrams 1995, Cajete 1994, Nelson 1993, Snyder 1989). By “more-than-human-world”, I refer to a world beyond human beings and human constructs.<sup>1</sup> This anthropocentric paradigm is characterized by “our ever increasing intercourse with our

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<sup>1</sup> . I use the term “more-than-human-world” not to exclude humans, but to place a greater focus on the landscape and all of its elements that are non-human. I was introduced to this term through the work of David Abram in his book, *Spell of the Sensuous* (1995). Where possible, I avoid using terms such as ‘nature’ and ‘the natural world’, for they subtly perpetuate the perception that we humans are separate, even autonomous, from the world around us.

own signs” (Abram 1995) and our concomitant loss of awareness of our relations, obligations, and reliance on a more-than-human-world.

Since humans coevolved with the landscapes and biota that we now degrade, at one time our primal perceptions must have been more attuned to the “natural world”; the same natural world toward which we have become callous today. This radical shift in perceptual paradigms, from ecocentric to anthropocentric, has disconnected us from the relationships with the animate world that sustains us. These relationships shaped all human ethics and actions during 99% of our history as a species (Lee and Devore 1968). Placed in the perspective of this history, our current disregard and ignorance of a more-than-human-world is a very recent and dangerous trend. Yet, during this brief phase, we have lost much of the cultural knowledge that would guide us in a more reciprocal relationship with the living landscape of our homes. Only the few indigenous oral cultures that continue to inhabit familiar landscapes still demonstrate this type of mature ecological awareness (Nelson 1993).

If we are so far removed from the perceptions and lifestyles of our indigenous roots, how can we regain our ecological sensitivity? How can citizens of modern technological societies regain ecological skills to live a more sustainable life? What are the steps that must be taken in order to move towards reinhabitation and reconnection with our vital sources of life?

## RECONNECTING TO THE COMMUNITY OF LIFE

Becoming more ecologically aware and competent citizens will happen only if people have more direct contact with their local natural landscapes. This may be contact for sustenance, contact for curiosity, contact for spiritual guidance, or contact for exploration. But ecological competence also calls for a commitment to learning how to live well in place. This will require guidance and training from those who are knowledgeable about the land and care to live well on it.

A myriad of authors cite the vast importance of contact with nature during childhood in the cultivation of nature literacy (Feinsinger et. al. 1991, Fenton 1997, Keen 1990, Nabhan and Trimble 1994, Orr 1992, Pyle 1992, Sobel 1996, Traina 1995). Yet, more children today are separated from the natural world than ever in human history. M. J. Cohen (1988) estimates that 95 percent or more of the average American youth's time is spent indoors in artificial environments. Children may know of global warming or the deforestation of distant rain forests, but they probably don't know the smell of a spring rain or the calls of the birds that visit their neighborhood daily. With the global electronic media dominating their knowledge of nature, children are losing the kind of local awareness of nature that television and "interactive" computer programs cannot supply. Local knowledge of the home, held by most living a century ago, is now held by only a small segment of the population. Historically, this sort of bioregional knowledge I refer to would have been derived out of livelihood and necessity. Inhabitants of rural areas did not need a bioregional quiz to teach them where their water came from, the length of their growing season, or the names of five edible plants in their region. Studies show that the

average child in our country today can identify 1,300 corporate logos, but only ten plants and animals native to their area (Lukas 1996).

Our technologies have helped separate us from this simple, yet profound awareness of our local environment. In our modern consumer-culture, we no longer rely on our local community and bioregion for basic sustenance, knowledge or wisdom. Without a firm connection to the abundance and limitations of the home place, we are free to live in reckless ignorance of the consequences of our lives on others, both locally and globally. Without this fundamental knowledge of place we are not only dangerously removed from an awareness of our own limits, but also callous towards the degradation we wreak as a result of our lifestyles. As biologist and writer Robert Michael Pyle (1992) summarizes, “People who care, conserve: people who don’t know don’t care.”

Certainly much of the direct experience that children can have with their natural world should occur in the form of spontaneous unmediated explorations with peers or in solitude (Fenton 1997, Nabhan and St. Antoine 1993). These experiences will provide a foundational connection with a more-than-human-world. In order to achieve an understanding and commitment to the environment, however, these experiences must be integrated with interactions with community mentors who are knowledgeable about nature and can pass on an ethic of care and restraint. Numerous authors and researchers cite the importance of contact with local elders, naturalists and mentors who can instill local cultural knowledge of wild places rich with moral codes (Cajete 1994, Bowers 1995, Nabhan 1994, Nelson 1993, Noss 1996, Orr 1992, Pyle 1992). Through a combination of

direct experience with nature and the teachings of local mentors knowledgeable about nature, children will begin to acquire the knowledge of how to live well in a place.

### **POTENTIAL OF SCHOOLS**

School programs are natural places to begin rediscovering this type of local knowledge. School programs that emphasize direct experience with local communities and natural environments can begin to reconnect youth to their bioregion. Programs that encourage involvement in community issues and interactions with community naturalists will help students cultivate a stronger connection to their community of life and a broader awareness of how their lives affect their environment.

This emphasis on “place-based knowledge”, with consistent immersion in one’s community, does not have to come at the sacrifice of the existing curriculum. It will, however, change the methods used in the classroom and the day-to-day activities of many standard classes. Rather than assigning lessons in a standardized text to introduce the terms and concepts in a biology class, why not connect these terms and concepts to home by paying regular visits to a nearby river course where students can become acquainted with their local landscape and more-than-human-community? Why not study the migration of the osprey or discharge rates in the local watershed to learn skills in math that are commonly confined to the classroom and the text?

As educators, if we rely too heavily on curriculum and methodologies that are designed for the entire nation and, hence, not rooted to any particular place, we perpetuate our students’ detachment from their local community of life. By relying on

generic curricula we will not encourage students to cultivate a connection and care for their human community and the enveloping natural world. With no sound connection to their local community, how will students gain a level of civic competence that allows them to be active and responsible members of a community? We need to compliment this standardized curriculum with local knowledge, thereby enabling students not only to think globally, but to act - *from an informed position* - locally. Wendell Berry (1998), in an essay entitled “The Futility of Global Thinking”, summarizes the importance of focusing on the local place:

The question that must be addressed, therefore, is not how to care for the planet but how to care for each of the planet’s millions of human and natural neighborhoods, each of its millions of small pieces and parcels of land, each one of which is in some precious way different from all the others. Our understandable wish to preserve the planet must somehow be reduced to the scale of our competence - that is, to the wish to preserve all of its humble households and neighborhoods.

As land-use issues become more critical in rural and urban communities, schools must provide students with an introduction to their local natural systems and how their lifestyles effect them. Such curricula will provide students with an awareness that encourages informed decisions and improves their problem-solving skills. This type of place-based education will only be sustained if we find ways to infuse the stories of our local community into each of the classes offered in schools. The study of natural history provides an ideal bridge between classroom studies and community-level studies. Topics in natural history are easily infused into many standard classes taught in schools and can stimulate interdisciplinary approaches. By infusing natural history studies into the curriculum, the stories of the local community (including: humans, flora, fauna, and

landscapes) can be told through activities in science, history, art, literature, writing, and public policy classes. When engaging in cross-curricular studies in natural history, students are provided a broader perspective of their place within the landscape of home.

### **EXPERIENTIAL NATURAL HISTORY OPPORTUNITIES**

To model an education environment in which experiential natural history studies of home are infused into schools, I have created the Community Naturalist in the Schools Program (CNSP). The model is developed for secondary schools in Missoula, Montana, but could easily be adapted to the particulars of other communities. The program is designed to engage students in learning activities that involve direct experience with the local community and natural environment and to provide experiential and inquiry-based learning environments that stimulate curiosity and care for local landscapes and issues. In short, the goal of the Community Naturalist in the Schools Program (CNSP) is to encourage an awareness of a more-than-human-world, ecological literacy<sup>1</sup>, and hands-on skills that will empower students with how to live well in a place. CNSP achieves this goal by weaving direct experience with the natural world, engagement in community issues, and hands-on stewardship projects into secondary school curricula.

The Community Naturalist in the Schools Program (CNSP) relies on an education coordinator to promote and organize experiential natural history activities based at local

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<sup>1</sup> The traits that constitute ecological literacy include an intimate knowledge of one's local landscape, caring for this landscape, and possessing the practical skills to live in a mutually nourishing way with all life in this landscape. In order to be an effective, ecologically literate citizen, one must also have the civic skills necessary to work with diverse interest groups and advocate for a sustainable future. Finally, as ecologically literate citizens, we must acquire practical skills that will benefit not only ourselves, but our broader community: our local community of life.

natural areas with a variety of community naturalists, teachers, and students. The coordinator connects local naturalists in the community with secondary school teachers and students. The CNSP coordinator then encourages teachers and naturalists to collaborate on topics and curricula that emphasize local place, hands-on experience, and community issues. Partnerships stimulated by CNSP enliven existing curricula and, in turn, help students become more informed about their local ecologies, landscapes, and communities. The project coordinator solicits project proposals from community naturalists and then searches for appropriate local school groups that could pursue these projects as part of their required coursework. These projects allow students to apply concepts from the classroom to locally relevant field activities. Through CNSP, teachers consult with experts within their community to identify local areas and issues that are germane to their coursework. Once a partnership is formed, both teacher and naturalist collaborate to develop activities that will enrich the course and involve the students.

To pilot the CNSP, I worked with the Montana Natural History Center (MNHC) as the education organization in Missoula to oversee CNSP and maintain a thriving network of naturalists, teachers and stewardship projects. MNHC has a history of providing natural history education opportunities in Missoula. MNHC also has strong ties to scientists, teachers, land managers, naturalists, and instrumental members of Missoula's city government.

I have tried to cover the important development considerations during this project, to ensure the program's effectiveness in achieving its goals. CNSP is a flexible vision that should be tailored to the subtleties and characteristics of the community and landscape in



which it is implemented. By responding to and blending with the needs of each particular landscape and community, we will be taking part in the ancient art of reciprocity that is pervasive in natural systems.

## CHAPTER II

### The Key Elements of CNSP

The Community Naturalist in the Schools Program (CNSP) is based on four key elements that are embedded within a sound and healthy pedagogy. Since the components of a sound pedagogy, including using inquiry-based teaching methods, having a respectful rapport between teacher and student, using cooperative learning techniques, and design of the physical school environment, have been elucidated in other texts (Berkowitz et al 1991, Johnson et al 1991, Uno 1990, Gatto 1992), this chapter will focus on the key elements of an experiential natural history education curriculum.

These key elements are:

- 1) providing students with time for **direct experience** in the natural world;
- 2) engaging students in a **placed-based curriculum** with their bioregion and landscape of home;
- 3) using **natural history** as an interdisciplinary bridge between the existing curriculum and the local landscape;
- 4) connecting students with their **community** through **mentorships** and involvement in community issues;

These elements play a significant role in developing ecological literacy, civic competence, and locally-relevant hands-on-skills. These elements are often lacking in educational institutions ranging from the elementary to graduate level (Hanna 1990, Nabhan and Trimble 1995, Noss 1996, Orr 1993, Palen 1991). By emphasizing these

four elements, CNSP strives to model an educational environment that will restore our rapidly disintegrating connection to the environment and to a sustainable future.

### **DEFINITIONS**

Before elaborating on the elements listed above, a few frequently-used terms deserve further clarification.

#### **Ecological Literacy**

The term ecological literacy could easily be interpreted a number of ways.

Perhaps the narrowest of these would define an ecologically literate individual as one who is familiar with the science of ecology and who can read and write about ecology. To define ecological literacy, I build on Peter Feinsinger's (1991) definition, that entails:

1) understanding of the scientific process as applied in ecology; 2) familiarity with the ecological processes in one's local environment; and 3) sufficient familiarity with ecological principles to understand the basic ecology of environmental problems in other regions.

Yet, my definition also shares with David Orr's (1992) concept that:

Knowing, caring, and practical competence constitute the basis of ecological literacy... [and this]... implies a different kind of education and a different kind of educational experience that develops the practical art of living well in particular places.

This intimacy with landscape engenders care and respect towards a broader community of life and leads, "toward prudence, stewardship, and the celebration of creation" (Orr 1992). With this definition, ecological literacy results in "the practical art of living well in a place" (Orr 1992).

### **Community**

My use of the word **community**, due to its inclusive nature, also deserves an explicit definition. By narrowly defining the word **community** to include only humans, we actively exclude all other fellow creatures from a circle of relations and responsibilities that is implicit to membership in a community. Hence, in this paper, by **community** I mean “a place and all its creatures”, aptly quoted from Wendell Berry’s (1995) essay “Health is Membership”.

### **Direct Experience**

The term “direct experience” refers to our sensorial contact with the animate world. Through immersion in wild places without a narrow, predetermined objective we allow our senses to come alive and our perceptions to be broadened. As bioregional writer and activist Jim Dodge (1995) informs us:

... [T]his requires literally getting out in the elements where you live, out in the rain, wind, snow, and the heat of it, the loam and mud and rock, the ponds, streams, rivers, ocean, getting wet, dirty, blown, and burned -- attending as completely as you can, the astonishing welter, weave and tangle of associations that compose life: mine, yours, alders, and mayflies.

### **Natural History**

A more explicit definition of the term **natural history** may allow the reader to understand the full potential of this field. I build on the definition provided by the American Heritage Dictionary: “The study of natural objects and organisms and their origins, evolution, interrelationships, and description”. **Natural history**, then, includes the history of humans and how they have related to particular places. In the field of **natural history** we study how the parts relate to the whole, rather than attempting to isolate and

further reduce the natural world into smaller parts. We may study humans in natural history, but only as they relate to their animate environs.

The study of natural history is by its very nature a descriptive and expressive realm. In contrast to the ecologist, who commonly uses reductionistic methods to study the natural world, the natural historian's primary goal is observation, description, and understanding relationships. The natural historian cultivates a personal understanding of the world that can be expressed in a variety of ways, including art, creative writing, scientific descriptions, music and philosophy. Natural history helps us focus on the creatures, cycles, patterns and forms of the natural world. It is a study which helps to compensate for our excessive emphasis on studying ourselves, especially ourselves apart from a more natural and rooted whole.

In summary, I define natural history as the study of the natural world (both parts which we consider animate and inanimate), its origins, evolutions, interrelationships and descriptions, initiated primarily through a practice of first-hand observation and description which then lead to a diverse array of responses often expressing understanding, intimacy, awe, respect, and love.

#### **DIRECT EXPERIENCE**

Perhaps the single most important element of an experiential natural history education program is providing students *with frequent direct experience with wild places*. It is here that students will have the opportunity to engage all of their senses in the more-than-human world, and, through this interaction, come into contact with that world which

sustains them. By delicately facilitating these experiences, instructors can allow spontaneous perceptions, observations, and curiosities to serve as a springboards for more guided activities that interface with the standard curricula. The following discussion touches on how direct experience with a more-than-human-world can promote both local ecological knowledge and an ethic of care and respect for nature.

The simple act of getting children outside into wilder places allows them to come in direct contact with less human-dominated landscapes and to engage all of their senses in meeting their greater community. As Gary Paul Nabhan (1992) notes when referring to the playful exploration of habitat, “Through such informal means, tens of thousands of generations of children have become ecologically literate about their home ground.” By spending time outdoors in local wild places we become familiar with nature’s cycles and styles, and begin to learn how to be awake and attentive to its other inhabitants. These experiences can inform our decisions on how to live in greater reciprocity with the living world.

David Abram (1996) describes how this reciprocal relationship with the earth is increasingly diminished by our anthropocentric culture:

...[O]ur organic attunement to the local earth is thwarted by our ever-increasing intercourse with our own signs. Transfixed by our own technologies, we short-circuit the sensorial reciprocity between our breathing bodies and the bodily terrain. Human awareness folds in upon itself, and the senses -- once the crucial site of our engagement with the wild and animate earth -- become mere adjuncts of an isolate and abstract mind bent on overcoming an organic reality that now seems disturbingly aloof and arbitrary.

Abram argues that we need not “go back” to ancient cultural habits to restore a sustainable relationship with the earth, but come full circle by uniting our “capacity for cool reason” with a more sensorial way of knowing rooted in our direct participatory engagement with our local world. By doing so, we begin to apprentice ourselves to the ecologies of particular places; we begin to reinhabit a place.

To reinhabit is to commit to a place and pay attention to the particulars of that place. It is to become a member of the community of that place and to adopt the responsibilities and relationships that are included in membership in that community. This act of reinhabitation requires consistent direct experience with the local landscape so that relationships are established between the individual and the greater community.

Gregory Cajete (1994), educator, Tewa Indian and author, discusses how direct experience and participation in one's community is an integral element of a traditional American Indian education;

In Tribal education, knowledge gained from first-hand experience in the world is transmitted or explored through ritual, ceremony, art and appropriate technology. Knowledge gained through these vehicles is then used in everyday living. Education, in this context, becomes education for life's sake. Education is, at its essence, learning about life through participation and relationship in community, including not only people, but plants, animals, and the whole of nature.

Here, the ecology of place and active participation in one's community constitute a holistic education that has direct relevance to life and fosters a greater understanding of the interrelatedness of all things. Only through consistent direct experience through participation in the community can a student obtain an education that does not alienate “man from his own being and the natural world” (Cajete 1994).

Through direct experience with nature, children can escape the perceptual paradigm imposed by a culture inimical to nature, and begin to learn directly from the land. By educating ourselves through direct experiences with nature, we do not restrict ourselves to our culture's reductive truths and, hence, are more open to perceiving the world in expansive ways. James Raffan (1993), a Canadian teacher, touches on a similar point when he suggests that by acknowledging our emotional response and growth that occurs when exposed to the wild, we begin to understand the profound influence of the land as teacher. Yet, accepting the notion that children can learn from direct experience with the land is difficult for many of us. Teacher and outdoor educator Gail Fenton (1997) reminds us that, "There are times when teaching about nature distracts children from experiencing nature.... Too often we react as if educational interventions can make up for children's lack of experience with nature." By learning about the world outside the classroom through their own observations and encounters, children are more likely to develop what Nobel Prize winning genetecist Barbara McClintock called "a feeling for the organism" that allows them to know the world as part of their own bodies; a world that requires the same care and respect (Keller 1983).

Logistical barriers, such as time constraints, liability issues, and lack of training prevent many school teachers from getting their students outside to learn about their local environment and local environmental issues. As a substitute, nature programs at schools often use interactive computer software, videos, "curriculum trunks", and reports of environmental problems in distant lands to expose children to environmental subjects. What is the problem with this form of environmental education? After all, in many ways



our global electronic media has increased our awareness of, at least, an abstract environment. But as Robert Michael Pyle states in his essay, "Intimate Relations and the Extinction of Experience"(1992) :

...[D]irect, personal contact with other living things affects us in vital ways that vicarious experience can never replace. Everyone has at least a chance of realizing a collegial wholeness with nature. But to get there, intimate association is necessary. A banana slug, face to face, means much much more than a Komodo dragon seen on television.

This feeling for the organism comes when we immerse our senses in the world outside of our labs and outside of our computer generated models; a world that is full of mystery, knowledge and wonder. Unfortunately, opportunities for this nature immersion become increasingly rare in our rapidly developing landscapes. How many children in the United States today regularly experience a world where the marks of their own species are rare? Very few, I imagine. Our familiar landscapes are dominated by our own presence. Given this, it is easy to understand how we have lost our sensitivity to that which is other than human. Pyle (1992) explains that this loss of wildness near home leads to our cycle of disaffection with nature:

As cities and metastasizing suburbs forsake their natural diversity, and their citizens grow more removed from personal contact with nature, awareness and appreciation retreat. This breeds apathy towards environmental concerns and, inevitably, further degradation of the common habitat.

Wild places can connect us with a more-than-human-world and give us a better perspective on the potential for a healthy cohabitation with all of life. If we are exposed exclusively to human-dominated landscapes and their degraded ecologies, we will miss

this perspective all together. Orr (1992) raises this issue when discussing why ecological literacy has been so difficult for western culture. He attributes this, in part, to the decline in our capacity for aesthetic appreciation of natural systems:

We have become comfortable with all kinds of ugliness and seem incapable of effective protest against its purveyors... . Rene Dubos once stated that our greatest disservice to our children was to give them the belief that ugliness was somehow normal.

If our goal as environmental educators is only to coach children in their understanding of scientific ecological concepts and their skills in scientific inquiry, we will create a generation of skilled applied ecologists who have no experience with wild ecosystems, who are not familiar with the subtle signs of poor wildlands stewardship, and who in Reed Noss' (1996) words, "...lack the long-term, emotional investment in wild places...".

The Community Naturalist in the Schools Project will to get children out of their classrooms and into the wilder, less human-dominated landscapes near home. This educational model is designed for communities where relatively wild places still exist either within the city limits or just beyond. The program could be adapted to suit more urban communities, but would have to focus more on urban ecology and the restoration of native habitats within these areas. CNSP strives to engage students in the stewardship of natural areas so that they can better understand how their behaviors and actions affect the long term health of their greater community. Stewardship projects can get students outside through hands-on learning activities. Teachers can convey the concepts of their

curricula through stewardship projects that also link students to their community beyond the schoolyard.

### **PLACE BASED EDUCATION**

Another fundamental element of an experiential natural history education program is its emphasis on the local place and community. When we immerse students in their local wilds and involve them in local neighborhood issues we begin to reconnect them to the land that sustains them. This section highlights some of the main ways an emphasis on the local place can benefit middle and high school curriculum. The following list of benefits of a place-based education was gathered from points made by numerous authors (Feinsinger et. al 1994, Hale 1986, McKibben 1997, Nabhan and Trimble 1994, Orr 1992, Sanger 1995, Smith 1995, Sobel 1996, Traina 1995) and my own personal experiences as an educator. Summarized below, a local emphasis can:

- provide tangible and personal links for abstract concepts;
- facilitate direct experience and experiential education approaches;
- reduce the logistical problems often associated with longer field trips;
- connect students to their community;
- be ideal for community service and stewardship activities;
- promote an understanding of how our lifestyles effect our environment.
- present ecological problems on a manageable scale

In a curriculum that is filled with abstract concepts presented through texts and lectures, studies of the local community can provide students with the tangible and personal links necessary for successful constructive learning. Studying new concepts

through the landscape of home will allow these concepts to be linked to the student's existing knowledge framework. A student can build onto their existing knowledge by relating new concepts to their familiar terrain. This constructivist approach to cognitive development will help a student understand the relevance of their studies to the world outside of school. When abstract concepts are applied to community service projects that include problem solving and hands-on activities students will be more likely to understand them and find the motivation to excel in their studies.

Beyond its clear advantages for a constructivist approach, an emphasis on the local place can also tie a student physically, emotionally and spiritually to their studies. Visiting a local river corridor every week to study biology will encourage students to learn with all of their senses. What better way to understand how plants and animals adapt to winter than to take students into the cold of winter on local field trips while observing plant morphology and animal behavior? Regular visits to local places, especially those that a students can return to on their own time, can encourage intimacy with wild places and their inhabitants. This intimacy will encourage an emotional relationship that elicits care and respect for these familiar places. When discussing the educational potential of the local environment Monica Hale (1986) cites among many advantages the familiarity students already have with places near home.

Children can relate to their own familiar environment more readily, and are less inclined to associate field-work with something 'done' only in different and invariably unique environments. For the majority of children, living in urban areas, this is of consequence as there is a tendency to psychologically downgrade the city environment. An important effect of working in the local area is to foster a sense of 'belonging' and caring for the environment.

Involving students in the studies of their neighborhood areas can stimulate pride and result in care and attention towards otherwise ignored places.

Studying local natural areas and local issues is also ideal for an educational approach that relies on direct experience and participation with the broader community. Using hands-on and minds-on activities, teachers can convey the required concepts and also engage their students in the study of their home place. Again, Monica Hale discusses these benefits when stating that,

**“Involvement in practical conservation and environmental projects in the local area similarly provides the opportunity for contact with the ‘natural world’.” “...opportunities for children to come into contact with ‘live’ organisms in their natural surroundings should encourage a greater understanding and respect for other forms of life.”**

As educators, we often find that the greatest hurdles to experiential environmental education lie in the logistical difficulties of field trips to distant sites. Time and cost requirements for longer field trips can make getting students outside nearly impossible. In rural communities and even some urban communities, however, relatively natural habitats are often within a few blocks of schools. In many cases, walking or biking to these sites is a very feasible and preferable option (Hanna 1992). By using these local natural areas we can reduce the conflicts inherent with longer field trips and increase the frequency of visits to these sites. By increasing the frequency of our visits, we will be able to make these experiential natural history excursions an integral part of the curriculum. When discussing the many virtues of using local natural areas to study ecology, Hale (1986) states,

**“The teacher is given the additional freedom to plan lessons and related field-work as required, facilitating a more logical approach to investigative work: as a topic is completed in the classroom it can be immediately followed-up by practical experience in the field situation.”**

**Use of local natural areas that are easily accessed is essential for education programs that rely on regularly infusing experiential natural history activities into the curricula in an effective manner.**

**Curriculum that is based on real issues and local places can lead to a more creative learning process that engages each student in a process of exploration, values clarification, original discovery, and community participation. This is the type of education that can actually contribute to the broader community and integrate youth into its membership.**

**Frequent exposure to local natural areas will begin to connect students to a more-than-human-world in their community. When regularly exposed to the local natural world students will begin to understand that the willow and the nuthatch are just as much members of their community as their next door neighbors; members that deserve equal care and respect. As M. Gilliam and L. Lane-Zucker (Sobel 1996) write, “[I]t means redefining *community* as an interwoven web of nature and culture, a relationship marked by mutual dependence and one enriched and sustained by love.”**

**Stewardship and community service-related projects at natural areas can link natural history studies with social studies by engaging students in hands-on experiences at local wild places that also involve specific management issues. As educator and author David Sobel (1996) points out, “Environmental projects that serve the community show students the relevance of the curriculum and give community organizations an injection of**

youthful energy.” A habitat restoration activity will improve student retention of concepts in a biology class by making them more relevant, will show students how their actions can make an ecological difference, and will improve the quality of life for the community.

These local natural areas are ideal sites to witness the impacts humans can have on their local ecosystems. In contrast to curricula that focus on nationwide rates of soil loss, tropical deforestation or global warming, hands-on studies of local environmental problems will pique a student’s interest and make the fundamental connection between personal lifestyle choices and these problems. By studying how local urban and/or rural habitats have been effected by our actions, we can begin to link our daily behaviors and decisions to the welfare of our plant and animal neighbors. Once this connection is initiated, a class can have discussions that explore and clarify their values and how they relate to the environment. These discussions may stimulate projects that work towards more responsible behaviors towards local ecosystems. As David Sobel (1996) has witnessed, this sort of “authentic environmental commitment emerges out of firsthand experiences with real places on a small, manageable scale”. Discussions of environmental problems that lead directly to action-based projects will empower students with the confidence that they can affect change at a local level.

In summary, an education that focuses regularly on the local landscape and on local community issues will make the curriculum more relevant to students, will facilitate experiential forms of learning in the natural world, will connect students with their broader community, and will empower students by helping them realize the connection

between their lifestyles and the health of their environment *and* showing them that they can be instruments of positive change.

### **NATURAL HISTORY: THE BRIDGE BETWEEN TWO WORLDS.**

I have asserted that consistent direct experience with our local communities is essential for regaining a sensitivity and respect for the animate earth. In order for students to have consistent contact with the natural world, we need to get them out of their classrooms and into their neighborhood wildlands. I have also claimed that having a stronger emphasis on the local place in our curricula will encourage these frequent field visits. Now I will explain how the study of natural history is such a crucial element in this educational model. For, it is the study of natural history that can connect the secondary school curricula with regular direct experiences in the local landscape.

Natural history can act as a powerful bridge between traditional disciplines taught within schools and the natural world. The study of natural history is inherently interdisciplinary; it focuses on the relationships between the members of a landscape, rather than studying each member in isolation. It, therefore, can be incorporated into any traditional subject, whether this entails studying the use of a local river corridor by early settlers in a history class, or using regular visits to this same river corridor to stimulate writing projects in creative writing class. A biology class can visit a local forested area to study the relationship between forest management and biodiversity. A social studies class can visit this same area to discuss how the forestry industry has effected the culture and economy of peoples of that region. The common denominator in all these examples is that students are learning the concepts required in their traditional curriculum through



direct experiences with their local place. Hence, introducing the study of natural history throughout a curriculum does not threaten or replace the content provided in each discipline, it simply offers a new and effective way for teaching standard concepts.

Natural history studies can serve as an interdisciplinary link between the disciplines traditionally offered in school. Studies in natural history can encourage collaboration between teachers in different departments and help students understand the connections between the subjects presented to them in school. By presenting thematic units in natural history that weave together these disjunct disciplines, a student will experience a more holistic and integrated form of education. Our education system's preponderance for isolating and compartmentalizing aspects of life draws scathing criticisms from John Taylor Gatto (1992), an award winning inner city teacher and author of Dumbing us Down. Based on his extensive experience as a public school teacher, Gatto indicts our educational system for promoting confusion and indifference in the student body. Confusion and indifference are two of Gatto's seven "hidden lessons of compulsory schooling". Gatto finds that schools promote confusion by teaching disconnections, teaching subjects out of context, and by presenting too much information all at once. Our education system uses similar tactics, Gatto (1992) claims, to promote a feeling of indifference;

Schools teach children not to care about anything too much. By breaking each day into a set schedule that ruthlessly ignores any of the natural rhythms or discoveries of the moment, hour or day, school bells slowly dull the students ability to be truly passionate and engaged in anything that occurs at school.

An education program that: 1) engages students in the studies of their home; 2) integrates disciplines through experiential natural history topics; and 3) involves students in

community service projects, can provide an antidote for the disjointed, abstract and dispassionate education that Gatto so harshly criticizes.

Natural history studies can allow students to become passionately engaged in their studies. In contrast to the study of ecology, natural history encourages a personal understanding of the world that can be expressed through story, art, writing, detailed description, and careful acts of stewardship. In order to retain its position as an objective science, the study of ecology must avoid the realms of expression filled with emotion and sentiment. Biology professor Robert Henry Peters (1980) makes a strong distinction between natural history and ecology. When characterizing the natural historian, Peters (1980) writes, “As naturalists, we seek those characteristic qualities which individualize each leaf or glade or insect. In so doing, we relate to their individuality and experience a sense of unity with them as interlocking components of our shared world. If natural history promotes an understanding of the world, it is in the same sense that we understand another person.” It is this unique personal quality of natural history that allows us to perceive ourselves as an integral part of the natural world. Furthermore, this ‘feeling for the organism’ engenders an attitude and behavior of respect, care, and reciprocity to a more-than-human-world.

So, if natural history studies are so ideal for the secondary curriculum, why, then, are they so noticeably absent in our educational system in America? In an attempt to answer this question, teacher and professor Paul Haemig (1990) suggests that the all-embracing education philosophy in America is *humanism*.

Haemig's suggestion, provides some unique insights into the value of a natural history education. Humanism, as defined by the American Heritage Dictionary, is "a doctrine or attitude that is concerned primarily with human beings and their values, capacities, and achievements." Rather than questioning this doctrine, our educational system is perpetuating the cultural paradigm of humanism; a paradigm so inwardly focused, that it resembles cultural narcissism. Our educational system perpetuates this status quo by placing an emphasis on teaching children anything that relates to humans, while de-emphasizing knowledge about other aspects of nature, except those serving as resources for humans. In Haemig's (1990) words, "The products of such an educational system are ecological illiterates, able to quote Shakespeare and the Gettysburg address, but unable to identify the plants and animals in their own back yard, or know how they interact."

In order to reverse this trend towards ecological illiteracy, educators at secondary schools must provide students with an adequate knowledge of the basic natural history of the natural communities to which they belongs. By cultivating local natural history knowledge we will begin to have more care for and be more careful with our greater community.

In summary, the study of natural history is a crucial component to an educational system that promotes ecological literacy through direct experience with the local natural world. Natural history provides an inclusive way of perceiving the natural world that does not continue to alienate humans from nature. It's interdisciplinary nature lends itself to infusion into many subjects within the traditional curricula and encourages

interdisciplinary educational approaches that will provide students with a more integrated and engaging way of learning. It encourages a more personal way of knowing that can lead to more thoughtful and careful actions towards a more-than-human-world. And, finally, the study of natural history can help pull our culture out of its anthropocentric paradigm and begin to forge a new connection with our more-than human-world.

### **COMMUNITY**

The fourth component of a successful experiential natural history education program is the need for interaction with the community through mentorships and through service projects. Community members who are knowledgeable about their local natural world and can express their care and respect for this world will be excellent facilitators of natural history field studies. Service projects take education forward into action, complementing both the student's learning opportunities and the health of the greater community.

In today's fast-paced and unsettled world, there are few cultural incentives for staying put in one place, spending quality and quantity time in the wild, or becoming intimate with a more-than-human-world. Consequently, there are typically few among us that show this level of local commitment, knowledge and care. The few who do, however, are the pilots in each community that can guide us towards a more sensitive and responsible way of living. Unless we listen to those who have this 'naturalist's intuition' and can share and nurture a practice of careful stewardship, we may fail to encourage ecological literacy and ecologically sustainable communities.

Conservation biologist Reed Noss (1996) proclaims the importance of such knowledgeable naturalists and also warns us that our education system is largely responsible for the loss of these naturalists in our time. In an editorial in *Conservation Biology* entitled “The Naturalists Are Dying off”, Noss explains that the declining emphasis placed on field experience and natural history knowledge in higher education is leading to a smaller number of field savvy naturalists in our society. Noss warns fellow conservation biologists that unless we revive field-based studies in natural sciences -- studies that emphasize a knowledge of “the identification, evolutionary relationships, and life histories of organisms” via direct experience in natural systems -- we will raise a generation of computer nerd conservation biologists with no firsthand knowledge of natural history and no personal ties to the land. Noss firmly states that, “Scientific abstractions and fancy technologies are no substitutes for the wisdom that springs from knowing the world and its creatures in intimate, loving detail.”

Similarly, David Orr speaks to the importance of mentors in the development of environmental attitudes and behaviors. Orr (1992) cites three elements commonly responsible for cultivating an environmental ethic: 1) experience in the natural world at an early age, 2) a teacher or mentor who acts as a role model, and 3) seminal books that explain what we feel deeply. Orr states that ecological literacy is not becoming more difficult because there are less books about nature, but because there is less opportunity for direct experience in nature. I would add that there is also less opportunity to interact with and learn from elders and other mentors who are intimate with the natural world and can serve as role models.

Apart from the fact that there are simply fewer knowledgeable naturalists these days, our educational system (and further, our culture) has almost eliminated the possibility of interactions between older and younger generations. As John Taylor Gatto (1992) explains, “We are witnessing a great social crisis in the community. Children and old people are penned up and locked away from the business of the world, for the most part: leaving our communities no past and no future.” The artificial segregation of generations enforced by our schools stifles the potential dialogue and learning opportunities that are possible in a truly integrated community. As Taylor observes, this robs us of not only our past, but also our future.

Students can interact with other generations during their education if allowed to participate in projects that involve community issues. Community service projects provide students with the opportunity to apply concepts taught in class, test their problem solving and communication skills, and become part of the community dialogue and process at an earlier age. Projects that expose and engage students in their community beyond the schoolgrounds allow them to be taught by the entire community, rather than a few teachers.

Educator and author Gregory Smith (1995) criticizes our education system for preparing us “to live as possessive individuals in institutions predicated on the transcendence of place and the disregard of natural limits.” Smith believes that schools can help us move towards a more sustainable relationship with our environment, but only if they begin to instill in each child a sense of community and an understanding of their role in promoting community welfare. Secondary schools are a primary vehicle by which

children from rural communities are inducted into the industrial/corporate world. As Smith states, “In this country school success translates into leaving home in the pursuit of personal opportunities -- despite the consequences of this mobility for the welfare of communities.” Once on a career path within the corporate world we become progressively entrenched in an anthropocentric paradigm that disregards natural limits. Smith asserts that by breaking down the boundaries between schools and communities, we can begin to strengthen social relationships and build our community bonds. Secondary school programs that engage students in projects with public lands and community members can encourage this sense of shared existence and prepare children to become contributors to the common good.

Community service projects are especially ideal for high school students who are ready to be challenged by complex issues and need to be reminded of the relevance of their education. Gifted students in high school are often left unchallenged by their studies. This can lead to a withdrawal from enthusiastic participation in the school community. Community service projects can get these students involved in complex issues while working shoulder to shoulder with a blend of generations from their communities. Such students can be further challenged by assuming leadership positions when guiding younger students in these projects.

High school students frequently question the relevance of their education and can become disillusioned by the abstract nature of their studies. If we weave hands-on projects of community-wide importance into our daily curricula, students will be able to

directly explore the relevance of their studies and will be able to achieve a stronger and more integrated understanding.

For many, high school represents the final educational stage experienced within a home community. Higher educational institutions are for the most part predicated on the transcendence of place and are aloof to the basic commitments and responsibilities included in community membership. Hence, high school is the last and highest stage of formal education where students have the opportunity to participate in active membership with their native community. If we allow students to be active participants in their communities at this age, they will acquire a better understanding how to be more respectful and active members of a community and a place.

Gregory Cajete (1994) captures the essence of an education that is inseparable from community participation when describing a traditional American Indian education:

“[T]raditional American Indian education historically occurred in a holistic social context that developed the importance of the individual as a contributing member of the social group. Tribal education sustained a wholesome life process. It was an educational process that unfolded through mutual, reciprocal relationships between one’s social group and the natural world. This relationship involved all dimensions of one’s being, while providing both personal development and technical skills through *participation in community life*. It was essentially a communally integrated expression of environmental education.”

### SUMMARY

The Community Naturalist in the Schools Program weaves together the elements discussed in this chapter into dynamic educational opportunities for secondary school students. Students are engaged in natural history studies of their home through direct experience in local natural areas and through involvement with community issues and



community mentors. Some of these elements have been introduced into the school curricula during contemporary environmental education efforts. Unfortunately, there are few environmental education programs that have succeeded in implementing all of these elements in schools on a regular and sustained basis. The following chapter discusses some of the main barriers that challenge experiential natural history education programs and describes how the Community Naturalist in the Schools Program overcomes some of these barriers. By understanding these challenges, we can continue to find ways to instill life into our education system.

## **CHAPTER III**

### **Barriers that Challenge Experiential Natural History Education**

The success of experiential natural history programs is limited by common barriers that fit into three broad categories: 1) barriers within our education system, 2) barriers embedded within our lifestyle and society, and 3) barriers resulting from a human dominated landscape and the resulting loss of wild places near home.

The barriers within these three categories are inescapably intertwined through cause and effect relationships. For example, the lack of wild areas for children to learn from is largely a result of patterns in our lifestyle and society, which are, in turn, perpetuated by implicit and explicit messages delivered in our education system.

In this chapter I review the barriers within our education system and discuss some of the ways that CNSP effectively eliminates them as obstacles to successful experiential natural history education programs. In so doing, I assert my faith in the potential leverage of educational institutions to move society towards environmental sustainability. The major barriers that challenge experiential natural history programs in schools include:

- the ‘crammed curriculum’;
- accountability issues or ‘teaching for the test’;
- fragmented scheduling that leads to a lack of time for extended learning and integration;
- field trip costs and liability issues;
- lack of teacher competence and confidence in natural history;

## THE 'CRAMMED CURRICULUM'

One of the most pervasive barriers to experiential outdoor learning identified by teachers is a lack of time. This challenge is referred to as the “crammed curriculum” by members of the Roger Tory Peterson Forum on “Breaking the Barriers: Linking Children and Nature” (1989). When asked what causes this shortage of time most teachers reply that they have too much to teach in too short of a time, are already overworked by their standard responsibilities, or cannot find large enough time blocks during the school day to diverge from their typical classroom sessions. When teachers are approached to be involved in a new project which may add to an overburdened schedule, they are quick to show their lack of interest. For environmental educators who see the need for more experiential nature education, this can present a substantial challenge.

When viewed as yet another content area, natural history education simply contributes to this problem of an overflowing curriculum. Yet, as long as experiential outdoor education remains peripheral to the curriculum it will be an easy target for budget cuts and education reforms that advocate a back to basics philosophy by eliminating “distractions” from the standard curriculum (Westheimer 1992). As an alternative, when viewed as something relevant to every subject area, experiential natural history can encourage interdisciplinary learning without adding additional burdens to an already full and fragmented curriculum. By infusing experiential natural history activities into traditional subjects, nature education can be part of the core curriculum without contributing to a full plate. Besides, all education should be environmental education, and all learning should be rooted in experience (Dewey 1938). Successful experiential

environmental education programs should be infused into the existing curriculum. This will require the collaboration of teachers who work in teams and have the support of administrators, parents and consultants (Hanna 1992).

Infusing environmental education within the existing curriculum does not require modifying the curricular requirements of a school system. Existing curriculum standards in public schools are mandated by the State and are implemented at the county and school district level. Attempts at changing existing curricula by adding requirements for experiential natural history will require significant administrative efforts at the district level. Although these efforts are important for the long term success of environmental education, experiential natural history activities can also be infused into the currently mandated subject matter without challenging these district requirements. Much of the content and concepts covered in common subjects (social studies, history, biology, math, etc.) can be introduced and mastered through experiential activities in natural areas near schools.

The Community Naturalist in the Schools Program was designed to work with teachers to find common ground between their curricular agendas and experiential natural history opportunities. Teachers still must be open to changes in *how* some concepts are taught, but are not asked to add more programs that will be considered peripheral to the curriculum. By infusing experiential natural history studies within the curriculum, educators also deliver a message that knowledge about the local environment is valued by the community and culture. It is through this infusion model that CNSP can contribute to the curriculum and engage students in natural history studies of their home.

## TEACHING FOR THE TEST

The crammed curriculum syndrome is compounded by the pressure to prepare students for standardized tests. This can lead to less creative, interactive and dynamic teaching methods in the classroom. Members of the Roger Tory Peterson Forum on “Breaking the Barriers: Linking Children and Nature” (1989) labeled this problem “teaching for the test”. Teachers are often forced to reduce the amount of student-directed learning time they offer in order to cover the concepts and facts for which students will be held accountable on standardized tests. This is especially true during more advanced grades in high school, where curricula are designed to prepare students for standardized exams that will assess their eligibility for admission into college and other institutions. The movement within the past twenty years to establish nationwide standards for school curricula which are assessed via standardized tests threatens to further reduce the autonomy of the community and the teacher in creating authentic learning environments which are relevant to particular student populations (Westheimer et al 1992).

This ‘teaching for the test’ syndrome can present substantial challenges to educators who wish to involve their students in locally relevant, experiential forms of learning. Accountability pressures can often control what content is covered in school curricula, regardless of whether teachers feel this content is the most enriching or appropriate for their students. As Joel Westheimer and others state (Westheimer et al. 1992), “Experiential educators, building on the work of Dewey, reject the notion that experts can specify a common set of learning goals suitable for all students in all

situations. The notion of teaching to and learning from experience grants primacy to the relationship between teacher and student". In trying to teach for the test, teachers become inculcators of facts, rather than facilitators of learning. This lack of reciprocity between teacher and student disempowers students and acclimates them to an educational environment in which learning is based on passivity and conformity rather than participation and critical thinking. Through these means, our school system narrows the perception of our future generations, and reduces the possibility of realizing ecologically sustainable alternatives to our current destructive lifestyles.

The Community Naturalist in the Schools Program does not attempt to replace the required content for which students will be held accountable. Instead, it applies a strategy in which the CNSP coordinator works with teachers to identify aspects of their required curriculum that can be covered through locally relevant experiential learning activities. Through these experiential means, students can still obtain the content for which they will be tested, but will also be exposed to a more authentic learning environment that invites their participation and critical thinking. Once these pieces of standardized curricula are placed within the context of home, a student will achieve a greater depth of understanding and will be able to evaluate associated values that are often embedded within the subject matter.

### **THE FRAGMENTED SCHEDULE**

Another aspect of the traditional school environment that presents a challenge to experiential natural history educators is a highly fragmented and disjunct daily school schedule. The traditional half hour to one hour long class period is typically inadequate

to allow travel time to off-campus sites and to encourage quality experiential learning (Hanna 1992). Even if field areas are within ten minutes of a school ground, field trips which allow time for direct experience, observation, reflection, and discussion will require more than the typical 50 minute class period. This fragmented schedule is largely a result of a reductionistic approach to learning that requires the distinction and separation of various parts of life into disciplines. By splintering our world of understanding into numerous compartments, we also splinter our school day into short, incongruous segments that disengage students from reality and their desire to learn (Gatto 1992). As a result, there are no large blocks of time when students can pursue their own curiosities and make personal connections with the subject matter.

The Community Naturalist in the Schools Program incorporates two strategies to alleviate the problems associated with the fragmented schedule. First, CNSP natural history activities and projects are based at natural areas located in the neighborhoods of each school ground. This not only requires less travel time to and from the outdoor classroom but also enables class groups to visit these areas on a more frequent basis. Studying and working at local natural sites will also encourage a tone of pride, responsibility and stewardship for these wild islands in the city. Second, since many experiential natural history projects lend themselves to interdisciplinary studies, CNSP projects will promote more collaboration between teachers who are responsible for different subjects. This interdisciplinary approach will work especially well in schools where teaching teams already exist. These teachers can then coordinate their monthly schedules to allow for more significant blocks of time in the field. By promoting

experiential projects at local natural areas, teachers will not only allow their students to learn from their landscape's more frequently but will also tie together disjunct pieces of a curricula to form a more integrated whole.

### **FIELD TRIP COSTS AND LIABILITY CONCERNS**

Field trip costs and liability issues often prevent enthusiastic teachers from getting their students to field sites. For many outdoor education programs at schools, this can constitute the most significant barrier to a more complete experiential program.

Transporting students to distant field trip sites via buses that require professional drivers create significant cost concerns.

There are several benefits to visiting natural areas that are close to the school grounds. Some of these benefits, such as the greater ease in scheduling field trips, the opportunity for more frequent visits, and the value in connecting students to familiar sites near home, have already been mentioned in previous sections. Other clear benefits in using local natural areas as educational field sites include a reduction in both field trip costs and liability concerns. Although extended excursions into more remote terrain are invaluable, shorter more frequent visits to wild places will ensure that children become more knowledgeable and respectful of their natural community. Field trips close to the school grounds are less of a safety/liability concern and will not require expensive forms of transportation. When possible, students should walk or ride bicycles to their field classes. As Glenda Hanna (1992) states, "This physical activity is a positive reinforcement of active living and a commitment to "green" transportation. Teachers should set a positive role model there." Quality field trips can occur regularly to local



natural areas at little to no cost. Since the visits are less logistically complicated, a teacher can incorporate them into lesson plans in a more logical and fluid manner.

### **TEACHER COMPETENCE AND CONFIDENCE**

Many teachers choose not to incorporate the local natural world into their curriculum because they do not feel competent or confident in their own local natural history knowledge. This is a formidable obstacle for experiential natural history education. Many teachers are not adequately prepared to lead projects in natural history (Roger Tory Peterson Institute 1989). They lack proper training, curricular materials, personal experiences, and the connections to the networks of resources on natural history. Although pre-service and in-service training for natural history education is crucial, it is equally scarce.

The Community Naturalist in the Schools Program can alleviate this obstacle in a number of ways. First, the CNSP coordinator assumes much of the responsibility typically left to the teacher. Once familiar with the class curriculum, the CNSP coordinator can work with teachers to identify what natural history activities will suite their class and then gather and arrange much of the resource materials, resource guides, and naturalist/mentors suitable to the project. Second, through partnerships with the coordinator and other knowledgeable naturalists, teachers can, in essence, gain valuable experience with natural history topics which they can draw from in the future. Ideally, the CNSP combines the instructional expertise of the teacher with the natural history knowledge of the greater community, resulting in powerful learning experiences that help students build a sense of place. The CNSP coordinator provides a teacher close

assistance and gives them an added incentive to explore new units that are rooted in local natural history topics. Finally, in the long term, CNSP would include more formal avenues for teacher training and inservice natural history education providing continuing education credits. CNSP teacher workshops would connect teachers to the array of naturalists and natural history topics in their community. The workshops would be linked to field trips that were designed to familiarize teachers with their local natural history and be exposed to field teaching techniques.

### **CONCLUSION**

In summary, there are many barriers that currently challenge the successful implementation of experiential natural history education programs. Although many of these exist outside of our education system, educators should work to reduce these broader issues through genuine efforts within the formal school system. The Community Naturalist in the Schools Program provides solutions to many of the common obstacles encountered in this education environment. By infusing natural history activities and projects into existing courses, we can encourage a greater understanding of our local natural communities and still pass on the required subject matter for which students are held accountable on standardized tests. The integrated nature of natural history topics will encourage interdisciplinary collaboration between teachers and will provide students with more time in direct contact with nature and with a less fragmented perspective of their world. CNSP emphasizes field trips to natural areas that are close to schools, thereby reducing cost and liability concerns that often cripple outdoor education efforts. And, finally, by building a supportive team of teachers, naturalists, and project

**coordinators, CNSP will increase the competence and confidence of teachers in natural history field studies.**

## **Chapter IV**

### **Piloting the CNSP Concept**

During the fall of 1996 and the winter and spring of 1997, I piloted a portion of the Community Naturalist in the Schools Program. The pilot was designed to implement many of the preliminary concepts presented in this paper in a few secondary school programs in Missoula. This pilot endeavor constituted the heart of my professional paper effort. The CNSP model was largely shaped by lessons learned from this pilot program.

#### **OVERVIEW OF PILOT PROCESS**

The pilot study began with an outreach letter and a survey form sent to approximately 30 life-science teachers at secondary schools and an equal number of naturalists in Missoula. Based upon the responses, I began to work on a one-on-one basis with those who were interested in participating in a pilot run of the program during the Spring of 1997. The Missoula County School District's curricular requirements were reviewed for the select grade levels and subjects with which I might be working.

Natural areas in the Missoula area that might serve as field education sites were evaluated. The newly acquired Mount Jumbo Conservation Area fit the selection criteria, and as a result, I became involved in drafting the areas' management plan. During the management planning process a number of potential projects that secondary school classes might take on were identified. I then worked with teachers to develop a curriculum that suited their classes and fit their time constraints. A group of naturalists

who were involved and interested in Mount Jumbo and could provide their expertise with students in the field were contacted and asked to participate.

The project culminated in a series of spring classroom and field activities that focused on the native plant communities and their non-native competitors on Mount Jumbo. Students were trained to be native plant stewards of the mountain and established vegetation plots that will be revisited each year by school groups and used by Mount Jumbo park managers in their management efforts.

#### **LINKING CNSP WITH THE MONTANA NATURAL HISTORY CENTER**

To ensure that the Community Naturalist in the Schools Program would be effective and functional, it was necessary to link it to a respectable education organization that could grant it some level of permanence. The logical candidate organization in Missoula, was the Montana Natural History Center (MNHC). As an education non-profit based on the University of Montana campus, MNHC had sustained a variety of natural history and nature awareness programs since its inception in 1989. Their affiliation with a host of professors at the University and their strong student-based volunteer support system granted them the resources to conduct a wide range of programs without requirements for an enormous budget. Furthermore, MNHC had a reputation in the community for providing excellent natural history related programs and, as a result, had connections with a variety of naturalists in the greater Missoula community.

The pilot program was run under MNHC's name, and therefore, the outreach materials described below were identified as a project of the Montana Natural History Center.

### **OUTREACH**

Outreach materials were drafted to locate a few secondary school teachers in Missoula who might be interested in participating in a pilot program. These materials consisted of an introductory letter, a draft project proposal, and a brief survey where teachers were asked to respond questions regarding the proposal and then return it to the Montana Natural History Center. Outreach packets were mailed to approximately 30 teachers in Missoula, primarily life science, biology, and physical science teachers. Although CNSP is appropriate for non-science classes, the pilot was narrowed to these subjects to narrow the list of potential projects. A slightly different version of the packet was distributed to local naturalists who had participated in some form of community-level natural history education in the past. Examples of these outreach materials are located in Appendix A of this paper.

These outreach materials made it clear that teachers could largely design projects that met their own particular interests and curricular needs. The success of the CNSP program would be rooted largely in the degree of ownership that participants took in its design and implementation.

Out of the roughly 30 outreach packets sent to teachers, six surveys were returned. Of these six, four teachers indicated a clear interest in participating in the CNSP pilot program. These teachers included two middle school life science teachers and two

high school level science teachers. The Middle school teachers were Robin Kent of Meadow Hill School and Bob Andrews of Rattlesnake School. The high school teachers who responded with interest were Steve Nelson of Loyola Sacred Heart High and Mike Ganser at Hellgate High. After meeting with each of these teachers, it became apparent that only Bob Andrews and Steve Nelson were ready to work on a project that spring. As I discovered later, developing curricula with real-life connections for four teachers simultaneously would have been unrealistic.

Fewer responses were received from local naturalists who were sent outreach packets. Out of the three responses returned by naturalists, all were positive about the program as a whole, but did not show interest in participating in the pilot program. All three of these naturalists mentioned the importance of providing fair compensation to naturalists without a salary to cover for their participation in CNSP activities. Naturalists who were employed by public agencies or universities, for example, may be able to justify their time spent with schools as part of their community service obligation. Others, however, would be contributing their time. These naturalists pointed to a clear flaw in the design of the CNSP: there were no obvious benefits to participating naturalists. In order to sustain a program which required the active input of qualified and dedicated community naturalists, CNSP would have to find a way to make their time worthwhile. Unfortunately, this pilot project did not have the budget to reimburse naturalists for their time. As an alternative, naturalists were solicited who either had a vested interest in a particular project, perhaps one in which students could help, or had salaries that would cover for their time given to the pilot program activities. The handful

of naturalists who assisted in the spring pilot activities fell into one of these two categories.

Naturalists who did end up participating in the pilot program in the Spring of 1997 included John Pierce, a local botanist and member of the Mount Jumbo stewardship committee, Steve Shelly, a Forest Service botanist and Rattlesnake Valley resident, and Jack Greenley, also a Forest Service botanist. Peter Lesica, another local botanist and Rattlesnake Valley resident, provided invaluable assistance in the design of the project's vegetation sampling methodologies.

#### **FIELD EDUCATION SITES**

Missoula has a wealth of nearby places that are still relatively wild and open to the public. These sites range from the large, federally managed forests just outside of town, such as the Rattlesnake and Blue Mountain Recreation Areas, to the fairly small city parks and open spaces, such as the Garden City Islands and Greenough Park. All of these natural areas present unique educational opportunities for Missoula city schools. The map presented in Figure 1 locates some of these local wilds and illustrates their proximity to Missoula's secondary schools. As discussed earlier, I chose to focus the CNSP field activities in these local natural areas because their access makes it realistic for school groups to visit them on a regular basis. The sites shown in Figure 1. were distinguished from other open space areas and public parks because they contain some native habitats and are, at least to some degree, managed to allow for natural processes. In contrast, parks that are actively mowed, landscaped, or farmed were not shown because they do not present opportunities for studying natural ecosystem processes and habitats



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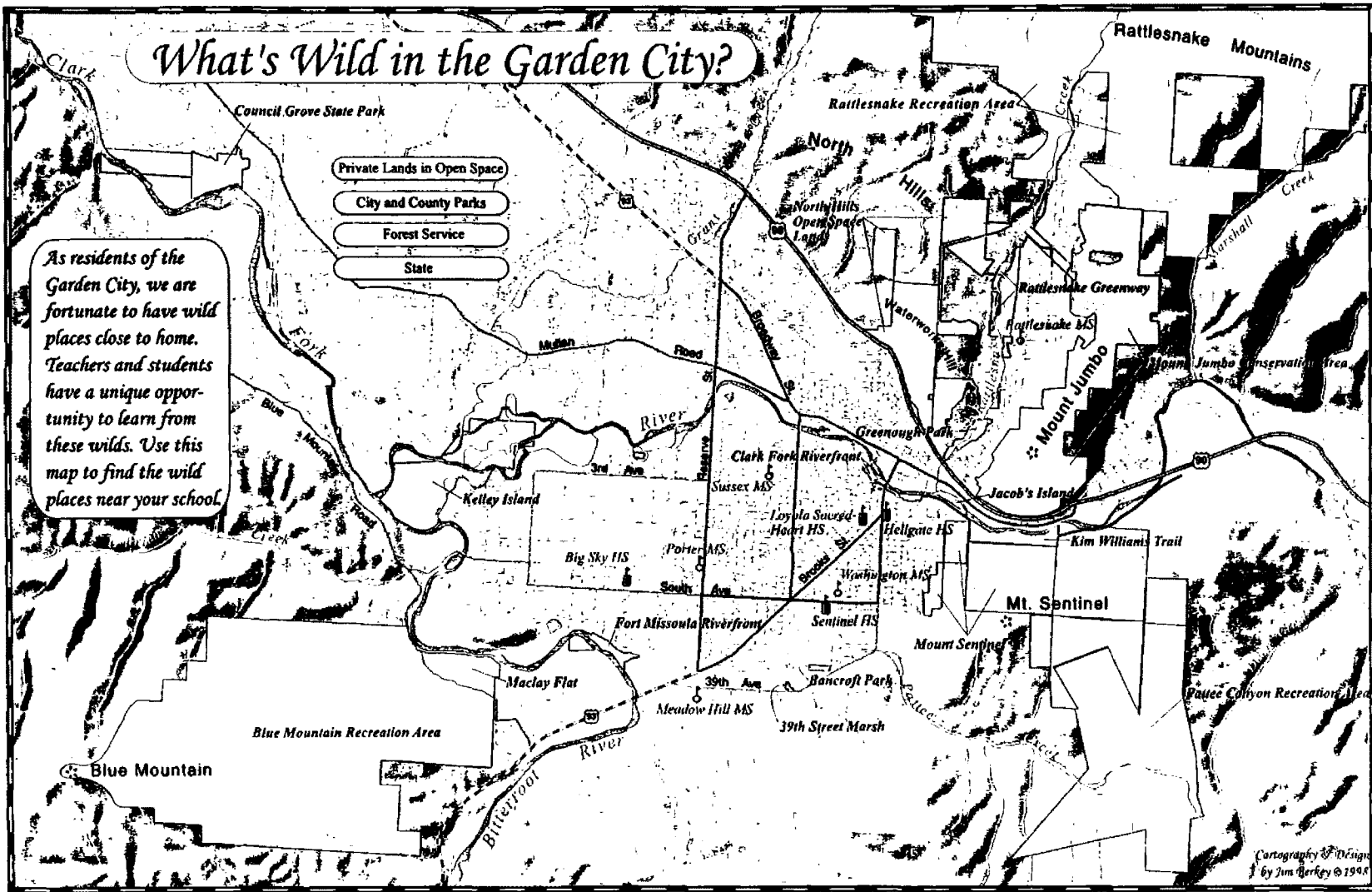


Figure 1. Natural areas accessible to the public near Missoula

native to western Montana. Of course, all of the natural areas shown in Figure 1 are, to some degree, effected by the human population in Missoula. All of these areas, however, provide a glimpse of wild native habitat, and can also provide ideal restoration related stewardship opportunities for school groups.

I further refined my list of possible educational field sites by determining which of these areas were 1) close to the schools from which the teachers had responded, 2) associated with an issue that concerned the greater community, and 3) of interest to local naturalist who might be able to assist in natural history education. The recently acquired Mount Jumbo Conservation Area, managed by the City Parks and Recreation Department, met all of these criteria and also interested the participating teachers. Consequently, my focus turned to Mount Jumbo.

#### **MOUNT JUMBO: LINKING MANAGEMENT WITH EDUCATION THROUGH STEWARDSHIP**

As a member of the Mount Jumbo Stewardship Subcommittee, I quickly saw the potential to link experiential natural history activities in school groups with the stewardship related goals identified by the draft Mount Jumbo Conservation Area Management Plan. Chapters of this draft plan proposed an ambitious agenda that included visitor education programs, trail maintenance and stabilization projects, and native plant community maintenance and restoration. Moreover, there was a general understanding amongst committee members that public involvement in both drafting and implementing the management goals was critical to community ownership and support of the management plan.

Bob Andrews, Steve Nelson, and I decided to work on a project that would involve their students in the restoration of native plant communities on Mount Jumbo. The maintenance and restoration of native grassland plant communities promised to be a management goal that would stimulate interesting projects for school groups. The management plan proposed establishing several demonstration or test plots on Mount Jumbo where a variety of experimental weed control techniques would be applied on a limited scale. If any of these treatments were deemed successful, they would be applied to larger areas of the mountain. These demonstration plots were going to be very labor intensive, and would need an organized group of volunteers. From an education standpoint, grassland restoration plots were fertile ground for studies in life sciences; students could learn about local plant communities, scientific methods, and how studies such as these often lead directly to management decisions.

Bob Andrews intended on including this as part of his seventh grade life science class at Rattlesnake Middle School, while Steve Nelson would involve his eleventh and twelfth grade students who were members of Loyola's environmental club. Both teachers provided feedback on what they thought would be appropriate for their students and from this we constructed an outline of spring events.

### **CURRICULUM DEVELOPMENT**

In order to facilitate the infusion of this project into the regular school curriculum, the science curriculum guidelines set forth by Missoula County School District's Department of Curriculum were reviewed. Through this review, it was determined that a Mount Jumbo curriculum could either partially or completely satisfy thirteen of the

eighteen “Standards of Learning Objectives” set forth for seventh grade life science classes. Only the sections on human physiology, genetics, and development and cellular structure were not covered by the Mount Jumbo curriculum. Although slightly more restrictive, at least twelve of the twenty “Standards of Learning Objectives” for high school biology could also be covered by a Mount Jumbo stewardship curriculum.

Taking these district learning objectives into consideration, a curriculum was designed that guided students through five different modules designed to stimulate local natural history awareness and knowledge and involve them in ongoing community-based stewardship and restoration projects on Mount Jumbo. The development of this curriculum was, in part, guided by a high school curricula developed by the National Park Service and the California Native Plant Society entitled “Creating Community A Curriculum for the Future” (1996). This curricula was designed to engage high school students in San Francisco’s Presidio neighborhoods with habitat restoration efforts at the Golden Gate National Recreation Area. The Presidio curriculum combined classroom activities with hands-on restoration field projects through a full school year program and a full cycle of seasons at the Presidio.

Although not as comprehensive as the Presidio’s, the Mount Jumbo stewardship curriculum would guide the pilot effort during the spring and provide a template that could be used in the future. This draft Mount Jumbo stewardship education curriculum was reviewed by both participating teachers. A version of this curriculum is located in Appendix B of this paper. These teachers were encouraged to shape the curriculum into something that excited them and that was appropriate for their students.

## ORGANIZING COMMUNITY NATURALISTS

Community Naturalist and Volunteers were recruited from the Mount Jumbo Stewardship planning groups, the Clark Fork Chapter of the Native Plant Society, and the University of Montana student body.

A group of four college students enrolled in the year-long Wilderness and Civilization Program at the University of Montana were eager to help. They had obtained a mini-grant from the university to conduct middle and high school presentations, but had not chosen their topic. These students were trained to assist with the introductory classroom presentations on Mount Jumbo and Missoula's open space system.

Only one naturalist from the Mount Jumbo stewardship committees, John Pierce, participated in the field efforts on Mount Jumbo during the Spring of 1997. As the chair of the vegetation working group, John understood the need for volunteer assistance in vegetation restoration efforts on Mount Jumbo. John was unable to attend most of the field trip outings with students. He did meet with me in the field to pass on some of his knowledge of the local flora. Other local botanists who participated included Steve Shelly, Jack Greenley, and Peter Lesica. Between John Pierce and Steve Shelly, I was tutored on the ecology and identification of the native flora on Mount Jumbo to the extent where I was comfortable leading botanical investigations with secondary students without any assistance. Jack Greenley participated in the spring field activities with students, whereas Peter Lesica provided assistance in vegetation sampling methods.

Without strong support from community naturalists, I found myself diverging from the CNSP model, where students would learn from naturalist mentors. Instead, I assumed not only the role of the coordinator but also the naturalist.

### **SPRING EDUCATION ACTIVITIES**

The native plant stewardship curriculum template was designed to take approximately three months and include alternating classroom and field activities. This curriculum would guide students through Missoula's open space system, Mount Jumbo's conservation history and issues, the general ecology, plant species, and communities on Mount Jumbo, and then, finally, into collecting baseline data to describe plant communities within future demonstration plot areas. Unfortunately, two main factors resulted in condensing the time frame for this education agenda down to about a month. The first factor was that spring came unusually late for western Montana in 1997. Snow drifts still covered much of the field area on Mount Jumbo until the end of April. Consequently, the plant communities were really not "greening up" on Mount Jumbo until early May. The second and more overbearing factor that controlled the time frame was that both teachers had difficulties scheduling the field trips with their classes. Field trips were rescheduled and dates adjusted an average of five to six times for both school groups. Consequently, field activities continued to get postponed and pushed back later in the season. This presented a significant problem for coordinating with participating community naturalists. As field trips were postponed, some naturalists who had committed to a field trip could not find the time to reschedule. This resulted in a

reduction in the overall number of community naturalists who interacted with student groups.

Despite these difficulties, we were able to lead both of these school groups through the three main learning activities described in the outline in Appendix C. The college students from the Wilderness and Civilization program helped present an introductory talk to participating classes. An outline for a version of this presentation is located in Appendix D.

Secondary school students were then led up onto Mount Jumbo, where they were introduced to the general ecology of grassland habitats and begin to learn how to identify the native and non-native plants. This 3 hour afternoon field trip was broken into a journaling/orientation section, a discussion on how the various member of the habitat fit into the trophic system for this ecosystem, and a plant identification section. Bob Andrews of Rattlesnake Middle School, decided it would be easier to get approximately eight of his students to participate in this initial field trip on Jumbo. These students would, in turn, become team leaders who guided their peers through the identification and sampling of plants during the next field season. The eight students that Bob Andrews chose were those who had excelled in their sixth grade wildflower unit, were highly motivated, and quickly learned the plant species.

For both school groups, the project culminated in two field days of plant sampling conducted in areas chosen by John Pierce. These were regions on Mount Jumbo that were easy to access, still had viable native plant communities, and were being invaded by an aggressive non-native plant species. Because of the larger size of the Rattlesnake



Middle School group, they were assigned a large region on Mount Jumbo's Saddle which has a relatively high density of Spotted Knapweed (*Centaurea maculosa*) amidst a still viable native plant community. The other field site was located immediately above the Lincoln Hills subdivision in an area heavily infested with leafy spurge (*Euphorbia esula*). The Loyola High group worked on this site during their field studies. Both spotted knapweed and leafy spurge are listed as a Category I Noxious Weeds in the state of Montana, and are target species for control under the draft Mount Jumbo Management Plan.

In order to streamline the data collection process for these two groups, a handout was developed that led students through the plant sampling methods and a data form was provided for students to record vegetation information from plots. Samples of both the methods handout and the data forms are located in Appendix E of this paper. These methods were significantly different from those initially proposed in the draft management plan, but promised to be more effective in collecting information useful in subsequent restoration efforts.

At the end of the second day of field sampling, students broke into analysis teams and calculated some relatively simple summary statistics on the plant communities inventoried. Native plant diversity and non-native plant species density were calculated for each plot after which the groups compared results. This was followed by a discussion of how this information would be used by land managers to mark the progress of vegetation restoration efforts each year.

## SUMMARY

Through the course of approximately eight months of planning, design and countless meetings, the CNSP pilot effort culminated in a series of natural history field activities related to the stewardship of the Mount Jumbo Conservation Area. Although many compromises were made along the way, an education program was initiated between a few Missoula secondary schools and a community issue: the Mount Jumbo area management and native plant communities. The program promised to continue with MNHC taking the lead in Mount Jumbo education efforts and with the stewardship committees' understanding for the need for both public support and volunteer help.

As of this writing, the 1998 Spring field season is warming up with at least three school groups participating in the stewardship curriculum. Both school groups involved in the pilot study will be involved again this season. Moreover, the Mount Jumbo Management Plan may be approved as early as this June, leading to an increase in the number of field activities possible. This year, I have contracted with MNHC to develop a secondary school teachers guide and curriculum and lead school groups onto the mountain. It is my hope that the link between Missoula schools and the stewardship of Missoula's open space areas will continue to grow and strengthen. Therein lies great potential for excellent experiential natural history education opportunities and stronger links between schools and the greater community.

## **Chapter V:**

### **Assessment & Recommendations**

In this chapter I provide an assessment of the CNSP pilot and recommended modifications to the CNSP model. The assessment will be based on the evaluations given by the teachers who participated in the pilot and on my own evaluation of how successful the pilot was in achieving its initial goals. In response to this assessment, recommendations are offered to improve future CNSP efforts.

#### **ASSESSMENT OF THE PILOT STUDY**

In order to assess the effectiveness of the CNSP pilot study, let us first briefly revisit the main goals of the project. As summarized in the CNSP Proposal, the project goals were:

1. To engage students in learning activities that involve direct experience with the local community and natural environment; and
2. To provide experiential and inquiry-based learning environments that stimulate curiosity and care for local landscapes and issues.

The pilot study was conducted to implement one of the strategies suggested in the CNSP Proposal: initiating partnerships between teachers and naturalists in order to stimulate place-based natural history education.

#### **Feedback from Teachers**

To evaluate the effectiveness of CNSP, participating teachers were interviewed during the fall of 1997. These interviews were conducted by asking each teacher a series

of questions that closely followed the initial questionnaire they had completed at the onset of the project (see final interview questions Appendix F). What follows are some of the responses offered during these interview sessions.

When asked to summarize his experience of CNSP, Bob Andrews had these remarks:

I think the project was really positive because it tied into my life science curriculum perfectly. It helped [my students] build their self esteem in terms of their community and their ability to work and participate in a project that meant something to them and their community. (paraphrased)

In addition to these remarks, Mr. Andrews indicated that many of his students have asked about the project and are eager to find out how their data were being used in management efforts on Mount Jumbo.

Although not part of his curriculum, Steve Nelson thought that the program really helped his students see the connection between lifestyle choices and impacts to native ecosystems. Two of his students were intrigued by the science of biologic control agents and intended on working on this subject for an advanced biology class.

Both Bob Andrews and Steve Nelson thought that the program brought in a 'sense of relevancy' to their curriculum. As Bob said, "The only time you buy into something is when you actually do it." Both teachers also felt strongly that it is important to bring the community into the school as often as possible.

These teachers thought that the program would have a greater success in infusion into the curriculum if they were presented with the project opportunities earlier in the academic season and allowed time to prepare students for the field activities. They

thought that CNSP would have more luck involving more teachers if MNHC built an arrangement with them slowly over a school year. Bob Andrews suggested circulating a list of potential projects to teachers, one that they would evaluate and fit into their curriculum where feasible. Bob Andrews also thought that CNSP would have more success scheduling field activities if teams of teachers worked on the project together. He thought that this would provide more time for the full curriculum to be implemented and would allow for a richer interdisciplinary experience for the students.

Overall, both teachers considered the program a success and are eager to begin another spring field season with their students on Mount Jumbo. Based on feedback received via these interviews, the pilot study did indeed stimulate student curiosity for the local natural world through activities on Mount Jumbo

### **Personal Assessment**

Although the project received shining evaluations from both participating teachers, I believe the CNSP pilot fell short of fully realizing its goals. From my observations, the CNSP Pilot engaged students in direct experience with their local community and natural environment, but only for a brief time near the end of the school year. Furthermore, during this brief time, students were not exposed to many community members. These shortcomings can be attributed to problems with two key strategies: 1) CNSP activities were not successfully infused into the curriculum, and 2) CNSP did not find community naturalists who were committed to working with teachers and students. Although I strove to implement both of these strategies, I was not able to overcome some of the more significant barriers that challenged these efforts.

### *Curriculum Infusion*

For both school groups, the Mount Jumbo stewardship activities were extracurricular. In other words, students were exposed to the stewardship curricula outside of their regular class studies. As a result, students were only exposed to the stewardship activities for a limited time. These time limitations, in turn, restricted the depth and breadth of the natural history curriculum. If experiential natural history education has to compete for time blocks and priority with the required curricula, it will always be limited to these rare free time slots.

I had initiated contacts with teachers early in the school season with the intention of working experiential natural history activities into their spring curriculum. The teachers who responded to the CNSP survey were open to the curriculum infusion concept, but never became willing to take the risk of disrupting their course by infusing CNSP.

What prevented the CNSP pilot from being infused into the existing curriculum? A number of factors contributed to this shortcoming. First, even though I thought the teachers had been approached early enough in the year, for most teachers, their curriculum plans were already set. Second, the duration of the pilot program was not long enough to cultivate the trust and collaborative spirit necessary for teachers to willingly take risks and change their teaching plans. Third, since the project worked through individual teachers, rather than teaching teams, there was less freedom and flexibility in scheduling natural history field activities. Finally, the CNSP pilot only represented the first steps in the extensive process of finding teaching partners, establishing trust, and creating a

program that modeled the benefits of such an educational approach. The true success of CNSP would come through time, persistence and patience with the education community.

In summary, although both student groups were involved in experiential natural history projects, they were not immersed in these projects long enough to gain a strong connection to the land or their community. The CNSP pilot has taken the first step towards realizing more consistent, locally relevant natural history studies in Missoula's secondary schools.

### *Recruiting Naturalists*

One of CNSP's primary goals is to get students interacting on a more regular basis with members of their community who are knowledgeable about their more-than-human-world. Through this interaction, students can find role models that may help them become more aware of their broader community. By selecting Mount Jumbo, a field area at the center of so much discussion, interest, and debate in the community, I did not expect to have difficulty finding naturalists to participate. Over the course of developing the pilot program, I interacted with a diverse range of knowledgeable community members who were potentially valuable resources for Mount Jumbo education. At the end of the spring field sessions, however, only two naturalist (not including myself) had interacted with participating students. Why then did the CNSP pilot not successfully recruit more community naturalists?

Although many of the reasons for a low naturalist turnout are discussed elsewhere in this paper, I will briefly summarize them here. First, some of the most talented and knowledgeable naturalists in the Missoula community are being over-utilized as

volunteers. These individuals are becoming exhausted and disillusioned as a result of their generosity. Second, many of these naturalists cannot afford to contribute their time and expertise without being fairly compensated. Third, community naturalists who have regular occupations find it difficult to schedule field trips in the middle of the day. Finally, many of these naturalists are not teachers. These naturalists either lack the experience of working with kids that would build these teaching skills, and/ or lack the confidence to immerse themselves in a new education environment.

As a result of the low turnout, I assumed much of the role of the community naturalist. Through my involvement in the project, I became versed in a number of aspects of the Mount Jumbo stewardship agenda, including the management planning process, the ecology of native and non-native plant communities on Jumbo, weed control techniques, vegetation sampling, and the identification of native plants of the mountain. This incidental training allowed me to facilitate the education activities with confidence. Yet, my guidance most likely lacked the depth and wisdom that might be imparted by more long-standing members of the community. Furthermore, it is unrealistic to expect the CNSP coordinator to also act as teacher and naturalist to more than, perhaps, two school groups at any time. Consequently, a different strategy would have to be employed to encourage more community participation in stewardship projects.

### **RECOMMENDATIONS**

Based on this assessment, I have developed a series of recommendations for future CNSP efforts and similar programs. These recommendations are organized to address the two main shortcomings of the pilot discussed in the previous section.



### **Encouraging Curriculum Infusion**

In order to successfully infuse natural history projects, education consultants such as MNHC, will have to work with schools over successive years to develop curricula that include experiential nature study. This will require persistent outreach efforts in order to build partnerships with schools and teachers. It will also require collaboration between consultants and teachers to establish shared goals that will satisfy the needs of teachers and build a solid foundation of trust.

With a limited staff and a full plate of educational commitments, however, the Natural History Center will need to allocate funding to pay for a coordinator's time and program expenses. Once on board, the coordinator would develop a task force of teachers, parents, naturalists, and other interested parties who would co-create CNSP's short and long term goals. These goals may include a list of stewardship project ideas, teacher training programs, the development of a natural history education directory, and outreach strategies for involving naturalists, schools and other contributors.

As in the CNSP pilot effort, outreach efforts will, at first, connect with a small population of teachers who are willing to take risks and who see the potential benefits of natural history projects. By working with these teachers, programs such as CNSP will refine strategies and establish a good working model that demonstrates the potential benefits to others in the education community.

In order to recruit a wider sector of teachers into CNSP, efforts should be made to educate and empower teachers with natural history knowledge and teaching skills. This will not only create more effective teachers, but will build the confidence necessary to

take risks and stretch the curricula to include more out-of-classroom natural history activities.

I recommend that this teacher training occur through the development of curriculum and teachers guide which are then introduced to teachers in workshops and field trips sponsored by groups such as MNHC. The curriculum should be place-based and include regular field visits to local natural areas. It should also move in a progression from initial awareness and perception to action through community-based stewardship projects. The teachers' guide should contain sections specific to each natural area which are either close to schools or offer exceptional learning opportunities. These guides should be linked thematically so that teachers can visit a variety of sites during a curricular unit. The guides should include information on the natural history of the site (habitats, organisms, human history, seasonal events, etc...), field maps, logistical information, suggested activities and community based project ideas, and a list of community resource people associated with the area.

Groups such as MNHC could then coordinate workshops with teachers in order to introduce this place-based curriculum. The workshop format would model a field-based experiential education approach. Workshops would be based largely in the field, and connect teachers with naturalists who may be willing to participate with their classes in the future. In order to receive continuing education credits for their involvement in the workshops, teachers would be asked to adapt the curriculum they receive in the workshop to their particular class, write up this new unit, and implement it within the next academic year. By taking the template created by MNHC and adapting it to their

own particular interests and their class's focus, these teachers will have more ownership of the natural history curriculum and will be more likely to use it regularly in the future

Furthermore, these initial curricula, guides and workshops should all be developed through collaborative efforts between education consultants, teachers, students, parents, and community naturalists to ensure that this process generates a collective ownership and interest. By working with administrators and teachers to gradually infuse experiential natural history into the curriculum educators will ensure that these experiences occur frequently and are relevant to the standard curriculum.

Finally, the stewardship curricula should be strongly rooted in the seasonal cycles of the local landscape. If the curricula applies directly to the subtleties and events of the seasons, it will encourage teachers to implement it throughout the year. Using the Mount Jumbo Stewardship curriculum as an example, curricula in mid-winter might focus on animal adaptations, elk behavior, and winter folklore. Even in cold and snowy winter conditions, CNSP should encourage field trips to study the natural history of our winter landscapes.

### **Recruiting Community Naturalists**

In order to involve an active cadre of community naturalists, MNHC will have to provide these people with a variety of incentives.

The first and perhaps most obvious incentive MNHC could provide would be to pay these individuals for their time. This would justly reward them for their skills and encourage them to take more time for natural history field education with school groups. Fund raising efforts for CNSP and similar programs should budget for generous naturalist

stipends. MNHC should also communicate these intentions to the network of community naturalists, so that they become more responsive to the idea of participating in future projects. Unfortunately, one cannot rely on grants and other sources of 'soft' money indefinitely to fuel such education endeavors. As members of non-profit organizations know only too well, programs must become self-sustaining so that they do not continually drain the organization of time and energy for the fund raising process. Once teachers and parents see the benefits of CNSP programs, they should be encouraged to find their own funding sources to pay for naturalist stipends and other associated project costs. Revenue can also be generated from fee-based programs that work with a broader segment of the community in public education efforts. Furthermore, if CNSP activities lead to stewardship projects that accomplish goals identified by city land managers or other public land managers, these managers should support this form of education and community service by including funds in their budgets earmarked for these purposes.

Another tactic that may encourage naturalists to participate would be to find naturalists who need help with specific projects. If these naturalist can benefit from a student work force, perhaps they will be more willing to interact with and train these students. This will require time to connect with naturalist and understand how a partnership in education can be most beneficial to their work. Since many naturalists are not teachers, groups such as CNSP should also provide naturalists teaching workshops that expose these people to engaging and interactive teaching methods.

Even with increased incentives for naturalists to participate, we must accept the fact that there are a limited number of skilled naturalists in any given community. In order to ensure that students are provided community mentors, efforts should be made to train other community members to be naturalists in the schools. For example, an existing network of naturalists could be paid to lead a naturalist training program for interested community members who would then be certified as docent naturalists. This would create a cadre of docent naturalists who would participate in stewardship projects at local schools. It would also provide the additional benefit of involving a broader segment of the community in both natural history education and stewardship projects based at the schools.

#### CONCLUSION

This pilot study provided invaluable information by testing many of the concepts and strategies of the Community Naturalist in the Schools Program. Although the pilot can be judged a preliminary success, modifications will be necessary to successfully infuse natural history into the school curricula and involve more community members in the process of education. Fundamental change in our education institutions will come slowly, and only as a result of the persistent efforts of broad-based coalitions representing the diverse education community and beyond. As the status quo of our education institutions gradually shifts to accept more experiential natural history education in school curricula, it will be necessary to constantly evaluate our goals and the strategies used to achieve these goals. Through these means, we will develop thriving communities, where a common sense education cultivates a rich knowledge of the home

place and where people work together to ensure that these places are treated with the respect and care they deserve.

## **APPENDIX A: Outreach Materials**

**The following pages contain the CNSP outreach materials sent out to approximately 30 secondary school teachers in Missoula. Included are 1) a cover letter, 2) a preliminary project proposal, and 3) a survey form. Similar materials were sent out to an equal number of naturalists in the Missoula region.**

Dear Missoula school teacher,

Providing more field activities for students is something that may interest you as a teacher. I have an idea that could make that easier for you. Enclosed is a preliminary proposal briefly describing a new project sponsored by the Montana Natural History Center (MNHC). The Community Naturalists in the Schools Project (CNSP) would create a network of community naturalists and secondary school teachers who collaborate on experiential natural history activities that are compatible with existing curricula.

The first stage of the Community Naturalists in the Schools Project involves reviewing your needs and opinions so that the project can become more realistic and useful to you. I am enthusiastic about the CNSP and send you this preliminary proposal in hopes of receiving your constructive feedback. I greatly appreciate your time reviewing the proposal and completing the brief survey. Please feel free to offer any additional comments you have regarding this project.

Please return your completed questionnaire and any comments to: **Jim Berkey, 1629 Defoe St. Missoula, Montana, 59802 (406) 543-8195**

Thank you very much for reviewing this proposal. Your input is crucial for making the CNSP worthwhile to both schools and community members in Missoula.

Sincerely,

Jim Berkey  
Masters Student  
Environmental Studies Department, University of Montana

## **Community Naturalists in the Schools Project; Preliminary Proposal**

The Community Naturalists in the Schools Project (CNSP) will connect local naturalists with secondary school teachers and students. This project will encourage teachers and naturalists to collaborate on topics and curricula that emphasize local place, hands-on experience, and community issues. An Environmental Studies Masters student at the University of Montana will work through the Montana Natural History Center (MNHC) as the formal liaison between community naturalists and school teachers. This student will implement a pilot study to assess the needs and interests of naturalists and teachers and will organize efforts towards building partnerships between these groups. Based on the pilot study and the continued input of community members, the CNSP will be designed to accommodate the needs and visions of both naturalists and teachers.

Here are *some* of the ways that CNSP could connect students and teachers with local naturalists.

1. provide a clearinghouse of projects sponsored by local naturalists that can be pursued by local school groups
2. create and distribute a directory of local naturalists and teachers listed according to areas of expertise
3. organize weekly talks given by local naturalists and offered at secondary school campuses\*
4. coordinate field trips led by local naturalists that focus on relevant community issues and/or specific natural history topics\*

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\* Teachers could receive continuing education credits for participating in these activities.

### 1. Partnership Project:

The CNSP Partnership Project would enliven existing curricula and, in turn, help students become more informed about their local ecologies, landscapes, and communities. The Partnership Project would solicit project proposals from community naturalists and then search for appropriate local school groups that could pursue these projects as part of their required coursework. These projects would allow students to apply concepts that they are learning in the classroom to locally relevant activities. Through CNSP, teachers could consult with experts within the community to identify local areas and issues that are germane to their coursework. Once a partnership is formed, both teacher and naturalist could then collaborate to develop activities to enrich the course and involve the students. Curricula stimulated by the Partnership Project could range in scale from a one class period activity to a semester long study that yields a service to a community interest group. Community naturalists may choose to either take on the responsibility of project facilitator, or simply to help a teacher design an activity pertaining to their area of expertise. At the very least, these



curricula would involve an out-of-classroom experiential component, and would be compatible with existing curricular standards.

We hope to attract a preliminary group of community naturalists and teachers for a trial run of the CNSP Partnership Project concept. These partnerships will be organized this Fall so that activities can be carried out during the Winter of 1997. Based on the results of these initial collaborations, the project will be modified and pursued at a larger scale.

## 2. CNSP Directory

CNSP would create a directory of naturalists and other natural history resources to circulate to Missoula area teachers. This directory would encourage teachers to contact naturalists and design natural history-related activities.

## 3. CNSP Seminar Series

Designed to keep teachers informed about local issues and local natural history topics, the CNSP Seminar Series would be offered at regular intervals throughout the school term. These seminars would be scheduled at appropriate time slots during the school day, and offered on the school grounds. There, teachers would be able to obtain locally relevant information that could prove useful in their classes.

## 4. CNSP Field Trips for Teachers

CNSP would coordinate field trips to local natural areas or sites relevant to community issues. Led by competent local experts, these field trips could serve as continuing education for teachers while providing them with ideas on field trips and activities they could lead with their own classes.

### **Project Goals:**

1. To engage students in learning activities that involve direct experience with the local community and natural environment.
2. To provide experiential and inquiry-based learning environments that stimulate curiosity and care for local landscapes and issues.

### **Background:**

In order to prepare students for capable citizenship in today's complex communities, school curricula must provide learning experiences that are rooted within the local culture and community. The Community Naturalist in the Schools Project strives to bring local community issues into the classroom via community mentors who sponsor service projects, field trips, and other activities. This Project will help bridge the gap between abstract academics and real community life.

Human activities have a profound effect on the local landscape. As land-use issues become more critical in Western Montana, it is essential that schools provide students with both an introduction to their local natural systems and how their lifestyles affect them. Such curricula will provide students

with an awareness that encourages informed decisions and improves their problem-solving skills. The CNSP will highlight how humans and natural systems interact. Students will have the opportunity to learn and apply basic concepts introduced in classrooms through direct experience with their own community.

### **Why Natural History?**

The study of natural history provides an ideal bridge between classroom studies and community-level studies. The stories of the local community (including: humans, flora, fauna, landscapes, etc...) can be told through activities in science, history, art, literature, writing, or public policy. Topics in natural history can be easily infused into many classes currently taught in public schools and can stimulate interdisciplinary approaches. By engaging in cross-curricular studies in natural history, students are provided a broader perspective of their place within the landscape of home.

### **Why Missoula?**

Missoula is an ideal location for such a project. Numerous easy-to-access local natural areas provide schools with outstanding opportunities for natural history field activities. Land use issues pertaining to these wildland/urban interfaces concern of a variety of community interest groups. In addition, the greater Missoula area is home to a wealth of knowledgeable naturalists who have spent significant time either conducting research, consulting with land managers, and/or educating people about these local natural lands.

**Community Naturalist in the Schools Project  
Preliminary Survey**

In order for the Community Naturalist in the Schools Project (CNSP) to be useful for you, we first need to identify your needs and interests. Please take a few minutes to respond to these questions regarding the preliminary CNSP proposal. Feel free to include additional comments on the back side of this form. Your participation in this preliminary assessment is greatly appreciated!

Have you worked with naturalists or other community experts in your classes before? If so, briefly describe the nature of your involvement. Was this a positive or negative experience?

Briefly describe the nature and degree of interest that you have in working with naturalists on curriculum topics relevant to your classes.

What would be the greatest obstacles for integrating locally relevant natural history activities into your classes?

Can you suggest ways of improving CNSP so that it fulfills your needs and interests as a teacher?

Would you be willing to participate in the Community Naturalists in the Schools Project? If so, at what capacity?

Would you be interested in participating in a trial run of the CNSP Partnership Program this Winter? If so, what type of project would be compatible with the classes you will be teaching?

**Do you currently use the internet as a tool for obtaining information? What kinds of resources would be useful for you on a Montana Natural History Center Web Page?**

## **APPENDIX B: Draft Stewardship Curriculum**

### **Overview of Mount Jumbo Stewardship Education Curriculum for Secondary Schools**

#### **Objective:**

The Mount Jumbo stewardship education program is designed to stimulate the natural history awareness and knowledge of Missoula secondary school students and involve them in ongoing community based stewardship and restoration projects on Mount Jumbo. Students will learn integrated skills in ecology, botany, drawing, writing, and problem-solving to achieve an understanding of the importance of biodiversity and to cultivate a sense of stewardship and community.

The curriculum is designed for secondary school classes within reasonable traveling distance to Mount Jumbo and will engage students in hands-on learning activities suitable for each season. The curriculum can be tailored to meet the curricular objectives and match the learning environment of individual class groups. Participating school groups will provide a coherent education-oriented stewardship work force that will play a key role in implementing the stewardship objectives within the Mount Jumbo Conservation Area Management Plan. In this way, school groups will be immersed in a rich education program and participate in a dynamic community service project.

#### **Overview of Modules**

This Draft Curriculum is divided into five modules. Each module consists of a lesson plan that includes both classroom and field activities. The modules guide the curriculum through the concepts and skills related to grassland restoration stewardship. These modules are:

- Biodiversity and Stewardship
- Plant Communities on Mount Jumbo
- Native and Non-Native Plant Species on Jumbo's Grasslands
- Inventorying and Monitoring Techniques
- Restoration and Stewardship Techniques

#### **Module I: Biodiversity and Stewardship**

##### ***Introductory field trip to Mount Jumbo -***

**Objectives** - Visit and identify the major habitats found on Mount Jumbo, discuss their importance to native plants and wildlife, introduce and discuss the concept of open space areas in an urban setting. Work on observation skills and field journaling techniques. Discuss the worldwide loss of habitat and biodiversity.

##### **Activities**-

a) Field Journaling- use journals to describe habitats and then share with group (back to back drawing, Kim's game, habitat report).

b) Patterns in the landscape - break into teams that discuss the patterns they see in the landscape of Missoula (as seen from up on Jumbo) and focus specifically on the presence or absence of native habitat.

c) group discussion on habitat in Missoula. Where is it? Who is it habitat for? What effects it? How can we be good neighbors?

### ***Slide show-Students, Stewardship and Sustainability***

Objectives - Introduce Missoula's Open Space Plan and Mount Jumbo conservation efforts. Review importance of habitat for biodiversity and importance of biodiversity for ecosystem function. Discuss the need for stewardship of these conservation open space lands to restore and maintain the native habitat. Introduce possible stewardship projects.

Activities -

a) slide show

b) role play - mock town planning meeting

### ***Field Trip to Jumbo - Grassland Ecosystems of the Mountain***

Objectives - Students will practice their observation skills by acquainting themselves with the diversity of species found in the grassland community. Explore the concept of trophic levels and nutrient cycling. Establish familiarity with plants and animals of Mount Jumbo.

Activities -

a) Trophic detectives - break into groups of three and have students choose an organism, describe it as completely as possible in their journals (include where it is and what is around it and where it tends to occur) then ask students to place it on the trophic level chart provided. Groups share with the class what they have discovered. Finally, we assemble a master trophic chart for the grassland ecosystem.

b) Asking Questions/Creative Writing - divide the group in half (can be by student choice). One half works in small groups and comes up with some questions related to their organism that may be answered through direct study. The other half writes haiku in response to their organism.

### **Module II: Plant Communities on Mount Jumbo**

Students will be introduced to concepts in community ecology and what controls plant species presence and distribution. Students will learn basic plant anatomy and learn how to use basic tools to identify and selectively collect plant samples.

#### ***Introduction to Plant Community Field Trip***

What is a plant community? How do members interact? What do they share in common?

How do plant communities correspond with soils, slope and aspect, distribution of water, etc...

#### ***Visit the Rattlesnake Herbarium and Construct Plant Press***

Discuss ethics of collecting and when it may be appropriate. Assemble a group plant press.

***Field Trip: Using a simple plant key and hand lens***

Learning the common members of each community. Work in small groups to identify and press a few plant species.

Which communities are more species rich? Which are more structurally diverse.

**Module III: Native and Non-Native Plants on Jumbo**

Students will be introduced to the history and ecology of invasive non-native plants in Montana. They will learn about the hazards these species present to native ecosystems how native plant communities can be made more resistant to invasion. They will learn to identify the main noxious weeds present on Mount Jumbo.

***Watch Montana Weed Project Video and then have discussion***

Learn the history of invasive weeds in Montana and why they are a problem for native ecosystems and biodiversity. Have samples or slides of the most common weeds on Mount Jumbo.

***Field Trip: Where have all the natives gone?***

Who is native and who is not in this plant community - what does this mean?

Review the problems with non-natives in an ecosystem. Discuss the trophic and food web concepts in light of non-native species.

Learn to identify main noxious weeds in their spring growth form.

**Module IV: Inventorying and Monitoring Techniques**

Students will be introduced to plant community inventorying and monitoring. They will acquire skills that will help them describe and quantify changes to plant communities over time.

***Class session on Inventorying/Monitoring***

What is an inventory and why conduct one? Good stewards have to know what is there and how it changes over time. Tools and skill for inventorying (reading maps, using a compass, taking good field notes, etc.) Perhaps bring in some introductory GIS concepts.

***Field Trip: Practice plant inventory/mapping techniques***

Practice inventorying techniques discussed in class. Trial run of plant community mapping methods.

***Introduction to Sampling plant communities***

Classroom activity with sampling

***Field Trip: Using transects and microplots to sample plant communities***

Set up trial plots and have students sample. Teams then switch plots and find how similar their results are.

**Module V: Restoration and Stewardship Techniques**

Students will be exposed to the complex issues associated with the management of areas with invasive non-native plants. Each school group can adopt a demonstration plot where they work with a community mentor in applying a weed control/ native plant restoration technique

***Classroom session on weed control techniques.***

Introduce Montana State noxious weed laws. Discuss pros and cons of various techniques

Conduct a mock weed task force meeting to explore issues.

***Field Trip: Establish experimental plots for class teams***

Students will work with community members on Jumbo's committees to establish demonstration plots and begin to collect baseline data on their plant communities

***Native Plant Seed Collecting with John Pierce (Summer)******Prepare a public display illustrating what schools are doing on Mount Jumbo***



## **APPENDIX C: Overview of Spring Activities on Mount Jumbo**

(This is a letter I sent to participating teachers to schedule our spring activities)

**To: Teachers involved in Stewardship Projects on Mount Jumbo**

**From: Jim Berkey**

Greetings! I've put together a rough overview of this spring's activities on Mount Jumbo. This includes a brief description of the pre-activities (student training) the proposed study methods, description of the study sites, and a tentative schedule for activities. Please review and post so that your students can refer to this as well. The last page contains a list of equipment we will need to conduct the projects. I need to know if your school can supply any of these items. I also need to know how many students will be involved from your classes, and what times they will be available for field studies on Jumbo. We can organize transportation logistics once these other factors are known. Thanks for your help. I look forward to some great field studies with you and your students!

### Pre-Activities and Tentative Schedule:

#### **April 20-25**

*Introductory Classroom Presentation on Mount Jumbo (1-1.5 hours)*

- Overview of Cultural History
- Overview of Ecology and Natural Features
- Importance of Open Space Lands for Habitat Conservation
- Development Threats
- History of Conservation Efforts
- Management Issues and Process
- Citizen participation in stewardship
- Role play debate on open space issues

#### **May 5-10**

*Introduction to native grassland communities on Mount Jumbo (Field Trip) (2-3 hours)*

- Native Plant communities on Mount Jumbo
- Common native grasses and forbs within these systems
- Primary non-native species that are threatening these communities
- Management questions related to non-native "noxious weeds"
- Integrated weed management techniques
- Community-based restoration projects on Jumbo
- (Bring plant press materials and begin to assemble a school herbaria)

**May 5-20**

*Setting up demonstration plots, plant ID and sampling techniques (Field Trip) (2-3 hours)*

establish study grid  
 establishing transect lines  
 learn major plant species/continue to build an herbaria  
 learning to sample along transects  
     Plant ID and measurements of height and cover  
 using data forms  
 establishing photopoints

**Summary of Grassland Stewardship Goals on Mount Jumbo:**

Several invasive non-native plant species occur on Mount Jumbo and are threatening native plant communities. Aside from their own intrinsic worth, these native plants create diverse habitats for various species of wildlife, including elk and mule deer. The Mount Jumbo Vegetation Stewardship Subcommittee (an ad-hoc citizens group helping with part of Jumbo's management plan) has discussed ways of preventing any further spread of these "noxious" weeds and gradually restoring plant communities. Some areas on Mount Jumbo have very little native plants remaining; noxious weeds comprise nearly the entire plant community. The subcommittee has decided to prioritize stewardship projects on plant communities that still have strong native plant components. Essentially, our strategy is #1 - prevent further spread of noxious weeds, #2 - maintain native plants within areas that have become infested, #3 - gradually eliminate weeds from these areas, #4 - restore areas that consist of noxious monocultures. Our stewardship projects for this Spring and Fall will involve #'s 1 and 2.

John Pierce, a local expert botanist and chairman of the subcommittee, has identified some regions near Mount Jumbo's saddle that fit the criteria mentioned above. We hope to establish weed control demonstration test plots within these areas, and monitor the effectiveness of various control methods over the next year. Ideally, at least one treatment in our plots will be successful enough to apply to a larger area. We then will not only be conducting research into effective methods of weed control and native plant community preservation, but will also use our research findings to control weeds on a larger area of the mountain.

**Study Methods:**

The following is a brief description of the study methods that have been proposed by the Mount Jumbo Stewardship Subcommittee. These methods are not rigid, and can be remodeled by students teams where appropriate.

As mentioned above, sites have been identified where test plots can be established. One site contains abundant spotted knapweed (*Centaurea maculosa*) the other abundant leafy

spurge (*Euphorbia esula*). We have chosen to apply the following treatment methods in replicate plots during the first year of the study:

- |                       |           |
|-----------------------|-----------|
| sheep grazing         | mowing    |
| hand pulling          | reseeding |
| transline application | burning   |

Treatments will vary depending on what noxious species is targeted. For example, hand pulling is not feasible with leafy spurge since it has extensive, deep root systems that produce new plant shoots. Many of these treatments will be combined in various ways to see if this is more effective. Other more experimental treatments will be applied singly in separate plots. Some examples of these include:

- straw tea
- mulching
- steaming/hot water

I encourage class groups to research and design weed control techniques that they can experiment with on these single-treatment plots.

Each plot will be 50 feet on a side (approximately 1/8 acre) and will have three permanent 30-foot long line transects to document baseline conditions and monitor after treatments. Figure 1. below illustrates how a typical grid of test plots will be arranged. This entire grid will be replicated in an adjacent and similar plant community. Treatment techniques are listed to the side of each plot and will be applied to the entire column or row. Single treatment plots are labeled within the plots. Control plots will be used to document the conditions of areas where no treatment is applied. The lines within each plot represent the three permanent line transects that will be used to record conditions within each plot.

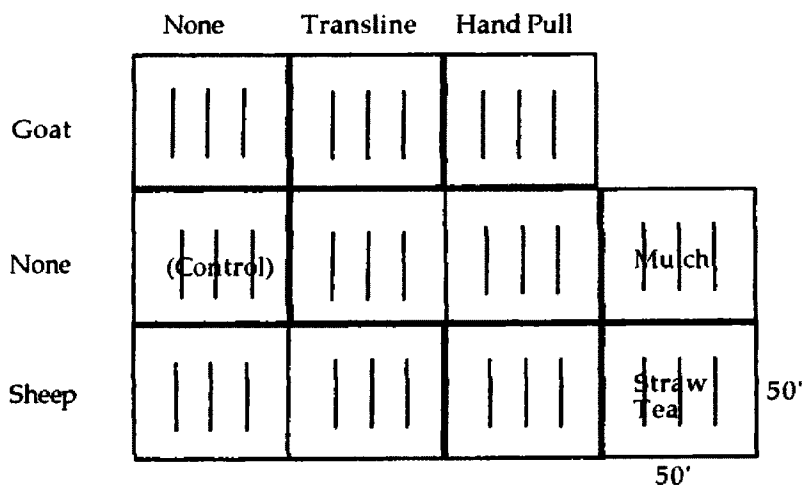


Figure 1. Test plot arrangement

Line intercept sampling will be used to measure the intercept length of a plant/moss/litter/or bare ground along a line. A flexible (fiberglass) tape measure can be

used to set the line and measure intercept lengths. Pins will be used to secure the tape measure on either end. Intercept length of grasses and forbs are measured along the line at the ground surface, while shrubs and trees are measured on the crown-spread intercept. The intercept lengths are summed by species or class (e.g., bare ground) for each line, and then cover and composition are calculated.

Cover is estimated by (sum of intercept lengths of a species)/length of transect  
For example, if the plant leafy spurge has a sum intercept length of 17.4 feet, and the transect is 30 feet long, then  $17.4/30 = .58$ , or 58% cover on this transect.

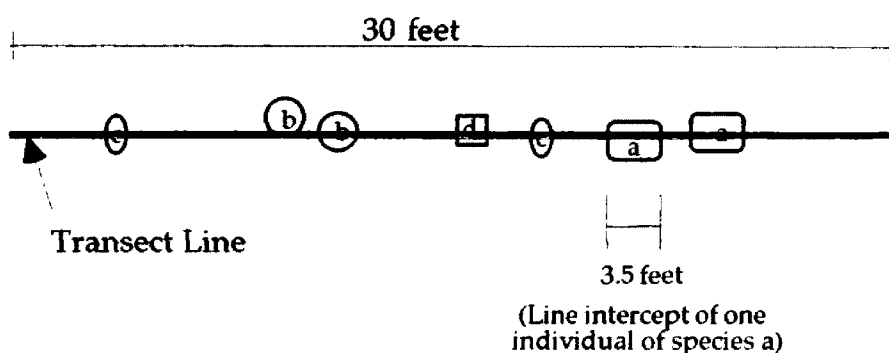


Figure 2. Example of Line Intercept Transect

Intercept data will be recorded on special forms given to student groups to keep in their journals. These forms will ask students to record plant species, intercept lengths, and calculated compositions and cover values for each transect. Students can work in teams of 2 while reading transects; one recording the data, the other reading the tape measure and identifying plants. This will help the transects go faster, and will allow students to confer with each other while identifying plants and making other decisions. Students can regularly swap roles to learn each task.

Conditions along transect lines at the time of sampling will also be documented with photographs taken at regular intervals. Photo numbers will be recorded on data forms and eventually pictures will be compared to assess the effects of treatments.

Many of the treatments will be applied during the summer. Some will have to be coordinated by experts from the community (e.g., grazing animals, application of chemicals). Other techniques such as mulching and hand pulling will require a significant team of students to complete. None of these treatments will occur until the Mount Jumbo Management Plan is approved by the citizens of Missoula and adopted by the Missoula City Council. This will hopefully occur sometime this early summer. Baseline data can be collected as soon as students are trained and available. It will be helpful to

know how many students are available this spring and how many may be able to participate this summer. Ideally, school groups would adopt a demonstration area and get involved in every stage of the study at that site. Transect sampling will also occur in the Fall so that standing biomass produced during the growing season can be recorded.

### Equipment List for Grassland Stewardship Projects

#### ***Plant Identification Tools:***

hand lens  
plant keys  
plant press

data forms  
calculator  
graph paper  
6" scale  
protractor  
camera

#### ***Plot Establishment Tools***

100' tape measure  
compass  
6" spikes  
survey flagging  
stake flags

#### ***Personal Gear***

windbreaker/raincoat  
warm hat/sun hat  
sturdy shoes  
warm layers  
water bottle  
pencil

#### ***Data Recording Tools***

field journal  
clipboards

## APPENDIX D: Introductory Presentation to Stewardship Classes

### “Students, Stewardship, and Sustainability”

Mount Jumbo was one of the main “cornerstones” identified in the Missoula Open Space Plan (1994).

#### Why Conserve Open Space?

...visual & aesthetic reasons, preserve agricultural lands, provide for recreation...

Yes, but, Mt. Jumbo is considered conservation open space land....this prioritizes the protection, maintenance, and restoration of:

- **natural diversity,**
- **native habitat,**
- **and the opportunity for people to have direct experience with wild places close to home.**

#### 1. **Biological Diversity** - or the richness and variety of life

from soil microbes .....to grizzly bears

Each organism is like a rivet in an airplane...the more you remove, the more likely the airplane, or in this case, the ecosystem, will fall apart.

**Ecosystem** - a system of living organisms, physical characteristics, and interactions.

within a ecosystem there are...

**Communities** - of organisms defined by most abundant species or a characteristic assemblage of species.

At the community level, if we lose native plant communities on Mount Jumbo, for example, this will lead to loss of native insects that rely on the plants, which in turn will lead to a loss in native bird species that feed on the insects, and so on.

Organisms in a community are connected to their ecosystem through a variety of trophic relationships.

#### 2. **Habitat** - or home to organisms.

Open space lands around Missoula can potentially provided habitat for many native species. These habitat types are becoming increasingly rare in western Montana. Low elevation grasslands, low elevation riparian areas, and ponderosa pine savannahs are all habitats that are currently threatened by rapid population growth and development. Habitat destruction is the most common cause for loss of natural diversity around the world.

3. **“Extinction of Experience”** - When we lose wild habitats with native organisms near our homes, we also lose our chance to learn about and from these wilds. Robert Michael Pyle calls this trend the “extinction of experience”. Our loss of biodiversity and habitat is paralleled by a cultural loss of experience with other creatures and natural landscapes. Without any relations to this more-than-human-world, we lose our awareness of how our lives are interconnected and how our actions affect this greater community of life.

**What can we do to help preserve these habitats?**

- support the conservation of open space in your area
- get involved in **Stewardship activities** of wild areas near your home

**Stewardship**

Stewardship of local natural areas can entail many things. This will include becoming a local advocate for its conservation and against conversion to housing tracts and parking lots. It may mean protecting the area from negative human impacts...such as dumping waste, erosion, overuse, harassment of wildlife, or importing non-native plants. In many cases, stewardship will also involve educating the local public about the ecosystem, habitats, and communities that occur in these areas, and teaching them how to be more neighborly to these wild inhabitants. Finally, in many suburban-fringe conservation open space areas, stewardship responsibilities will include restoring native plant and animal communities and restoring natural processes that help maintain these communities.

“Stewardship requires constant interaction with the environment, making careful observations, noting changes and becoming intimate with diversity”

This spring, I will be organizing a series of stewardship efforts on Mount Jumbo focusing on the conservation of native grassland plant communities and the reduction in noxious weeds that are currently displacing these natives. I hope to get volunteer student groups that will study grassland regions of Mount Jumbo, and then experiment with different integrated weed management techniques on small test plots.

## **APPENDIX E: Vegetation Sampling On Mt. Jumbo**

Our project will be the first stage in a long-term attempt to maintain and restore native plant communities on Mt. Jumbo. Many non-native plants are invading the mountain's grasslands and excluding the native plants that are so important for Mt. Jumbo's ecosystem. Before any weed control efforts are made, we need to describe and document the existing plant communities. We can then compare our "baseline data" with data gathered after weed control treatments and assess the success of our weed control efforts.

First of all, what is **sampling**? **Sampling** is a systematic way of describing a representative part of a population in order to learn more about the entire population.

We will sample a grassland plant community on Mt. Jumbo using **transects** and **microplots**. A **transect** is a long line along which plants are sampled. We will establish transects with a long tape measure and compass. A **microplot** is a square frame (we will use plastic pipe) of known dimensions that we will place on the ground and sample plants within.

### **METHODS:**

Step #1 - Locate your Treatment Plots (20 x 20 meters)

Step #2 - Locate your Transect Lines (10 meters long)

Start at the northeast corner of each plot. Have three students put hands behind their backs and pick a number between 1 and 3. This will give us a random number. Have them reveal their numbers and then total them. Use this number to measure from the northeast corner along the northern edge of the plot. Then take three large paces into the plot and mark your location with a flag. This is the starting point for your first transect. The transect will be perpendicular to the line you just measured, and will extend 10 meters into the plot. To establish your second transect line, repeat these steps, but each student should pick a number between 4 and 6.

Step #3 - Begin Sampling with Microplot Frames

- A.) Lay your measuring string between the flags that mark either end of your first transect.
- B.) Toss a coin to determine which side of the transect to lay your frame on first.  
- if HEADS... start on left/ TAILS... start on right. Lay your 0.5 meter<sup>2</sup> frame down beside the transect line at the 1 meter mark. After sampling



plants in this area you will place the frame on the opposite side of the transect at the 2 meter mark. Continue to alternate between the left and right sides of the transect, placing the frame at the next meter mark each time, until you have sampled 10 frames.

C.) At each frame placement, you want to record:

1. - the number of weed plants (knapweed, leafy spurge (> silver dollar-size) rooted within your frame,
2. - the presence of each native plant listed on your form,
3. - the estimated percent cover of bare ground and moss (using these %categories: <10%, 10-25%, 26-50%, 51-75%, 76-100%).

This information should be recorded on you data form. Then, go to the next meter mark and repeat step C until you have done 10 frames.

## **APPENDIX F: CNSP Follow up Assessment**

Please summarize your experience of the Community Naturalist in the School Program. Was this a positive or negative experience? Please explain.

Can you suggest ways of improving CNSP so that it fulfills your needs and interests of you and your students?

Do you think that regular activities with naturalist and other community members would give students positive learning experiences? If so, what kind?

Could you describe the nature and degree of interest that you have in continuing to work with naturalists on curriculum topics relevant to your classes.

What are the greatest obstacles for integrating locally relevant natural history activities into your classes?

One of my goals for this project was to get students involved in issues concerning the management of natural areas near their home. Do you think we succeeded?

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