Developing Field-Based Environmental Science Activities to Enhance the 7th Grade General Science Program at Lake Country School in Hartland, Wisconsin

By

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Submitted in Partial Fulfillment of the Requirements for the Degree Master of Science In Natural Resources/Environmental Education for Elementary and Secondary Teachers

College of Natural Resources
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July 2008
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Abstract

Connecting children to their local landscape is vitally important for creating environmentally responsible citizens. Research has suggested that bringing youth closer to a local natural community promotes overall health and well-being in mind, body, and spirit. Teachers are continually searching for ways to encourage students to develop a relationship with nature that is interactive, lifelong, and fulfilling. Field-based environmental education encourages students to use multiple senses to explore and investigate, and thus has been shown to foster growth in knowledge and appreciation for the surrounding landscape and its' many components. This project was designed to look specifically at how the 7th Grade Science curriculum at Lake Country School could be enriched by integrating field-based environmental science activities on the school site and the surrounding community. Unit goals and themes were researched and established using the Wisconsin Model Academic Standards for Science and Environmental Education as a framework. Specific locations for field-based studies were located on the school site and surrounding vicinity with the help of natural resource professionals and volunteers. The Lake Country School District Board of Education and other school and community organizations were informed of the progress and future goals for the development of the natural area and related curricula. School and community organizations responded favorably to proposals that emphasized the importance of environmental education in the school district’s curriculum. Standards-based activities were then created to utilize the school site and other local areas of interest. Students responded favorably to these outdoor activities. Results showed that a majority of the students agreed that the outdoor activities made science class more enjoyable than a “typical” indoor science class. A majority of the students also agreed that science class enrichment with outdoor environmental science activities made science concepts easier to understand. Ultimately, a habitat management / site use plan was developed for Lake Country School District that connected the field-based activities with the natural significance of the school site and surrounding areas of interest.
Acknowledgements

Sincere thanks to my wife, JoAnne, for her encouragement, patience, and unselfishness throughout the process of completing this project. I would also like to recognize my departed father, Gary, for his simple way of instilling a sense of awe and appreciation for nature in me at a very young age.

Support from many other relatives, friends, and colleagues has helped encourage me throughout the process. Thank you to all of the dedicated staff within the MS in Environmental Education program at the University of Wisconsin- Stevens Point. A special note of thanks goes to my advisor, Dr. Dennis Yockers, for his consistent and sincere guidance along the way.
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Chapter 1

Introduction

The Research Problem Statement

The purpose of the project is to develop field-based environmental science activities to enhance the 7th grade general science curriculum at Lake Country School in Hartland, Wisconsin.

The Sub-problems

1. Identify unit goals and themes for field-based environmental science activities within the 7th grade general science curriculum.

2. Determine resource professionals, organizations, and specific locations that will encourage field-based environmental education on the school site and surrounding natural communities.

3. Develop an initial Habitat Restoration Plan for the LCSD Natural Area to inform the LCSD Board of Education about the relevance of habitat restoration and its connection to field-based environmental education.

4. Develop and implement standards-based environmental science activities that utilize the ecological attributes of the school site effectively.

5. Create a Habitat Management/Site Use Plan for the LCSD Natural Area that will further guide best practices in habitat management and field-based environmental education.
The Hypothesis

1. Environmental science activities that infuse the Wisconsin Model Academic Standards for Science and Environmental Education into the 7th grade science curriculum at Lake Country School will provide meaningful instruction that encourages students to become environmentally responsible citizens.

2. Making field-based environmental science more visible to the Lake Country School Students, Staff and School/Community Organizations will lead to increased interest and participation in environmental education at the school from these groups.

3. Contacting local natural resource professionals for advice on the development of the habitat management/site use plan will be an effective method for completing the plan.

4. A habitat management/site use plan will be an effective way to provide information to the school and community about the habitats of the Lake Country School District Site and the possible utilization of such places for field-based environmental studies.

Significance of the Problem

Northwestern Waukesha County in Southeastern Wisconsin is known by the simple name of Lake Country. The area has been known for centuries as a place of “life-giving” water and exquisite natural beauty. However, in recent decades, the strain of development and recreational overuse has created many problems that threaten to destroy the lakes and lands of this region. Increased development has led to the sedimentation of lakes and concerns about the recharge of the aquifer that sustains lakes, streams, and drinking water supplies for local communities. Delicate wetland habitats are being...
fragmented. Invasive plant and animal species continue to cause significant environmental problems for community members and the native habitats of the region.

As these serious environmental issues threaten the surrounding community, most students are unaware of the challenges that remain in coexisting with such a delicate ecosystem as Lake Country’s. Understandably, students at Lake Country School have great opportunities right outside of the school doors to become aware, gain knowledge, and develop skills that will help them deal with environmental challenges they may face in the near future.

The Lake Country School District property includes 20 acres of stunningly diverse habitats. Cattail marsh and tamarack bog stretch from the shores of Lake Nagawicka’s northernmost “Kettle”. Upland areas reveal remnant bur oak, shagbark hickory, and black walnut that have withstood grazing from sheep and cattle and the continuing advance of development. Native plants of interest that remain include mayapple, jack in the pulpit, and the Wisconsin-threatened yellowish gentian. Resident mammals such as mink, white-tailed deer and coyotes take shelter in the wetland edges. Abundant birdlife including great blue herons, blue-gray gnatcatchers, and common yellowthroats find nesting cover nearby. Rarer sightings such as the bald eagle and Brewster’s warbler indicate the habitats as a migration corridor of importance.

However, the ecosystem health at the school site is not looking fine from all angles. Along Nagawicka Lake, concerns over shoreline habitat loss and sedimentation problems have been proclaimed on the front page of the local paper. Invasive plant species such as common and glossy buckthorn have begun to dominate the wetland and upland habitats, choking out native plants that form a balanced plant community. The fragmented section of property at Lake Country School provides little linkage to other habitats to the north because a two-lane road, a railroad track, and a four-lane divided highway impede wildlife movement. Although these problems are concerning, they also provide great examples of common environmental issues that are being faced throughout the region and world. In short, the issues provide corresponding hands-on opportunities that encourage awareness, in-depth study, and the development of an environmental ethic that stresses action.
Recently, little importance has been placed on utilizing the Lake Country School site for environmental education. On a self-guided tour of the school site in the summer of 2005, nature trails were impassable due to buckthorn growth. Bird nest boxes were randomly scattered throughout the forest, lacking needed maintenance and correct positioning. A battered wetland boardwalk peeked out from under a mat of cattails and sedges. Although the school administration stressed the importance of the natural site utilization, they were unaware of what opportunities existed and exactly how to establish field-based environmental education as an important curriculum component at the district.

The findings of Kellert (1998) have shown that teen participants in outdoor environmental programs report positive effects on their personal, intellectual, and spiritual development. In addition, access to natural areas like those found on school sites on a frequent basis during childhood have shown to be a major predictor of environmental sensitivity and responsible land stewardship (Wilson, 1997; Chawla, 1996). Richard Louv, in his book *Last Child in the Woods* (2006), further states, “Within the space of a few decades, the way children understand and experience nature has changed radically. A child today can likely tell you about the Amazon rain forest but not about the last time he or she explored the woods in solitude or lay in a field listening to the wind and watching clouds move.” He suggests that access to natural sites is vital for keeping children tuned into nature. By offering opportunities at Lake Country School for children and young adults to explore, experience, and change their natural environment, they will be empowered to take responsibility for the environment and quality of life in the communities surrounding them.

**Limitations**

This study will not attempt to measure the success of the students in acquiring knowledge outlined in the Wisconsin Model Academic Standards for Science and Environmental Education. The study will only attempt to find ways to integrate field-based environmental science activities into the 7th Grade General Science Curriculum.
The habitat management/site use plan developed for the Lake Country School District will not include a comprehensive curriculum plan for use in other grade levels at Lake Country School.

**Definition of Terms**

**Lake Country School** is a K-8 public primary school housing approximately 500 students in a rural suburban area of Hartland, Wisconsin, which has a population of 7,800. It is the only school in the Lake Country School District.

**Environmental Sensitivity** is defined as an empathetic perspective toward the environment. It is the one entry-level variable that has shown a dramatic relationship to environmentally responsible behavior. (Hungerford & Volk, 1990).

**Environmental Science** is the branch of science concerned with the physical, chemical, and biological conditions of the environment and their effect on organisms. (Random House, 2006)

**Habitat Management/Site Use Plan** is a plan that describes the historical, cultural and ecological importance of a site and further recommends research-based habitat management practices for continued site use for environmental education.

**Assumptions**

After the researcher was hired as a teacher at LCS, encouragement was given by the administration to develop an environmental education program that utilized the natural areas on the school site effectively. Therefore, it can be assumed that the LCSD is supportive of environmental science curriculum being infused into the general science curriculum.
Chapter 2

Review of Related Literature

The literature relating to the development of field-based environmental science activities to enrich the 7th grade science program at Lake Country School has been reported in the following sections:

1. The Value of Outdoor Environmental Education for Physical and Mental Well-Being

2. The Value of Creating and Utilizing Natural School Sites for Field-based Environmental Education

3. Connecting Field-Based Environmental Science Activities for 7th Grade Students to Established Environmental Science and General Science Curriculum Frameworks

4. Creating Programs, Units, and/or Activities that Encourage Environmental Sensitivity and Lead to Environmentally Responsible Behaviors

The Value of Outdoor Environmental Education for Physical and Mental Well-Being

Field-based environmental education has been proven through research to be not only "good education", but also to have many other related benefits for the mind, body and spirit. From the physiological intricacies of brain function to the simple feeling of being refreshed by nature, the immediate and lasting effect of quality outdoor environmental education is becoming more noted.

Research by Diamond and her colleagues demonstrated the value of an enriched environment (Cheskey, 1996). In her study, she showed that environmental stimulation results in physiological changes in the brain. The more enriched the environment was, the greater the ability to make connections between new information and information stored
in long-term memory. An outdoor learning environment with accompanying activities can be viewed as an enriched environment compared to the typical classroom setting.

Taylor, Kuo & Sullivan (2001) completed one of the earliest studies to explore the benefits of nature-based education for students with attention-deficit disorder. They found that attention deficit symptoms were more manageable after outdoor activities and also that the “greener” a child’s everyday environment, the more manageable their attention deficit symptoms will be in general. Louv (2006) also cited research from the University of Illinois that discovered children as young as five showed a significant reduction in the symptoms of attention-deficit disorder when they engaged with nature.

Academic achievement has also been shown to improve with outdoor education experiences. In a study conducted by The American Institutes for Research (2005), a 27% increase in measured mastery of science concepts was noticed for a group of students who attended weeklong residential outdoor education programs. In addition, enhanced cooperation and conflict resolution skills; gains in self-esteem; gains in positive environmental behavior; and gains in problem-solving, motivation to learn, and classroom behavior were also noticed from the program participants.

The findings of Kellert (2005) showed the significance of nature in healthy childhood development. Kellert affirmed, “Play in nature, particularly during the critical period of middle childhood, appears to be an especially important time for developing the capacities for creativity, problem-solving, and emotional and intellectual development.” He urged educators and other citizens to provide children with opportunities for positive contact with nature.

Participation in outdoor environmental education activities at school can also encourage and enrich those who are already interested in environmental studies. In the mid 1990’s Professor Howard Gardner described and publicized the addition of an eighth intelligence (naturalistic intelligence) to his Multiple Intelligence Theory (Wilson, 1997). Gardner defined a naturalist as a person who recognizes flora and fauna plus other consequential distinctions in the natural world and uses this ability productively (Gardner, 1999). As far as the educational implications for the naturalistic intelligence, Glock, Wertz, and Meyer (1999) suggested that developing the naturalistic intelligence is
no less important than teaching math or reading skills. They stressed the importance of giving our students the opportunities to develop this intelligence, since the welfare of our earth and the quality of our lives depend on it.

Benefits for educators using the environment as a teaching tool have also been well documented. Lieberman & Hoody (1998) described potential benefits for teachers who were using the Environment as an Integrating Context (EIC). They noted that teachers using EIC have increased enthusiasm for their job and that they develop better working relationships with their students and colleagues. They noted, “Many teachers consider their EIC endeavors the highlight of their professional careers.”

_**Value of Creating and Utilizing Natural School Sites for Field-based Environmental Education**_

Many benefits to using a naturalized school site as an environmental teaching tool have been documented. Advantages begin with the simplified logistics involved in visiting the site. Other benefits to natural areas on-site include: increased environmental sensitivity in students, increased possibilities for multidisciplinary curriculum development, and increased motivation and participation in school activities from students, staff, and community members.

The fact that natural school sites are literally right outside of the classroom doors raises their level of significance for formal educators. As described in the “Creating Schoolyard Habitats Workshop Facilitators Guide” (2001), on-site field trips lower costs, provide easier access, and require little coordination with other agencies or organizations. Consequently, because the sites are more accessible, they have the opportunity to be visited more frequently and studied in greater depth.

Rivkin (1997) submitted that children who did not have access to a natural area were missing something significant. She explained that children who did not play in natural habitats were unaware of and possibly did not care about the plants and animals that lived around them. She noted that many older Americans still remember outdoor play as a treasured part of their early experiences, but most of today’s youth have lost the
natural habitat as a place to learn. She further suggested that the lack of an opportunity to play or learn in a natural habitat would lessen a child’s likelihood of developing an environmentally sensitive ethic toward the world around them. Hungerford and Volk (1990) reported that environmental sensitivity development was a major contributing factor in leading to environmentally responsible behaviors later in life. Nabhan and Trimble (1994) also suggested that the quality of the physical environment, such as the schoolyard environment, can affect children’s attitudes and values toward nature and their role as land stewards.

Richard Louv (2006), in his book *Last Child in the Woods*, further states, “for eons, human beings spent most of their formative years in nature. But within the space of a few decades, the way children understand and experience nature has changed radically. A child today can likely tell you about the Amazon rain forest but not about the last time he or she explored the woods in solitude or lay in a field listening to the wind and watching clouds move.” He contends that access to natural sites is vital for keeping children connected with nature.

Reading and Taven (1996) noted the ability to link multiple curricular areas to the outdoor site as a major benefit. They relayed first-hand experience from their school site. “The links between the curriculum and the learning associated with an outdoor area became apparent even at the planning stage.” It was also mentioned that once their native park and amphitheatre were completed, hundreds of curricular connections in multiple disciplines were evident.

Another major benefit of green school grounds is increased involvement by adults and members of the nearby community (Bell & Dyment, 2006). Griffen (1997) connected how the creation of schoolyard habitats benefits wildlife while providing a learning opportunity for students and community members. The development or preservation of a natural school site “gives an opportunity to counteract a dangerous myth that nature is something that exists in faraway places, unconnected to our lives and managed by experts.” She suggested that the schoolyard habitat may help the local citizens see the interconnectedness of nature in their lives. Furthermore, she described the natural school
site as “an oasis in the urbanized environment where both children and adults can develop stewardship skills, nurture each other and touch ancestral home.”

Connecting Field-Based Environmental Science Activities for 7th Grade Students to Established Environmental Science and General Science Curriculum Frameworks

Engelson and Yockers (1994) stressed the importance of developing an environmental education curriculum plan based on the known developmental needs and characteristics of the students in “A Guide to Curriculum Planning in Environmental Education.” They suggested that a goal statement within the plan should identify the development of perceptual awareness, the acquisition of knowledge, the development of a positive environmental ethic, the development of citizen action skills, and the acquisition of citizen action experiences as categories of desirable learner outcomes. Through the goal and program development, they emphasized the importance of creating students “who are committed to work, individually or collectively, to defend, improve, and sustain the quality of the environment on behalf of present and future generations of all living things.”

The Wisconsin Model Academic Standards for Science (1998) and Environmental Education (1998) will be significant for integrating the field-based environmental science activities into the general science curriculum. It should be noted that many other Wisconsin Model Academic Standards for other subject areas could be linked to the developed activities, but they will not be included in this project.

The Wisconsin Model Academic Standards for Science closely follows the format and content of the National Science Education Standards, which will not be included in this project. The Wisconsin Model Academic Standards for Environmental Education are also closely mirrored by the Excellence in Environmental Education Guidelines for Learning (Pre K-12) (2004). Below, these standards are defined in greater detail.

The Wisconsin Model Academic Standards for Environmental Education are broken down into the following five subsections:
A. Questioning and Analysis

- Students in Wisconsin will use credible research methods to investigate environmental questions, revise their personal understanding to accommodate new knowledge and perspectives, and be able to communicate this understanding to others.

B. Knowledge of Environmental Processes and Systems

- Students in Wisconsin will demonstrate an understanding of the natural environment and the interrelationships among natural systems.

C. Environmental Issue Investigation Skills

- Students in Wisconsin will be able to identify, investigate, and evaluate environmental problems and issues.

D. Decision and Action Skills

- Students in Wisconsin will use findings from environmental issue investigations to develop decision-making skills, and to gain experience in citizen action skills.

E. Personal and Civic Responsibility

- Students in Wisconsin will develop a commitment to environmental stewardship.

*The Wisconsin Model Academic Standards for Science* include:

**Standard A--Science Connections**

Students in Wisconsin will understand that there are unifying themes: systems, order, organization, and interactions; evidence, models, and explanations; constancy, change, and measurement; evolution, equilibrium, and energy; form and function among scientific disciplines.
Standard B--Nature of Science

Students in Wisconsin will understand that science is ongoing and inventive, and that scientific understandings have changed over time as new evidence is found.

Standard C--Science Inquiry

Students in Wisconsin will investigate questions using scientific methods and tools, revise their personal understanding to accommodate knowledge, and communicate these understandings to others.

Standard D--Physical Science

Students in Wisconsin will demonstrate an understanding of the physical and chemical properties of matter, the forms and properties of energy, and the ways in which matter and energy interact.

Standard E--Earth and Space Science

Students in Wisconsin will demonstrate an understanding of the structure and systems of earth and other bodies in the universe and of their interactions.

Standard F--Life and Environmental Science

Students in Wisconsin will demonstrate an understanding of the characteristics and structures of living things, the processes of life, and how living things interact with one another and their environment.

Standard G--Science Applications

Students in Wisconsin will demonstrate an understanding of the relationship between science and technology and the ways in which that relationship influences human activities.
Standard H—Science in Personal and Social Perspectives

Students in Wisconsin will use scientific information and skills to make decisions about themselves, Wisconsin, and the world in which they live.

The Excellence in Environmental Education Guidelines for Learning (Pre K-12) (2004) suggest that in the fifth through eighth grades, learners begin to develop skills in abstract thinking and continue to develop creative thinking skills—and along with these, the ability to understand the interplay of environmental and human social systems in greater depth. The guidelines are broken down into the following four strands:

- Strand 1—Questioning, Analysis and Interpretation Skills
- Strand 2—Knowledge of Environmental Processes and Systems
- Strand 3—Skills for Understanding and Addressing Environmental Issues
- Strand 4—Personal and Civic Responsibility

Creating Programs, Units, and/or Activities that Encourage Environmental Sensitivity and Lead to Environmentally Responsible Behaviors

The importance of using environmental education as a tool for creating responsible citizens has been widely documented for some time. Ruskey (2000) writes, “Without question, the extent to which we will achieve environmental literacy and environmental sustainability will be the extent to which local level environmental education programs are developed and institutionalized.” Many researchers agree that the most effective method for developing these environmentally responsible behaviors lies in the cultivation of environmental sensitivity in children.

Often times, the first step of instilling an environmental interest in students can be the most challenging. Leslie (2002) explained, “It is easy for children today not to notice the streets they walk on, the plants at their feet, the birds above their heads, or the phases of the moon.” She specifically suggested how the activity of nature journaling could be used for connecting students with local natural history and developing a sense of
place which has been emphasized by Sobel (1996) and many others. She contends that nature journaling offers many other benefits, such as creating a more personalized connection with nature, which lead to the development of a sense of place and an environmental ethic.

Smith (1997) described how the activity of drawing childhood maps revealed the importance of the experience of place in a child’s formative years. He explained how vividly most adults could recall intimate details about their neighborhood surroundings as a child. In his article, he quoted Snyder (1990) as saying that, “revisualizing that place…. has a grounding and settling effect.” Smith believed his findings about childhood maps pointed to issues that environmental educators may wish to address in the activities they create for students. He found that much of our connection with the natural world occurred during times of silence, and, at these moments, the surrounding landscape became more visible and audible. He explained that we, as educators, should “recognize the value of those times when we stop talking and let the world speak for itself.” By designing opportunities for students that stress the significance of outdoor observation, he believed children could “come to love their places and develop the affiliative ties that lie at the heart of environmental wisdom and activism” (Smith, 1997).

Ten years later, Louv (2007) reaffirmed the importance of outdoor opportunities for children. He suggested that if children were denied the right to play and learn outside, the future sustainability of the Earth and the environmental initiatives of future generations would be at risk. “The future of children in nature has profound implications not only for the conservation of land but also for the direction of the environmental movement.”

**Summary**

In conclusion, The *Guidelines for Curriculum Planning in Environmental Education*, the *Wisconsin Model Academic Standards for Environmental Education and Science*, and the Excellence in *Environmental Education Guidelines for Learning (Pre K-12)* provide a starting point for the development and implementation of field-based
environmental education curriculum units at Lake Country School. The materials stress the importance of both content knowledge in environmental science and the application of that knowledge to investigate and respond to related issues.

The value of outdoor sites and experiences for enjoyment, development, and learning has been well documented. The physical and mental components of these benefits suggest that environmental education is even more meaningful and necessary than once believed.
Chapter 3

Methods

Introduction

The purpose of this project is to develop field-based environmental science activities for 7th grade students at Lake Country School (LCS) in Hartland, Wisconsin. Lake Country School has a population of about 500 students and is the lone school within the Lake Country School District. The village of Hartland has a population of about 7,800 and is located about 15 miles west of Milwaukee.

The LCS property is located on the northern edge of Nagawicka Lake in a region of Southeast Wisconsin known as Lake Country. The site offers diverse habitats ranging from tamarack bog relict to bur oak opening. Although nearly untouched wetland habitats exist on the site, most of the expanse clearly shows the heavy foot of human disturbance. Twenty-five years earlier, sheep and cattle grazed the property until most native plant species could no longer survive. Since then, invasive shrub species such as common and glossy buckthorn and honeysuckle have overrun the property. The understory has recently become unnaturally thick and the ground layer is now almost barren. Oak and hickory seedlings have little chance for survival and few herbaceous plants have chance of growing here. The future of the forested landscape and the ecosystem appears bleak. However, all hope is not lost for retaining some of the quality features of the site. Remnant plants such as the Wisconsin-threatened yellowish gentian, mayapple, and marsh marigold hold firm to their grip of the native landscape. They give a glimpse into what the resilient landscape would have looked like 200 years earlier.

In a site as degraded as this, the researcher needs to look at all of the possibilities creatively yet realistically. Using local models of successful habitat restoration and direction and encouragement from natural resource experts in the area, an initial 3-Year Habitat Restoration Plan for the LCSD Natural Area will be created. Habitat restoration projects will be started to reclaim parts of the landscape overtaken by invasive species.
These restoration projects on the school site will provide opportunities for enhancing the 7th grade science curriculum with outdoor environmental science activities. Students will use these hands-on experiences in environmental science in a real and tangible way. They will create and implement their own habitat management plan for a local site of their choosing later in the school year.

The utilization of local sites for ecological restoration models and the subsequent development of field-based activities will be outlined in the Habitat Management/Site Use Plan for LCSD. The plan will further guide the development of the site for use as a model of natural history and environmental stewardship practices for LCS students and the surrounding community.

**Sub-problem One Methodology**

**Identify unit goals and themes for field-based environmental education within the 7th grade general science curriculum.**

Beginning in the fall of 2005, the researcher will analyze the Wisconsin Model Academic Standards for Science and Environmental Education. National Science and Environmental Education Standards will also be reviewed. A Guide to Curriculum Planning in Environmental Education (Engelson & Yockers, 1994) will also be reviewed to articulate the main emphasis of the program and to ensure that curricular goals are met.

**Sub-problem Two Methodology**

**Determine resource professionals, organizations, and specific locations that will encourage field-based environmental education on the school site and surrounding natural communities.**
In the spring of 2006, local natural resource and educational specialists will be contacted to provide support for the development of the environmental program at Lake Country School. In the summer 2006, Marlin Johnson, an instructor and resident land manager for the University of Wisconsin-Waukesha Field Station, will be contacted to help coordinate a waters-based field day for 7th grade students. Mike Fort, a determined volunteer at Lapham Peak State Park since 1995, will be summoned to give suggestions and approve an initial Three-Year Habitat Management Plan for the school site. During this time period, other professionals such as Mike Bourquin, a naturalist with Retzer Nature Center; Clay Frazer, Habitat Chairman with Pheasants Forever; Matthew Tiller, Environmental Science Teacher at Verona Area High School; and Greg Bisbee, Biology Teacher at Hartland Arrowhead High School will be contacted for advice in both restoration ecology and the development of successful activities for the school site.

In the fall of 2006, Lapham Peak State Park and the UW-Waukesha field station will be visited to determine their usefulness as models for restoration and possible future field trip sites. Also in the fall of 2006, a questionnaire will be given to the parents of 7th grade students to determine possible interest of volunteers for the habitat restoration projects at the school site.

**Sub-problem Three Methodology**

**Develop an initial Habitat Restoration Plan for the LCSD Natural Area to inform the LCSD Board of Education and other school/community groups about the relevance of habitat restoration and its connection to field-based environmental education.**

On-site habitats will be classified during the spring of 2006 using indicator plant species as a guide. An initial Three-Year Habitat Management Plan will be developed and goals for the environmental science program and the LCSD Environmental Coordinator Position will be created during the summer of 2006.
School groups such as the LCS Board of Education, LCS Parent Teacher Organization (PTO), and the LCS Foundation will be informed of the program development in November 2006. Community organizations such as the Delafield Park and Recreation Department and the Lake Country Women’s Club will also be contacted at this time. Parents will also be notified of the environmental program development and will be asked to participate and volunteer in restoration activities if they can help.

**Sub-problem Four Methodology**

Develop and implement standards-based activities that utilize the ecological attributes of the school site effectively.

During the 2006-2007 academic year and the first month of the 2007-2008 academic year, outdoor environmental science activities will be developed that encourage students to develop awareness, knowledge, skills, and responsible environmental behaviors and actions. These activities will have students observe, identify, and research many aspects of the natural history of the school site and the surrounding region. Activities will also be designed to expose students to field-based habitat restoration work. Careful attention will be paid to developing regionally specific activities.

A short student survey will be given to understand the students’ perceptions of outdoor environmental science activities, their enjoyment of these activities, and the contribution of these activities to their learning (Appendix D).

**Sub-Problem Five Methodology**

Create a Habitat Management/Site Use Plan for the LCSD Natural Area that will further guide best practices in habitat management and field-based environmental education.
After finding specific locations and developing the field-based environmental science activities, a final recommendation will be made in the form of a Habitat Management/Site Use Plan for the LCSD Natural Area. The plan will be designed to emphasize current research practices for sound habitat management. The plan will also be created to highlight key features of the site to be utilized for environmental science activities.

**Developing Field-Based Environmental Science Activities to Enhance the 7th Grade General Science Program - Project Formation Timeline (2005-2008)**

**July 2005**
Researcher hired as LCSD 7th Grade Science Teacher. Administration and staff encourage the development of outdoor science education to utilize the LCSD natural landscape.

**August 2005**
Inventory school site natural history.

**September 2005**
Identify unit themes for 7th Grade Science using Lake Country School Scope and Sequence Table.

**November 2005**
Develop student-created habitat management plan unit within the 7th Grade General Science Curriculum. The site for the plan is not required to be a local site.

**September 2006**
Contact Marlin Johnson, Resident Manager of the UW-Waukesha Field Station; Mike Fort, habitat restoration volunteer at Lapham Peak State Park; Matthew Tiller, Environmental Science Teacher at Verona Area High School; Mike Borquin, naturalist at Retzer Nature Center; and Clay Frazer, Habitat Specialist with Pheasants Forever. Visit Lapham Peak restoration sites with Mike Fort to discuss some the successes and failures of his projects. Secure permission for seed
collecting at Lapham Peak State Park and UW-Waukesha Field Station in October and seek advice for “Restoration Site A.”

October 2006
Designate “Restoration Site A” (RSA) as initial area for habitat management. Clear area of existing vegetation and apply herbicide. Collect seed at Lapham Peak State Park and UW-Waukesha Field Station.

November 2006
7th grade students participate in seeding RSA with a mix of over 30 species of native plants. Propose initial Habitat Management Plan and the Development of Environmental Coordinator Position for LCSD to the Board of Education.

February 2007
Introduce restoration projects and outdoor environmental education plans to staff. Matt Kirk, 8th grade student, approached researcher for approval of Eagle Scout Project, a wildlife observation deck in the LCS Natural Area.

April 2007
Contact parent volunteer, David Guerra, to coordinate buckthorn removal at Restoration Site B (RSB).

May 2007
Plant native plant species in RSA. Develop an Outdoor Environmental Education Account with the LCSD. Matt Kirk completes Eagle Scout Project along nature trail.

September 2007
Create Habitat Management Plan Unit for 7th grade students.

October 2007
Entire 7th grade visits Lapham Peak State Park to take a tour, collect seed, and remove invasive species. Execute Habitat Management Plan Unit.

November 2007
Students create Habitat Management Plans for a local site. Environmental Club for 7th Graders founded. 15 7th graders participate in club activities throughout the
school year. Students participate in inaugural event of prairie seed collection at Lapham Peak State Park.

December 2007
Begin Earth Day Event planning with the LCS Foundation.

March 2008
Construct and erect bluebird nest boxes around school site with the 7th Grade Environmental Club.

April 2008
Researcher coordinates an all-school Earth Day event, “Wisconsin Wildlife and their Habitats.” Highlights include 7th grade students leading LCSD Natural Area tours for grades 1-4. Grades 5-6 participates in service-learning opportunities including a garlic mustard pull and soil preparation for native plant seeding in RSB. Grades 1-8 observe guest speakers Mary Schmaus and Randy Hetzel.

May 2008
Environmental Club visits Parfrey’s Glen and Devil’s Lake. Students carry out action steps of Habitat Management Plan and present final results to class. Researcher completes revised Habitat Management / Site Use Plan for the LCSD Natural Area.

Summary

The development of this project has been closely tied with the collaboration of local natural resource experts, the restoration of local habitats and the emphasis on an entire school community approach. The results of these efforts alone could be noted as necessary to the enhancement of the environmental education program at LCSD. However, the aforementioned components of the widely-scoped approach were designed to specifically be used as tools to further develop field-based environmental science activities that enhance the 7th grade science curriculum.
Chapter 4

Results

Introduction

This chapter will describe the identification of unit goals and themes to be addressed within the general 7th grade science curriculum. The consultations with resource professionals regarding the development of an Initial Habitat Management Plan for the school site will also be discussed. The field-based environmental science activities designed for the LCSD Natural Area will be shared. Components of the Revised Habitat Management/Site Use Plan for the LCSD will be displayed. The results of a student survey showing reactions to the outdoor environmental science activity implementation will be given.

Sub Problem One

Identify unit goals and themes for field-based environmental education within the 7th grade general science curriculum.

The National Science Education Standards and the Wisconsin Model Academic Standards for Science and Environmental Education were analyzed to find possible intersections of significance. Within the Wisconsin Model Academic Standards for Science it was discovered that Science Standard F: Life and Environmental Science, Standard H: Science in Personal and Social Perspectives and Standard G: Science Applications were the most applicable to the correlation with the outdoor activities. All five content standards of the Wisconsin Model Academic Standards for Environmental Education were taken into account within the created activities. The North American Association for Environmental Education Excellence in Environmental Education Guidelines for Learning (grades 5-8) were reviewed. The places where these standards
overlapped offered a starting point for developing the themes and units that would be expanded upon.

While keeping in mind the degraded condition of the LCSD Natural Area, yet also focusing on some awe-inspiring features of the site, it was natural for the researcher to develop unit themes that focused around ecological restoration and habitat management. These themes encouraged awareness and knowledge of natural specimens and processes yet also offered opportunities for inquiry-based nature study. This direction also provided interesting prospects for service-learning projects which encouraged civic responsibility. The unit concepts are outlined below:

❖ Habitat Management Plan Development By 7th Grade Students

➢ Inventory of local sites (habitats, animals, plants)

➢ Study of local habitat issues with an emphasis on habitat restoration

➢ Development of habitat management goal statements and action steps for a student-chosen project site in the community

➢ Execution of action steps at chosen site

➢ Presentation of site inventories and action steps completed

Sub-problem Two

Determine resource professionals, organizations, and specific locations that will encourage field-based environmental education on the school site and surrounding natural communities.

Resource Professionals

In the summer 2006, Marlin Johnson, an instructor and land manager for University of Wisconsin-Waukesha, was contacted to help coordinate a waters-based field day for the 7th grade students. Although Marlin’s expertise was then noted for the
waters-based activities, his wealth of knowledge and access to resources would make him extremely valuable when planning future habitat management activities. During the fall of 2006, the researcher learned from a colleague at Lake Country School that Marlin was instrumental in the establishment of restored prairies in Waukesha County dating back to the late 1960s. His work paved the way for many similar restoration projects on degraded sites throughout the next four decades. Knowing this, the researcher contacted Marlin and inquired about seed collecting in October and November of 2006. Over 30 species of prairie plant seeds were collected at the UW-Waukesha Field Station near the small town Dousman in Waukesha County (see photo in Appendix C). Seed was also collected at this site in the fall of 2007. Marlin was also instrumental in the success of the field trip to Lapham Peak State Park which will be discussed in further detail below.

Mike Fort, a retired airline pilot from Wales, Wisconsin, was contacted as another natural resource specialist. Although his title only signifies that he is a volunteer, he has been working with habitat restoration projects at Lapham Peak State Park for almost 15 years. He won the distinction of Wisconsin’s Invader Crusader in 2005 for his work battling invasive plant species. During the fall of 2006, Mike was willing to give a personal tour of the prairie, savanna, and oak opening habitat projects at the park. He pointed out areas that where seed could be collected. The researcher took him up on the offer about a month later. Mike’s expertise in local habitat restoration made him a valuable source of information for the development and approval of the Initial Habitat Management Plan for LCSD (Appendix C). In the fall of 2007, he also accompanied the LCS Environmental Club for seed collecting at the restoration sites. Most of the collected seeds were used to seed the restoration sites at the Lake Country School Natural Area. Mike helped coordinate a field trip to Lapham Peak State Park for the 7th graders in the fall as well. This trip emphasized service-learning such as seed collecting and buckthorn removal while giving the students a first-hand look at successful restoration projects and the awe-inspiring natural features (see newspaper article in Appendix B).

During the fall of 2006, other professionals such as Mike Bourquin, a naturalist with Retzer Nature Center and Clay Frazer, Habitat Chairman with Pheasants Forever
were contacted. These individuals gave advice for seed mixes for the savanna restoration site. Although the savanna site would not be seeded until the fall of 2008, the advice given was taken into account for the future (Appendix D).

David Guerra, parent of a 7th grade student in 2006-2007, responded to the parent questionnaire regarding the restoration projects. David indicated that he owned landscaping and tree removal business and that he would be willing to help out with removal of buckthorn at the savanna restoration site. During the spring of 2007, David volunteered to spend the better part of an April day using his “brush hog” attachment on the front of his Bobcat to cut down buckthorn (photo in Appendix C).

Matthew Tiller, Environmental Science Teacher at Verona Area High School was also an extremely helpful resource before and during the completion of this project. Matthew was the researcher’s cooperating teacher for student teaching in the fall of 2001. During this project, Matthew provided insight for the treatments of the restoration sites (Appendix D).

Greg Bisbee, Biology Teacher at Hartland Arrowhead High School, was also contacted for advice in both restoration ecology and the development of successful activities for the school site. He stopped out to the LCSD Natural Area to discuss several options for getting the restoration project started. Among his suggestions were to cover the designated area with tarps or newspaper to kill off existing vegetation before seeding with natives.

Organizations

The Lake Country School Board, the Lake Country School PTO, the Lake Country School Foundation, and the Delafield Park and Recreation Commission were contacted about the development of a habitat restoration program and associated activities at the school site. The information provided to them is discussed in Subproblem Three below. All of these groups have since contributed financially to the restoration projects in some way over the last two years. Additionally, representatives from the Lake Country School Foundation, Louisa Self and Lisa Skroblin, have helped in
the grant writing process for the seeking of additional funds for future restoration
projects. These same representatives from the LCS Foundation, in collaboration with the
researcher, helped plan an all-school Earth Day event at LCS. This event is described
more completely under Sub-problem Four.

Specific Locations of Importance

LCS Natural Area – Nagawicka Lake Wetlands

Lake Nagawicka lies just to the south of the LCSD property. In between are
wetlands of various classifications. Upland sites transition to dogwood/willow thicket,
cattail marsh, sedge meadow, and tamarack bog. The Wisconsin Department of Natural
Resources has classified this particular tamarack bog as an area of regional significance.
Established nature trails skirt the edge of these wetlands and give a glimpse into the
plants and animals that exist in these habitats. Birds such as the yellow warbler, common
yellowthroat, and red-winged blackbird can be seen from the trails while great-blue
herons frequently pass by overhead as they travel between their nesting and feeding
grounds. Mammals such as white-tailed deer and coyotes use the thick wetland
vegetation for shelter during the winter months. Plants along the path include marsh
marigold (Caltha palustris), dewberry, and turtlehead. Trees such as American elm and
tamarack are being threatened by introduced species such as glossy buckthorn and
honesuckle. Purple loosestrife populations have decreased since the release of
Galerucella beetles at the site about 10 years ago.

LCS Natural Area – Vettelson Road Bur Oaks

A handful of mature bur oaks were found on LCSD property near Vettelson Road.
One of the specimens has been estimated to be 150 years old. The area including this tree
was selected as a favorable savanna restoration site due to the presence of a new
generation (10 individuals) of young oaks and hickories that are less than 6” in diameter.
The general area including the oaks has also been overrun with invasive species such as
garlic mustard, honeysuckle, and common buckthorn. Black walnut trees are prevalent in
a few specific locales within this habitat and the researcher decided to avoid intensive
savanna or woodland restoration projects in these sites due to the Jugland toxin given off by the walnut trees. This toxin has a negative effect on many beneficial plant species that would otherwise be considered fit for restoration projects. This area was practically devoid of native species in the herb layer save a few black-eyed susan and mayapple. Birds observed nesting in these areas included downy woodpeckers, black-capped chickadees (nest box) and blue-gray gnatcatchers.

LCS Natural Area- Vettelson Road Retention Pond

A manmade retention pond near Vettelson Road was investigated as a possible site for hands-on wetland studies. This pond was found to have between one and three feet of water throughout the year. It most likely freezes solid in the wintertime. Common invertebrates such as dragonfly and damselfly larva were abundant. Green frog tadpoles were also numerous. A small pier can be found on the pond’s eastern shore, under which barn swallows make nests. The site was categorized as in need of maintenance due to cattails spreading in dense stands and sediment filling in. Purple loosestrife infestations were abated in recent years with biological control mechanisms.

Lapham Peak-Evans Prairie

This site was first visited in the fall of 2006 with Mike Fort. The site was converted from a farm field 10-15 years ago. The site boasts incredible diversity with thriving tall and short grass prairie ecosystems present. Species such as prickly pear cactus have been re-established on the sandier hilltops while big bluestem has dominated some of the flatter areas. Mike has even experimented in clearing some of the large areas of big bluestem from this site. Since this tall grass has an aggressive growing habit, it is actually causing a decline of some forb species in the prairie.

Lapham Peak Tower Area

The tower area at Lapham Peak State Park was found to have a wonderful combination of manmade and natural features. The observation tower sits atop one of the highest points in Waukesha County. The view from the top offers glimpses of
Milwaukee’s high rise buildings to the east, numerous local lakes, and many other glacial features such as moraines and drumlins. The landscape beneath the tower has been converted from a buckthorn infested shrubby stand into an open oak woodland with a prominent herb layer of bottlebrush grass, bergamot, Virginia wild rye and raspberry. Nearby pine plantations were also being managed by removing buckthorn. Glacial features such as ephemeral kettle hole ponds, moraines, and exposed glacial erratics were noted in the area. This site was visited briefly in the fall of 2006, but also in the fall of 2007 as a field trip site for 65-7th graders.

UW-Waukesha Field Station

This site in western Waukesha County, near Dousman, was visited as a seed collection site in the fall of 2006 and 2007. The researcher was accompanied by a fellow LCS teacher, her father, and Marlin Johnson, resident manager of the site. The prairie portions of the field station have been restored since the late 1960’s, making it one the oldest restoration sites in the county. Marlin mentioned that some of the original seeds and plants were obtained from the Curtis Prairie at the UW-Madison Arboretum in Madison. Marlin has given an open invitation to the researcher to return each fall for other seed collections. This area may also hold future value as a field trip site.

Sub-problem Three

Develop an initial Habitat Restoration Plan for the LCSD Natural Area to inform the LCSD Board of Education and other school/community groups about the relevance of habitat restoration and its connection to field-based environmental education.

A PowerPoint presentation was shown to the Lake Country School Board of Education in November 2006. This presentation was given to inform the district of the plans to begin habitat restoration projects on the school site, develop associated outdoor
activities, highlight local resources, and define the researcher’s role in the development of an environmental education program at the district (Appendix C).

The LCSD Board response was favorable. They were pleased that the researcher was utilizing a site that had been previously overlooked. A few weeks later, the district superintendent encouraged the researcher to develop an Environmental Project Coordinator position description (Appendix C). The researcher did so and the position was approved. Shortly thereafter, the researcher signed a one-year contract for the position.

An initial Habitat Management Plan was created to develop goals for restoration and possible site utilization by LCS students (Appendix C). This plan identified, described, and mapped out habitats of importance on the school property. The benefits of utilizing these sites for habitat restoration were explained in this document. These benefits included highlights for the natural communities, the students, and the Lake Country community as a whole.

The PowerPoint presentation given to the LCSD Board of Education and the Initial Habitat Management Plan were published on the school website later in the fall of 2006. These documents on the LCS website provided an easy opportunity for school/community groups such as the LCS PTO and the LCS Foundation to gain a background in what restoration projects were taking place and the future goals for the use of the sites. Restoration project funding requests were submitted to these organizations during the fall of 2006 and the spring of 2007.

**Sub-problem Four**

Develop and implement standards-based activities that utilize the ecological attributes of the school site effectively.
Introduction

As the researcher began to develop the Initial Habitat Management Plan for the LCSD Natural Area, it became quite clear that the students could take part in the plan development as well. Habitat, plant, and animal site inventories were modeled within the LCSD Natural Area. The researcher guided students through tree identification, fall flowering plant identification, an aquatic invertebrate study, a winter food pyramid project, and a spring bird observation study. These activities, in coordination with the study of basic ecological principles in the science classroom, gave students the background knowledge and experience needed to develop and implement their own habitat management plans at a community site of their choosing. During the spring of 2008, students carried out their action steps of these plans and reported back to the class about the habitat management projects at their site.

1. Tree ID Activity

The LEAF 7-8 Guide, Field Enhancement #1, Tree Identification, was used as a resource for the identification exercises in the fall. As an entire class, students were led through the dichotomous key to identify a tree species. Students were then placed into groups of 2-3 students and were given a “course” in which to follow to identify 7 different tree species. These trees were all located along a woodland edge so students could be within sight of the researcher during the entire activity. Students were given tree keys and a term sheet that explained and diagrammed several important terms/concepts. At the beginning of the activity, students were a bit overwhelmed with some of the vocabulary they needed to know to correctly identify key characteristics of each species. Mosquitoes were incredibly fierce in the fall of 2007 and this also presented a significant hurdle for getting some students to maintain focus on the task at hand. In the end, students became more comfortable with the key vocabulary terms and thus were able to become proficient at identifying the key characteristics of each species.
2. Fall Flowering Plant Activity

Students were led along another woodland edge to identify characteristic fall flowering plants. Students did not use a dichotomous key during this activity. Students took notes on 6 flowering plants of the LCSD Natural Area in September. Leafing arrangements, petal color, petal number, and height of plant were compared. Students used this information to help them distinguish key characteristics of plants that were found on their habitat management sites.

3. Aquatic Invertebrate Study

Students were introduced to the concept of the biotic index through an activity found on the Water Action Volunteers (WAV) citizen monitoring website. They spent one class period collecting invertebrate samples from the Vettelson Road Retention Pond. Students used dichotomous keys to identify invertebrate species and then placed these species into different categories. A biotic water quality index was calculated using the types of invertebrates as indicators.

Overall, the students enjoyed the exploring portion of this activity. They were extremely motivated in their collection of specimens. As expected, one student found walking across the muddy bottom of the pond particularly tricky. Good naturedly, she laughed as the pond water covered her up to her neck. Needless to say, it was a memorable day for her and the rest of the class.

4. Winter Food Pyramid Project

Using inventory techniques learned in the fall, as well as close observation of animal tracks observed from the trail, 7th graders created a winter food pyramid/web based on all plants and animals seen during a hike through the LCSD Natural Area. The class looked for evidence of seeds, bark, or other plant material that was recently eaten. Signs of browsing deer were noticed. One class also noticed a barred owl that escaped out of a cedar tree near the cattail marsh. A combined list of about 20 species of organisms were compiled from the day. The students were then required to place all of these species
into a food web and label them as producers, consumers or decomposers. The food pyramid showed students how the energy traveled from the producers up to the 1st, 2nd and 3rd level consumers. The students could then get a more complete picture of how local wildlife could survive the tough Wisconsin winters. See complete lesson plan in Appendix E.

5. Habitat Management Plan Development

During the later parts of the 1st semester, students created their own habitat management plans for a local site of their choosing. Groups of 2-3 students chose a site that was in close proximity to one or all of their residences. Sites chosen consisted of backyards, vacant lots, private woodlots, and large county parks. The management plans were presented to other classmates using Microsoft PowerPoint in late November 2007. The distinct activities involved in the plans are explained briefly below and in more detail in (Appendix E).

A. Goals for habitat management were developed after 9 weeks of environmental ecology lessons that discussed the different branches of ecological organization (species, population, community, and ecosystem) within the framework of local habitats. Students were given sample goals for the habitat management plans to help them get started.

B. Students used background knowledge from their science course work and completed additional research to help describe the importance of their goal.

C. Research was completed to find out more about the history of their site. For this, they may have asked park managers, neighbors, or conducted first-hand inventory to uncover how the age structure of the forest and other vegetation could indicate past land usage.

D. Timelines were created to show how the land had been shaped by natural events and human activity.
E. Habitat, plant, and animal inventory techniques which were modeled at the school site in science class were conducted by students at their own sites.

F. Next, students developed three action steps that could be taken to carry out their management goal. Goals were to be specific, reasonable, and doable.

G. Students used Google Earth to find a satellite view of their site. Exact project sites were labeled on the map.

H. The habitat management plan was summarized in three bullet points to explain the significance of the project and leave a lasting impression on the audience.

6. Spring Bird Study

The Cornell Lab of Ornithology’s All About Birds web pages were used to guide students through the basics of bird identification. The class completed a homework assignment that used these web pages as references. The site walked them through the various ways of identifying birds by sight such as the following characteristics and behaviors: silhouette, special field marks (unique characteristics), posture, size, flight pattern, and the habitats where the birds are found. One day in the classroom was spent discussing these field characteristics. Before the students went outside for the bird watching, they were given instructions on how to use their binoculars and recording sheets. Each day that the students went out, they were given a “hit list” of 3-5 birds to identify. The researcher knew ahead of time that these birds were present along the trail and had a good chance of being seen or heard. This “hit list” helped students narrow their focus and look for specific characteristics in the birds. All birds seen or heard by the class were recorded. A selected path was taken and different monitoring techniques were discussed throughout the spring. The bird feeder and bird houses were closely watched for activity both during these bird observation days and from the classroom. Highlights from the year’s observations included: a flock of 13 great blue herons that were returning to the rookery, a Baltimore oriole that was tracked down by its call and finally seen
directly overhead, a house wren making a nest in one of the bluebird houses while dealing with competing tree swallows.

Overall, students became much more aware of their surroundings after these bird days. Many students would comment to the researcher about birds they had seen before or after school and wonder what they were and what they were doing. This reflected the impact the learning had on their everyday lives.

7th grade Field Trip to Lapham Peak State Park, Delafield, Wisconsin

In mid-October 2007, the 7th grade class from LCS, consisting of 65 students, attended a half day field-trip to Lapham Peak State Park. Three volunteers from the area helped out to make the day educational and worthwhile for the participants. The class was split into three different groups for the day, each participating in three 45 minute sessions.

Group 1: Tower Climb and Glacial Geology Hike
Session Leader – Marlin Johnson

Marlin Johnson, introduced earlier in this project as well, is the Resident Manager of the UW-Waukesha Field Station. Marlin began the tour with an explanation of how glaciers advanced throughout most of Wisconsin (see picture in Appendix B). He traced the terminal moraine on a map and showed how the Ice Age National Scenic Trail followed the path of the last glaciers in Wisconsin. Next, students were awed at the view of at least 20 miles in each direction from the top of the lookout tower. Lake Nagawicka and Holy Hill were seen to the north, the Milwaukee skyline to the east, and many glacial features such as moraines and drumlins were observed to the south and west. One student commented, “I never thought that I’d see Lake Nagawicka as a puny puddle!”

After the tower climb students were led on a hike on the Ice Age National Scenic Trail that gave them a close-up look of a kettle pond and a stone fence made up of many rocks (glacial erratics) carried down from Canada with the last glaciers 10,000-14,000 years ago. Marlin was an exceptional tour guide and he did a splendid job of
incorporating a few interesting stories into his informative session. Students were amazed when he pulled out a 10 lb piece of copper out of his backpack and passed it throughout the group. The fact that this piece of copper had been carried hundreds of miles to the Kettle Moraine by the glacier gave a great indication of the force the advancing glaciers held.

**Group 2: Buckthorn Hauling**

**Session Leader – Mike Fort**

Mike Fort, retired pilot and current habitat restoration volunteer at the park, led students on a mission to haul cut buckthorn. The buckthorn was stacked into large piles that were to be burned during the winter. Students worked together to clear large areas within a pine plantation of this invasive shrub. The students enjoyed working together and getting a little bit dirty in the process.

**Group 3: Seed Collecting**

**Session Leader – John Lupo**

John Lupo, a member of the Friends of Lapham Peak group, helped out with organizing a seed collecting session in an oak opening restoration near the tower. Open woodland grasses were the focus of the collection. Students were taught how to tell the difference between bottlebrush grass, Canada wild rye, and Virginia wild rye. Student collection bags were then combined and given to John at the end of each collection. Later in the fall, Mike Fort handed me a woodland seed mix with some of the woodland species that we collected on the field trip. The students were excited to learn that the seeds they collected would be used to help restorations at the park, but also that some would be used at LCS’s own restoration plots.

In summary, this field trip enriched the 7th grade science curriculum by integrating informative sessions with service-learning opportunities. The volunteer session leaders added a fresh new dimension to the outdoor learning. The students saw the responsible environmental behaviors modeled by the group leaders, and, for the day,
were able to share in the common mission of making improvements to the health of the local ecosystem in the Kettle Moraine.

Bluebird Nest Boxes Erected and Monitored

In Late February 2008, students in the 7th Grade Environmental Club spent a day after school constructing bluebird nest boxes. Students worked in groups of two to complete 5 nest boxes. Boxes were mounted to galvanized pipes and erected with the 7th grade students during science class the following week. Boxes were carefully placed throughout the school grounds more than 100 yards apart to accommodate the bluebird’s nesting territory. Boxes were placed facing east and were put in open areas with trees close by for perching. Boxes were monitored by the researcher and the 7th grade classes during the spring bird survey.

Although bluebirds investigated the nest boxes, no bluebird pairs took up residence in the nest boxes. However, all of the boxes saw some activity by the end of May. Nest box #1 had house wrens and tree swallows battling for rights, with the energetic wren winning the battle. Box #2 was almost completely packed with moss which revealed a black-capped chickadee had found a home. On May 28th, 7 chickadee eggs were noticed. Boxes #3 and #4 had tree swallows and box #5 had an infamous house sparrow nest. Students had a chance to observe some of these birds build the nests and care for the young. The different species that made our boxes their nest site led to worthwhile discussions about “beneficial” and “harmful” species and the complicated decisions involved in wildlife management.

Overall, having the boxes on the school site provided a sense of ownership with the bird species that used the boxes. Students were interested in what was happening to “their” birds. Students understood that the decline or success of these species depended on their decisions and actions. This type of hands-on experience encouraged them to be stewards on their own property now and in the future.
LCS Earth Day 2008

This event included tours of the restoration sites and natural areas for grades 1-4, service learning opportunities for grades 5-6, and guest speakers for grades 7-8. All students were able to see the guest speakers throughout the day at some point.

In the afternoon, 7th graders listened to guest speakers present on wildlife that could be found in the LCSD Natural Area. Randy Hetzel, an expert on reptiles and amphibians, brought his outstanding collection of native Wisconsin species for an up-close view. Mary Schmaus, a raptor rehabilitator, brought her collection of Wisconsin birds of prey. The one hour demonstrations / presentations gave students a chance to learn about local biodiversity and the importance of sound wildlife management practices on our school site and throughout the surrounding community.

7th graders in the Environmental Club led tours for grades 1-4 during the morning. During the tours, the 7th graders described restoration projects that were ongoing and did a sound mapping activity with the younger children (see picture in Appendix F).

The Lake Country Reporter ran a story about the Earth Day Event at LCS and also briefly described the outdoor environmental education program at the school (Appendix B).

Student Survey Results

Students responded to survey questions during the last weeks of school for the 2007-2008 year. They were asked to reflect on the significance that the outdoor environmental science activities had for both their enjoyment and learning in science class (Appendix D). 61 out of 67-7th grade students were surveyed. 97% of students responded that they were at least somewhat excited that they were able to participate in outdoor activities during science class. 98% of the students agreed that the outdoor activities made science class more enjoyable than a “typical” indoor science class. 93% of respondents thought that science class enrichment with outdoor environmental science activities made concepts easier to understand.
Sub-Problem Five

Create a Habitat Management / Site Use Plan for the LCSD Natural Area that will further guide best practices in habitat management and field-based environmental education.

The Habitat Management / Site Use Plan for the LCSD Natural Area was developed to establish goals for future habitat management and to discuss how the site could continue to be used for outdoor environmental education. The completion of this plan was based on additional site inventory, ongoing restoration projects, and new activities that were developed (Appendix E).

Location

The 20-acre LCSD Natural Area is located along the northern shore of Lake Nagawicka in northwestern Waukesha County. The entire property (30 acres) is bordered to the north by Vettelson Road, railroad tracks for freight and passenger trains, four-lane State Hwy 16. To the east, across Nagawicka Road, lies University Lake School and a forested ridge of approximately 180 acres. To the west, the City of Delafield Conservancy owns a parcel of upland forest.

Historical Uses of the Site

Most of the LCSD Natural Area consisted of a farmstead until the early 1990’s. Sheep and cattle grazed much of the property into the wetland habitats surrounding Lake Nagawicka. Although forest regeneration has occurred, most of the species that have become established since the grazing are undesirable species with invasive qualities and minimal wildlife value. However, a few relict trees remain on the site and serve as a reminder of what the landscape may have looked like before farming, grazing, and other disturbances caused by settlement in the early 1800s.

Habitats Present

Although the no large connected tracts of habitat exist on the LCSD property, these fragments remain a stronghold for many species of plants and animals. The habitats
represented on the property are diverse, and, therefore, successfully provide the basics of habitat such as food, water, shelter, and space for many species.

Specific habitat components found include:

- Cattail Marsh
- Shrub-carr
- Tamarack Bog
- Open Bog
- Southern dry-mesic forest
- Regenerated pasture

Of these habitats, tamarack bog is specially designated as Natural Areas of Regional Significance due to its relative rarity south of the tension zone. The wetland habitats, protected from sheep and cattle grazing for the last 150 years, contain the most natural features and species of interest.

**Desirable Species of Interest**

**Plants**

Bur oak and shagbark hickory relicts exist on the site in the upland areas. However, regeneration of these trees has been hindered by dense growth of common buckthorn and honeysuckle in the understory. Herbaceous species such as marsh marigold, mayapple, yellowish gentian, and turtlehead have been observed on the site. Virginia bluebell, a native species, has been reintroduced to the southern dry-mesic forest. Over 35 other native species have been reintroduced into the restored prairie plot (Restoration Site A).

**Animals**

Mammals of interest include mink, muskrat, coyote, and white-tailed deer. The site offers suitable habitat for otter and beaver but none have been observed. Birds of
interest include numerous great-blue herons that use the property as a feeding ground. Wild turkeys have been seen displaying on the property. Barred owls are known to reside on the property. The site also is an important stopping point for numerous songbirds. Songbirds of interests seen at the site include the Wisconsin-threatened yellow-throated vireo and the Brewster’s warbler, a relatively rare hybrid of the blue-winged warbler and golden-winged warbler.

Species of Invasive Concern

Shrubs that have caused ecological damage at the site include honeysuckle, common buckthorn and glossy buckthorn. Although native, poison ivy and boxelder have taken over some of the upland sites. Herbaceous plants include major infestations of garlic mustard, motherwort, and Queen Anne’s lace. In the wetlands, hybrid cattail and purple loosestrife have invaded shores.

Restoration Sites

Restoration Site A

Restoration Site A was cleared in the fall of 2006. The site consisted of mixed shrub and old pasture components. The site was dominated by boxelder, common buckthorn, and Queen Anne’s lace. Native plants that existed on the site included bergamot, black-eyed susan and New England aster. It was planted in late fall of 2006 with a mix of nearly 35 native prairie species. The site was mowed in May of 2007 and planted with additional native plants in June and September. During the summer of 2007, Queen Anne’s lace was pulled by hand after a rainstorm. This biennial weed became a major problem on this site, but pulling was successful in ridding the plot of the seed bearing plants. Boxelder and common buckthorn regrowth from stumps was cut and treated with herbicide in May 2008.

Restoration Site B

This site initially consisted of one mature bur oak and about a dozen young bur oaks and shagbark hickory trees. The understory was completely dominated with common buckthorn and no herb layer was present on most of the site, except along Vetteloson Road. A few native species such as black-eyed susan exist near the roadside.
In the spring of 2007, David Guerra, a parent volunteer, used a “brush hog” attachment on his bulldozer to cut down the buckthorn shrubs (see picture in Appendix C). In late spring the area was sprayed with Roundup by the district’s hired landscaping company. Buckthorn, boxelder, and ash regrowth was noticed by late summer of 2007. In the spring of 2008, much of the coarse mulch that was left from Mr. Guerra’s operation was raked up by 6th and 7th grade students. This exposed the soil and also promoted the growth of a few more undesirable seedlings. Another herbicide application is planned in the summer of 2008 and then the site will be seeded in the fall with a prairie / savanna mix.

Restoration Site C

This site lies to the east of Restoration Site B. The site has three mature bur oak trees, about six large black walnuts and a few eastern red cedar and white cedar. The understory consists of mixed boxelder, ash, hickory, and oak. Some portions of the site contain little understory but make up for it with a thicker herb layer. Ground level woody plants include raspberry, Virginia creeper, and honeysuckle. Garlic mustard is the most prevalent forb, but mayapple and reintroduced Virginia bluebells can also be found there. The black walnut trees on this site are of concern because the chemical “juglone” is emitted by the roots of the tree and high levels are also found in the buds and nut hulls. Many plans are intolerant of “juglone” and will not survive under the black walnut trees. Garlic mustard has been pulled from the site for the past three years but it shows no signs of becoming less prevalent. The seedbank seems to be saturated with the seeds. Although no plans for immediate seeding the area are in the works, desirable species will be added as plants in the coming growing season. Continued work will be needed to be done to inhibit the spread of other invasive woody species such as boxelder, common buckthorn and honeysuckle.

Connections to Curriculum: Student Involvement in Habitat Projects at LCS

Prairie / Savanna Plots

Since the fall of 2006, students have been involved in the prairie/ savanna restoration sites on the property. In the fall of 2006, students collected cup plant,
bergamot, and black-eyed susan seeds from various areas of the property. Students were then involved in the initial clearing and seeding of Restoration Site A. In the spring of 2007, they participated in planting the site with prairie seedlings that were grown in the classroom and some that were donated or purchased. In the fall of 2007, additional adult plants were added to the site by 7th graders. Sixth and seventh graders also helped in the clearing of debris from Restoration Site B in the spring of 2008.

The sites have been used for plant identification exercises in the fall. To this point, the most prevalent native plants in Restoration Site A include black-eyed susan and New England aster. Although many non-native species exist on the restoration sites, it is important that students understand that habitat management is an ongoing process. Students have been able to see that the restoration sites are a work in progress. In a way, they are a scientific experiment that is ongoing, presenting new challenges and successes with every passing year. Along the way, new successful strategies may be uncovered and failures learned from.

*Bird Feeding*

Bird feeders were purchased and placed in view of the researcher's classroom in the spring of 2006. A telescope was purchased to make the birds appear closer than the 40 meters that existed between the second story classroom window and the feeder along the wooded edge. The telescope is always set up in the back of the classroom and frequently students will be seen checking the activity of the feeder. This feeder is not part of a formal bird study, but often times discussions are started because of a new sighting at the feeder. During spring, wild turkey toms can be seen displaying to the hens that are eating under the bird feeder. The researcher has frequently taken calls from other excited teachers that have made new discoveries at the feeder. Bird seed is typically donated by 7th grade families throughout the year. Wild Birds Unlimited in Delafield has also been gracious to donate seed in the past. Interesting sightings throughout the years have been five species of sparrows at one time, Baltimore orioles, indigo buntings, and many other songbirds.
Bluebird Nest Boxes

In the spring of 2008, the 7th Grade Environmental Club constructed five bluebird nest boxes. The boxes were erected on the property and monitored throughout the spring. Although no bluebirds stayed to nest in the boxes in 2008, chickadees, wrens, and tree swallows were active in the boxes. The researcher recently noted that bluebirds preferred weathered looking boxes and hopefully the new looking pine will be more attractive to the bluebirds in 2009 and subsequent years. The students were thrilled at setting up the boxes and seeing birds take up residence. A particular 7th grade class got a kick out of watching a house wren try to fit sticks that were twice as long as itself into its nest box while fighting off competing tree swallows. The class noticed a pile of sticks below the nest box, indicating the wren was not letting past failures hinder its task at hand, -a good life lesson for the students. The bird houses added a new component to the 7th grade bird study in the spring of 2008. The results of the study were compiled and submitted to eBird, which is an online posting site available to other bird researchers thanks to the Cornell Lab of Ornithology. During four days of observations throughout the late winter and early spring of 2008, 40 species were identified on the property. Our observation data was used in some 7th grade math classes. The percent change of species seen from one observation day to another was calculated. Species numbers fluctuations were compared with migration trends to find peak migration times on the LCSD property.

Summary

Although the effectiveness of the environmental science activities, the restoration projects, or the overall environmental education program at LCSD was not proposed to be researched, the 7th graders were surveyed to determine their opinions of the outdoor environmental education experiences at LCS. Results from the survey were encouraging. 93% of respondents thought that science class enrichment with outdoor environmental science activities made concepts easier to understand. Again, these results do not completely explain the effectiveness of the created activities, but it was encouraging to
note that the students felt the outdoor activities were enjoyable and they contributed to their learning.
Chapter 5

Conclusions and Recommendations

Importance of Outdoor Learning Experiences

Review of related literature has revealed the importance of outdoor environmental experiences for school-aged children. From the physiological workings of brain function to the simple feeling of being refreshed by nature, the diverse benefits of outdoor learning and play experiences have been documented by many researchers.

Specifically, the outdoor activities experienced by the researcher’s 7th grade students will work to develop their own environmental sensitivity. The students’ development in awareness and knowledge of things natural will help them take note of how humans and nature need to live together. The experiences help them develop a “sense of place” and a sense of ownership regarding the natural resources that can be found in their place of upbringing. A “sense of place” has been known to lead students toward environmentally responsible behaviors which are vitally important to the future health of our planet.

Using natural sites on school grounds and other local areas encourages students to realize that nature does not only exist somewhere else. Nature in the landscape is all around us and we are a part of it. As Aldo Leopold stated, “When we see land as a community to which we belong, we may begin to use it with love and respect.” Through frequent meaningful visits to local natural areas, students may begin to understand and take hold of this concept of nature stewardship.

During an informal discussion at the end of the school year, the researcher’s 7th grade class was asked what they gained from the experience of completing the habitat management plan assignment for a local community site. One 7th grader responded that she developed a special “bond” with her site. Although this simple answer could have been easily overlooked, it was noted as an extremely insightful comment. The term
“bond” used alluded to the fact that the student not only was more aware of the natural features of the site, but also that she began to care about the site in a new way. Perceptions of the sites were changed and likely, a “sense of place” was developed more completely by this unsuspecting 7th grader.

Resources for Developing Outdoor Environmental Science Sites and Related Activities

As much as the researcher would like to think otherwise, the task of developing outdoor sites and related activities for environmental education has been done before. Natural resource professionals, volunteers and education partners were found to exist in the southern Wisconsin area. In fact, most of the resources were found within 10 miles of the researcher’s school site. These resources, whether they were individuals, organizations, places, or documents, were significant in the completion of this project. Of these, individuals were the most important piece of the resource puzzle. Building a rapport with individuals such as Mike Fort and Marlin Johnson assisted the researcher with inspiration, knowledge, and access to many other resources.

Creating Meaningful Outdoor Environmental Science Activities

The researcher created activities that revolved around a common unit theme of wildlife and habitat management. This theme allowed students to explore the school site and their own off-school site through habitat, plant, and animal inventories. The completion of the inventories required students to be careful observers to identify and classify particular species of interest. Local habitat related issues were covered in the classroom to build a background for students as they developed habitat management goals for their own natural site. After the completion of goals, students carefully planned action steps that would help them reach their main goal of management. Action steps were implemented by students in their small groups. Results were reported back to the class during the last weeks of 7th grade.
The development and execution of these plans was significant for many reasons. The development of the habitat management plans by the students paralleled work that ecologists do today. Through guided inquiry, students needed to exhibit critical thinking skills to develop goals and action steps that they could complete. Perhaps most importantly, the overarching concept of land stewardship was practiced and exhibited in the final steps of executing and presenting the successes and failures of the final habitat management project to the class.

**Recommendations**

**Develop Activities and Events that Have a Community Focus**

Activities such as the students’ habitat management plan encourage them to complete work outside of the classroom and typical school environment. Since the students had to complete their habitat management plan project at a community site, they became visible to others outside the school community. This community infiltration raises awareness for the LCS environmental education program and raises awareness about environmental topics in general. This takes education beyond school walls into families, subdivisions, communities, and the surrounding countryside. Hopefully, this approach to environmental education yields greater returns when thinking of raising the environmental awareness and sensitivities of entire communities.

The LCS Earth Day Event in the spring of 2008 encouraged all classes at LCS to take part in the activity. An all-school event such as this may encourage unity regarding the importance of environmental education at the school. This event also may have raised awareness from other students and classrooms that have never been exposed to environmental topics. Making an event open to the entire school encourages discussion between teachers and between teachers and students. Often times, new resources can be uncovered through these discussions.
Service-learning components of environmental education activities should also be stressed within the school and community. For example, educating and completing projects that address ecosystem health are a priceless value to the community. Habitat projects that were completed at the LCSD school site, local public parks, and privately owned lands were all beneficial to the community while simultaneously enriching the science education of LCSD students. Encouraging students to continue with these types of opportunities after their formal schooling will help them to develop and maintain healthy communities wherever they may be.

Encouraging the Emphasis of Environmental Education at the School

The researcher proposed an Environmental Project Coordinator Position be established at LCSD to emphasize the importance of the environmental education at the school. The researcher was hired to fill this supplemental position. By establishing this position, the LCSD Board of Education vowed their support for the environmental education program and the continued work of the researcher to develop goals and strategies for program development in the future. Working under this position further gave the researcher the ability to make decisions regarding habitat management and the planning of special events, such as the Earth Day Event. The researcher was also able to act as a liaison for the school in discussing environmental topics with other community resources. The researcher also assumed responsibility for developing a 7th grade Environmental Club for interested students. Throughout the year, these students acted to further raise awareness about environmental initiatives at the school.

Continue Modeling Environmental Stewardship and Lifelong Learning

Environmental educators have sometimes been criticized for being activists instead of educators. However, in the case of land stewardship education, most will agree that it is important to protect our environment in one way or another. The lessons created as a part of this project will be more successful if the teacher believes and models the concepts studied. By modeling stewardship, students see how the concepts apply to real-
life situations. By learning along with the students, a teacher can foster excitement and suspense when making new discoveries. Most of all, teachers can portray how learning can be a lifelong process and how learning new things can improve one’s quality of life.

Encouraging Students to Lead or Teach

Students took responsibility to become experts of their habitat during the creation of the habitat management plans. They took pride in sharing their stories with other students about the experiences they had at their site. When presenting their habitat management plans to the class, they were questioned by the classmates about portions of their plan. The presenters needed to know their background information well in order to explain the project and answer questions.

During the LCS Earth Day Event members of the 7th grade Environmental Club guided tours for grades 1-4 through the restoration sites and other natural areas on the district property. Students enjoyed being the experts and the guides for these trips. Initially, a few individuals were nervous that they were going to be the teachers. However, after they got started, they wanted to continue with more tours. The researcher could see that they took a lot of pride in being a good “teacher” for the younger students. These student “teachers” were also looked upon as role models by the students in grades 1-4.

Being Visible and Maintaining Connections to Other Individuals and Organizations

Staying connected with other groups in the school and community ensured outside support for the environmental program at LCSD. Such groups like the LCS Foundation helped to search for additional funding through grants in the Milwaukee area. Those groups that invested money, resources, or time in the environmental program will be more willing to support it in the future.
Submitting newspaper articles and publicizing program successes to the students, school and community was important. Conversations were started with community members and staff members at LCS after a newspaper article was released. Classroom and hallway bulletin boards also highlighted successes to students, parents, and visitors to the classroom.

It has been important to build a rapport with the maintenance staff at LCS. Often times, special requests can be executed by no one else. They are important in making decisions about the equipment and school grounds and they are able to help out with necessary resources for habitat improvement projects on the grounds. Be sure to keep them informed about current projects and ideas for the near future.

Extended Research

As previously mentioned, this project was not intended to measure the effectiveness of the developed activities. Further research needs to be completed to measure the impact of outdoor environmental science activities on student learning, particularly in science. Once the impacts on learning are more clearly understood, educators will be able to effectively plan and execute activities that will be the most beneficial for providing students with the knowledge and skills needed to help them succeed.

Looking to the Future

Through the course of the last three years at LCS, the researcher has noticed the trust that is given to those who are visionary leaders with a strong connection to the community. Those with a clear idea for what they want to see at the school are respected for their ambition. These are the types of individuals and organizations that can make positive change at the school and surrounding community.
**Implications**

The activities created for use in the LCSD Natural Area and other local natural sites have encouraged students to develop an awareness of their local landscape. Based on survey results from 7th grade students at LCS, most students enjoyed and learned important lessons from the outdoor activities created. Students’ eyes have been opened to things that they used to just walk past. They now ask questions that reflect their level of interest and understanding. Students have even begun to share their experiences with others and have been given opportunities to present their own findings to the class, lead groups of younger children, and carry out environmental action steps in their own backyards and neighborhoods.

Through the completion of the Habitat Management / Site Use Plan for the LCSD Natural Area, the researcher was able to inform the LCS community about the natural resources that currently exist on the school site and how they can be used for education. The benefits of utilizing such an outstanding resource will be no doubt seen in the future, as young adults remember the lessons they learned outdoors. They will be encouraged and inspired to care for what they have come to understand more completely and will work to pass their knowledge and experiences on to future generations.
References


LEAF (Learning, Experiences, & Activities in Forestry) Program - Wisconsin Center for Environmental Education (2002). LEAF Lesson Guide – Original (7-8 Unit.)


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Appendix A

Wisconsin Model Academic Standards for Science and Environmental Education
Wisconsin Model Academic Standards for Science

Science, Standard A: Science Connections
Performance Standards - Grade 8

By the end of grade eight, students will:

A.8.1 Develop their understanding of the science themes by using the themes to frame questions about science-related issues and problems

A.8.2 Describe limitations of science systems and give reasons why specific science themes are included in or excluded from those systems

A.8.3 Defend explanations and models by collecting and organizing evidence that supports them and critique explanations and models by collecting and organizing evidence that conflicts with them

A.8.4 Collect evidence to show that models developed as explanations for events were (and are) based on the evidence available to scientists at the time

A.8.5 Show how models and explanations, based on systems, were changed as new evidence accumulated (the effects of constancy, evolution, change, and measurement should all be part of these explanations)

A.8.6 Use models and explanations to predict actions and events in the natural world

A.8.7 Design real or thought investigations to test the usefulness and limitations of a model

A.8.8 Use the themes of evolution, equilibrium, and energy to predict future events or changes in the natural world

Science, Standard B: Nature of Science
Performance Standards - Grade 8
By the end of grade eight, students will:

B.8.1 Describe how scientific knowledge and concepts have changed over time in the earth and space, life and environmental, and physical sciences

B.8.2 Identify and describe major changes that have occurred over in conceptual models and explanations in the earth and space, life and environmental, and physical sciences and identify the people, cultures, and conditions that led to these developments

B.8.3 Explain how the general rules of science apply to the development and use of evidence in science investigations, model-making, and applications

B.8.4 Describe types of reasoning and evidence used outside of science to draw conclusions about the natural world

B.8.5 Explain ways in which science knowledge is shared, checked, and extended, and show how these processes change over time

B.8.6 Explain the ways in which scientific knowledge is useful and also limited when applied to social issues

SCIENCE, STANDARD C: SCIENCE INQUIRY
PERFORMANCE STANDARDS - GRADE 8

By the end of grade eight, students will:

C.8.1 Identify questions they can investigate using resources and equipment they have available

C.8.2 Identify data and locate sources of information including their own records to answer the questions being investigated

C.8.3 Design and safely conduct investigations that provide reliable quantitative or qualitative data, as appropriate, to answer their questions

C.8.4 Use inferences to help decide possible results of their investigations, use observations to check their inferences
C.8.5 Use accepted scientific knowledge, models*, and theories* to explain* their results and to raise further questions about their investigations*

C.8.6 State what they have learned from investigations*, relating their inferences* to scientific knowledge and to data they have collected

C.8.7 Explain* their data and conclusions in ways that allow an audience to understand the questions they selected for investigation* and the answers they have developed

C.8.8 Use computer software and other technologies to organize, process, and present their data

C.8.9 Evaluate*, explain*, and defend the validity of questions, hypotheses, and conclusions to their investigations*

C.8.10 Discuss the importance of their results and implications of their work with peers, teachers, and other adults

C.8.11 Raise further questions which still need to be answered

**SCIENCE, STANDARD D: PHYSICAL SCIENCE**

**PERFORMANCE STANDARDS - GRADE 8**

By the end of grade eight, students will:

**PROPERTIES AND CHANGES OF PROPERTIES IN MATTER**

D.8.1 Observe, describe, and measure physical and chemical properties of elements and other substances to identify and group them according to properties such as density, melting points, boiling points, conductivity, magnetic attraction, solubility, and reactions to common physical and chemical tests

D.8.2 Use the major ideas of atomic theory and molecular theory to describe physical and chemical interactions among substances, including solids, liquids, and gases

D.8.3 Understand how chemical interactions and behaviors lead to new substances with different properties
D.8.4 While conducting investigations, use the science themes to develop explanations of physical and chemical interactions and energy exchanges

MOTIONS AND FORCES

D.8.5 While conducting investigations, explain the motion of objects by describing the forces acting on them

D.8.6 While conducting investigations, explain the motion of objects using concepts of speed, velocity, acceleration, friction, momentum, and changes over time, among others, and apply these concepts and explanations to real-life situations outside the classroom

D.8.7 While conducting investigations of common physical and chemical interactions occurring in the laboratory and the outside world, use commonly accepted definitions of energy and the idea of energy conservation

TRANSFER OF ENERGY

D.8.8 Describe and investigate the properties of light, heat, gravity, radio waves, magnetic fields, electrical fields, and sound waves as they interact with material objects in common situations

D.8.9 Explain the behaviors of various forms of energy by using the models of energy transmission, both in the laboratory and in real-life situations in the outside world

D.8.10 Explain how models of the atomic structure of matter have changed over time, including historical models and modern atomic theory

SCIENCE, STANDARD E: EARTH AND SPACE SCIENCE PERFORMANCE STANDARDS - GRADE 8

By the end of grade eight, students will:

STRUCTURE OF EARTH SYSTEM

E.8.1 Using the science themes, explain and predict changes in major features of land, water, and atmospheric systems
E.8.2 Describe underlying structures of the earth that cause changes in the earth's surface

E.8.3 Using the science themes during the process of investigation, describe climate, weather, ocean currents, soil movements and changes in the forces acting on the earth

E.8.4 Using the science themes, analyze the influence living organisms have had on the earth's systems, including their impact on the composition of the atmosphere and the weathering of rocks

EARTH'S HISTORY

E.8.5 Analyze the geologic and life history of the earth, including change over time, using various forms of scientific evidence

E.8.6 Describe through investigations the use of the earth's resources by humans in both past and current cultures, particularly how changes in the resources used for the past 100 years are the basis for efforts to conserve and recycle renewable and non-renewable resources

EARTH IN THE SOLAR SYSTEM

E.8.7 Describe the general structure of the solar system, galaxies, and the universe, explaining the nature of the evidence used to develop current models of the universe

E.8.8 Using past and current models of the structure of the solar system, explain the daily, monthly, yearly, and long-term cycles of the earth, citing evidence gained from personal observation as well as evidence used by scientists

SCIENCE, STANDARD F: LIFE AND ENVIRONMENTAL SCIENCE

PERFORMANCE STANDARDS - GRADE 8

By the end of grade eight, students will:

STRUCTURE AND FUNCTION IN LIVING THINGS
F.8.1 Understand the structure and function of cells, organs, tissues, organ systems, and whole organisms

F.8.2 Show how organisms have adapted structures to match their functions, providing means of encouraging individual and group survival within specific environments

F.8.3 Differentiate between single-celled and multiple-celled organisms (humans) through investigation, comparing the cell functions of specialized cells for each type of organism

REPRODUCTION AND HEREDITY

F.8.4 Investigate and explain that heredity is comprised of the characteristic traits found in genes within the cell of an organism

F.8.5 Show how different structures both reproduce and pass on characteristics of their group

REGULATION AND BEHAVIOR

F.8.6 Understand that an organism is regulated both internally and externally

F.8.7 Understand that an organism's behavior evolves through adaptation to its environment

POPULATIONS AND ECOSYSTEMS

F.8.8 Show through investigations how organisms both depend on and contribute to the balance or imbalance of populations and/or ecosystems, which in turn contribute to the total system of life on the planet

DIVERSITY AND ADAPTATIONS OF ORGANISMS

F.8.9 Explain how some of the changes on the earth are contributing to changes in the balance of life and affecting the survival or population growth of certain species
F.8.10 Project how current trends in human resource use and population growth will influence the natural environment, and show how current policies affect those trends.

**SCIENCE, STANDARD G: SCIENCE APPLICATIONS**

**PERFORMANCE STANDARDS - GRADE 8**

By the end of **grade eight**, students will:

G.8.1 Identify* and investigate* the skills people need for a career in science or technology and identify the academic courses that a person pursuing such a career would need.

G.8.2 Explain* how current scientific and technological discoveries have an influence on the work people do and how some of these discoveries also lead to new careers.

G.8.3 Illustrate* the impact that science and technology have had, both good and bad, on careers, systems, society, environment, and quality of life.

G.8.4 Propose a design (or re-design) of an applied science model or a machine that will have an impact in the community or elsewhere in the world and show* how the design (or re-design) might work, including potential side-effects.

G.8.5 Investigate* a specific local problem to which there has been a scientific or technological solution, including proposals for alternative courses of action, the choices that were made, reasons for the choices, any new problems created, and subsequent community satisfaction.

G.8.6 Use current texts, encyclopedias, source books, computers, experts, the popular press, or other relevant sources to identify* examples of how scientific discoveries have resulted in new technology.

G.8.7 Show* evidence* of how science and technology are interdependent, using some examples drawn from personally conducted investigations*.
SCIENCE, STANDARD H: SCIENCE IN PERSONAL AND SOCIAL PERSPECTIVES

PERFORMANCE STANDARDS - GRADE 8

By the end of grade eight, students will:

H.8.1 Evaluate the scientific evidence used in various media (for example, television, radio, Internet, popular press, and scientific journals) to address a social issue, using criteria of accuracy, logic, bias, relevance of data, and credibility of sources.

H.8.2 Present a scientific solution to a problem involving the earth and space, life and environmental, or physical sciences and participate in a consensus-building discussion to arrive at a group decision.

H.8.3 Understand the consequences of decisions affecting personal health and safety.

Wisconsin Model Academic Standards for Environmental Education

A. QUESTIONING AND ANALYSIS

Content Standard

Students in Wisconsin will use credible research methods to investigate environmental questions, revise their personal understanding to accommodate new knowledge and perspectives, and be able to communicate this understanding to others.

By the end of grade 8 students will:

A.8.1 Identify environmental issue* questions that can be investigated using resources and equipment available (see SC Inquiry; LA Research).

A.8.2 Collect information from a variety of resources, conduct experiments, and develop possible solutions to their investigations*.

A.8.3 Use techniques such as modeling and simulating to organize information gathered in their investigations* (see Mathematics [MA] Process).

A.8.4 Use critical-thinking strategies to interpret and analyze gathered information.
A.8.5 Use the results of their investigations* to develop answers, draw conclusions, and revise their personal understanding.

A.8.6 Communicate the results of investigations* by using a variety of media and logically defend their answers (see LA Writing; Math [MA] Process).

**B. KNOWLEDGE OF ENVIRONMENTAL PROCESSES AND SYSTEMS**

**Content Standard**

Students in Wisconsin will demonstrate an understanding of the natural environment and the interrelationships among natural systems.

*By the end of grade 8 students will:*

**Energy and Ecosystems**

B.8.1 Describe the flow of energy* in a natural and a human-built ecosystem* using the laws of thermodynamics (see SC Physical Science).

B.8.2 Explain how change is a natural process, citing examples of succession,* evolution,* and extinction.

B.8.3 Explain the importance of biodiversity*.

B.8.4 Map the levels of organization of matter; e.g., subatomic particles through biomes (see SC Physical Science).

B.8.5 Give examples of human impact on various ecosystems*.

B.8.6 Describe major ecosystems* of Wisconsin (see SC Life and Environmental Science).

B.8.7 Illustrate the conservation of matter using biogeochemical cycles; e.g., carbon, nitrogen, phosphorous.

B.8.8 Explain interactions among organisms or populations of organisms.

B.8.9 Explain how the environment is perceived differently by various cultures* (see SC Nature of Science).

B.8.10 Explain and cite examples of how humans shape the environment.
B.8.11 Describe our society* as an ecosystem*

Natural Resources and Environmental Quality

B.8.12 Provide examples of how different cultures* use natural resources reflecting the economic, aesthetic, and other values* of that culture

B.8.13 Diagram how resources are distributed around the world (see SC Nature of Science; Social Studies [SS] Political Science and Citizenship: Power, Authority, Governance, and Responsibility)

B.8.14 Identify the natural resources* that are found in Wisconsin and those that are imported

B.8.15 Analyze how people impact their environment through resource use

B.8.16 Recognize the economic, environmental, and other factors that impact resource availability and explain why certain resources are becoming depleted

B.8.17 Explain how human resource use can impact the environment; e.g., erosion, burning fossil fuels

B.8.18 Identify major air, water, or land pollutants and their sources

B.8.19 Distinguish between point* and nonpoint source* pollution*

B.8.20 Identify types of waste* and methods for waste* reduction (see SC Earth and Space Science)

B.8.21 Identify and analyze individual, local, regional, national, and global effects of pollution* on plant, animal, and human health

B.8.22 Identify careers related to natural resources* and environmental concerns (see SC Applications)

B.8.23 Identify governmental and private agencies responsible for environmental protection and natural resource* management

B.8.24 Create a timeline of Wisconsin history in resource management (see SC Nature of Science)

C. ENVIRONMENTAL ISSUE INVESTIGATION SKILLS
Content Standard
Students in Wisconsin will be able to identify, investigate, and evaluate environmental problems and issues.

**By the end of grade 8 students will:**

C.8.1 Define and provide examples of environmental issues,* explaining the role of beliefs,* attitudes, and values* (see SS Political Science and Citizenship: Power, Authority, Governance, and Responsibility)

C.8.2 Use environmental monitoring techniques; such as, observations, chemical analysis, and computer mapping software to collect data about environmental problems* (see LA Media and Technology; MA Measurement)

C.8.3 Use questioning and analysis skills to determine beliefs, attitudes, and values held by people involved in an environmental issue

C.8.4 Evaluate the credibility of information, recognizing social, economic, political, environmental, technological, and educational influences (see LA Writing)

**D. DECISION AND ACTION SKILLS**

**Content Standard**

Students in Wisconsin will use findings from environmental issue investigations to develop decision-making skills, and to gain experience in citizen action skills.

**By the end of grade 8 students will:**

D.8.1 Identify options for addressing an environmental issue* and evaluate the consequences of each option

D.8.2 List the advantages and disadvantages of short-term and long-term solutions to an environmental issue* or problem*

D.8.3 List reasons why an individual or group chooses to participate or not participate in an environmental activity in the home, school, or community

D.8.4 Explain the political, legal, and budgetary options for resolving local, state, and national environmental issues* (see SS Political Science and Citizenship: Power, Authority, Governance, and Responsibility)

D.8.5 Explain how personal actions can impact an environmental issue;* e.g., doing volunteer work in conservation

D.8.6 Develop a plan for improving or maintaining some part of the local environment and identify their role in accomplishing this plan
D.8.7 Identify examples of how personal beliefs* can influence environmental decisions

D.8.8 Give examples of education, economic, and government institutions' influence on an environmental issue,* and the role of citizens* in policy formation (see SS Political Science and Citizenship: Power, Authority, Governance, and Responsibility)

E. PERSONAL AND CIVIC RESPONSIBILITY
Content Standard
Students in Wisconsin will develop an understanding and commitment to environmental stewardship.
By the end of grade 8 students will:

E.8.1 Formulate a personal plan for environmental stewardship*

E.8.2 Explain the importance of characteristics (such as, trust, patience, self-discipline, respect, and open-mindedness) that enable people to function together to resolve environmental issues*
Appendix B

Related Newspaper Articles
Schools

Teacher takes school out on the prairie

By KRISTI HAUNFELDER
Staff Writer

Lake Country School District — Seventh-grade science teacher Dave Gerhartz has been at Lake Country School for less than two years, but he has already led students on initiatives to restore the school’s outdoor areas for environmental study.

“Like we want to promote the school as a model for environmental education,” Gerhartz told School Board members in an update on the prairie Nov. 29.

In Gerhartz’s role as a community liaison, he is working on ways to open the school property to community environmental interests, to promote service-learning opportunities and work with other groups to preserve the school’s natural areas.

Lake Country School property, on Vetteshaw Road, includes an environmental corridor along the northern edge of Nagawicka Lake that boosts natural areas, including wetland marsh and woods providing habitats for various animals.

“We did a bird study last year and found 59 different species of songbirds,” Gerhartz said of one of his class projects. He said that was by no means a comprehensive count of the feathered inhabitants.

The property also features varieties of plant life, including oak tree remnants of the original wilderness of the area, some of which might be nearly 100 years old.

But all is not well at Lake Country.

“A lot of plant communities are really in jeopardy from invasive species,” Gerhartz said. “Invasive species have taken over much of Southeastern Wisconsin.”

Plants such as honeysuckle, buckthorn and garlic mustard have become major problems for the area, crowding out native species and making habitat unsustainable for some native wildlife.

“Last spring, we began work on the garlic mustard,” Gerhartz said of his students. They removed about 100 pounds of the plant from school property.

Gerhartz and another teacher at the school also collected seeds, with permission, from other local natural areas, including Lapham Peak State Park.

In November, students spent class and after-school time cleaning up the prairie and planting 35 species of native plants.

Gerhartz has made connections with Retzer Nature Center, the University of Wisconsin-Waukesha Field Station, Lapham Peak, Arrowhead High School and other educational and environmental organizations as community resources.

Gerhartz also needs to develop a five-year prairie restoration plan, develop a budget for the environmental activities, bring in speakers on topics such as invasive species and, with other teachers, create more curricula for effective educational use of the natural areas.

Gerhartz said other staff members have told him they don’t always have the knowledge base to effectively use the outdoor areas in education.

A donation from last year’s eighth grade helped purchase plants and herbicide for the prairie planting project, but the ongoing care of the area could use more financial help.

Some funding might be available from school-related groups.

November 13 2007

Lake Country Reporter

Schools

Budding ecologists learn history of land

By KRISTI HAUNFELDER
Staff Writer

Lake Country School District — About 60 Lake Country School seventh-graders went into the savannah Oct. 23 at Lapham Peak State Park to help clear invasive species buckthorn, gather seeds for the park’s savannah restoration project and learn about different habitats and the natural landscape of Lake Country.

“I never thought that I could see Nagawicka Lake, it was a pretty little puddle,” student Mariah Priewe told Gerhartz after a trip up the observation tower.

“If felt like I was on top of the world.”

The students were guided in their explorations by several area volunteers, including Marlin Johnson, a senior instructor specialist in the biological sciences department at the University of Wisconsin-Waukesha and the university’s field station, and Lapham Peak volunteers Mike Fort and John Lupi.

“It was the first time I did a field trip like that, and the kids really liked it,” Gerhartz said. This is his third year with the school.

“Kids don’t really know a lot about their local area. They probably know more about the rain forest than about Lapham Peak,” Gerhartz said.

Gerhartz said the trip to the park gave his students a better understanding of different perspectives on the area they live in, including its history.

“I learned a lot about the glacial features from Marlin, and it was much easier to understand when there were examples surrounding me,” said Brenda Sulian, another of Gerhartz’s students.

From working the savannah, collecting seeds of the different grasses, at Lapham Peak, the students got a glimpse of what the area might have looked like before the arrival of Europeans to the continent irrevocably changed the landscape.

“The study of habitats and the restoration of habitats is a big focus,” Gerhartz said of the students’ studies.

At Lake Country School, Gerhartz has included an ongoing prairie restoration project in which the students have gathered seeds and wild plants, received them from other schools or organizations or had them purchased by the school and have planted them in the place of non-native species.

Gerhartz hopes some of the seeds his students helped gather at Lapham Peak will find their way to the school’s habitat restoration efforts.

“Overall, the trip kind of highlighted service learning,” Gerhartz said.

As the students helped remove buckthorn and gather seeds, they provided a valuable service for Lapham Peak, helping with the restoration project, but at the same time, the students learned a lot.
LCS educates about local wildlife, habitat

Lake Country School students will have a hands-on education this Earth Day as they hike, remove garlic mustard, listen to speakers and see local wildlife, all on the school’s 15-acre outdoor area.

By ERIN LAMB
elamb@jcpigroup.com

Lake Country School - Lake Country School students will have a hands-on education this Earth Day as they hike, remove garlic mustard, listen to speakers and see local wildlife, all on the school’s 15-acre outdoor area. Kindergarten through eighth-grade students will all participate in the school’s events, which are designed to bring awareness about local wildlife and habitat issues and teach students that they are caretakers rather than owners of the land.

The district’s property borders the northern edge of Lake Nagawicka and, until about 25 years ago, was inhabited by sheep and cattle. When the animals left, invading plant species such as garlic mustard and buckthorn overgrew the land because the animals were no longer grazing.

A few years ago, seventh-grade science teacher Dave Gerhartz proposed a restoration plan for the outdoor area. It allowed for students to learn and participate in the care and protection of the land.

He wanted to "raise awareness about plants and animals and just the whole concept of restoration," Gerhartz said. He said he looks at the students as future landowners who will someday make decisions about their own land and possibly others’ land too.

Gerhartz, who is working on his master’s degree in environmental education from the University of Wisconsin-Stevens Point, tries to incorporate the outdoor area into lesson plans. Students participate in a bird-watching unit, in which they have seen over 50 species of birds, including, great blue herons. This year, students are growing prairie plants...
in the classroom that will be planted outside during the last week of school.

The Earth Day events will include guest speakers sponsored by the LCS Foundation. Students will get the chance to listen to Randy Hetzel talk about reptiles, amphibians and wetland habits and Mary Schmaus, who will speak about raptors and rehabilitation. In addition, kindergartners through fourth-graders will go on hikes around the nature area led by seventh-grade environmental club students. Fifth- and sixth-graders will participate in a service learning project with Herb Rasmussen from Sandy Bottom Nursery, where they will remove garlic mustard and rake the savanna restoration area.

Gerhartz wants students to think about what's best for the land, not just what is best for them.

“How heavy of a footprint will we leave?” Gerhartz asks.
Appendix C

Habitat Management Plans for Lake Country School District
INITIAL THREE-YEAR HABITAT MANAGEMENT PLAN FOR LCS OUTDOOR AREA

Proposed by Dave Gerhartz, 7th Grade Science

Background Information on Current Habitats

Wetlands

Habitat types such as the shrub carr (dogwood and willow thicket), cattail marsh, and tamarack bog all exist along the boundaries of the school property. A restored wetland habitat was constructed in the 1990's. Along the trail, such plant species as Dewberry, Starry flowered-Solomon’s Seal, and Purple Loosestrife (an invasive species), can be found. Common nesting birds include the Song Sparrow, Common Yellowthroat, and the Yellow Warbler.

Shrub Carr

This very densely vegetated area is almost impenetrable. It provides suitable habitat for many wetland edge species. White-tailed Deer, Coyotes, and Wild Turkeys use this habitat for winter cover. Non-native plant species such as Purple Loosestrife and Glossy Buckthorn are displacing many of the native species found here.

Cattail Marsh

This habitat provides high quality nesting habitat for marshland birds. It also provides suitable feeding cover for ducks and herons.

Tamarack Bog

The Nagawicka Lake Tamarack Bog is located between the Kettle of Lake Nagawicka and the LCS property. Disturbances to the area appear minimal with some selective cutting along the lake edge. The bog has been designated a Natural Area of regional significance. Bogs located in the southern part of Wisconsin are rare.
Wetland Restoration

A small wetland restoration was completed in the mid 1990's. This pond is quickly filling in with sediment and the depth of the pond has been less than two feet for the past two years. The dominant vegetation is Cattail. Other plants found within the fenced enclosure include Purple Loosestrife, Black-Eyed Susan, Asters spp., Cup Plant, Boxelder, and Red Oak. Common invertebrates found in the pond include Dragonfly larvae, Water Scorpion, and Damselfly larvae. Green frogs are also a common find in the pond.

Woodlands

Early Successional Forest

The majority of the woodlands found on the LCS property are early successional species. This means that most trees have begun to grow in the last 20-25 years. Sheep and cattle previously grazed the land. Most of these plant species are ones that take over after a disturbance, such as grazing. The most common tree/bush species found are common buckthorn, glossy buckthorn, honeysuckle, green ash, and black cherry. Oaks and hickories are uncommon because the invasive shrubs such as buckthorn and honeysuckle have shaded out the seedlings. Native wildflowers are uncommon within the woodlands. Species that have been noted are thimbleweed, mayapple, and common blue violet. The state threatened species, creamy gentian was found for the first time in the fall 2006.

Oak Openings/Savanna

The oak opening/savanna habitat type occupies a small area surrounding the restored wetland. A few large bur oak and black walnut trees dominate this habitat. Some other tree species noted are shagbark hickory, ash, silver maple, and red and white Cedar. Common buckthorn (a non-native species) dominates the understory layer. This thick, junglelike growth inhibits the regeneration of the oak forest and also inhibits the success of native wildflowers. The ground layer has extensive garlic mustard infestations.
Native wildflowers include mayapple and common blue violet. Nesting birds include the blue-gray gnatcatcher and downy woodpecker.

**Prairie**

No true prairie habitat types exist on the property. Some open edges have shown native prairie plant species such as bergamot, black-eyed susan, and new-england aster. Garlic mustard, common buckthorn and boxelder are beginning to dominate these areas.

**Figure 1: Aerial view of habitat types**
Proposed Restoration Plan

The habitats mentioned above provide unique opportunities for LCS students to do field study work. These habitats provide food, shelter, water and space for numerous plant and animal species. However, many of these habitats are in danger of being permanently altered by invasive plant species and complacent land management. A plan needs to be implemented to protect these habitats from further destruction.

The implementation of the restoration projects suggested in this plan will be beneficial by providing:

- LCS students with a model for environmental stewardship
- service learning opportunities for LCS students
- project opportunities for local community groups
- a valuable connection point between staff, students, parents, families, and community members
- students, staff, and community members with a model of what a pre-settlement habitat type looked like
- increased opportunities for classroom involvement in the LCS Outdoor Area.
- an improved habitat for plants and animals
- a valuable aesthetic improvement of the school grounds

A summary of management techniques:

Habitat restoration requires the use of varied strategies to combat invasive species and restore the health of the ecosystem. Mechanical techniques to be used include pulling, cutting and working of the soil for planting. Herbicide will be applied according to state regulations to either the ground layer or cut stumps. Fire will be used in the future to control invasive species and regenerate native plant seedlings.
2006-Work Completed

Spring
The 7th grade class did minor invasive species removal in May of 2006. 17 bags of Garlic Mustard were removed from the Oak Opening/Savannah habitats located near the restored wetland mentioned above.

Fall
9/14/06
The project boundaries were determined. Dominant plant species were identified.

9/26/06
The corner plot south of restored wetland (3500 square feet) was sprayed, debrushed and stump treatments were applied with a 4-7% solution of glyphosphate (Roundup).

October
Native plant seed was collected was from the LCS property, UW-Waukesha Field Station, and Lapham Peak State Park.

Table 1: Seed collections, Fall 2006

<table>
<thead>
<tr>
<th>Species</th>
<th>Location</th>
<th>Date Collected</th>
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</thead>
<tbody>
<tr>
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</tr>
<tr>
<td>Cup plant</td>
<td>LCSD</td>
<td>10/10/06</td>
</tr>
<tr>
<td>Thimbleweed</td>
<td>LCSD</td>
<td>10/10/06</td>
</tr>
<tr>
<td>Black-eyed susan</td>
<td>LCSD</td>
<td>10/10/06</td>
</tr>
<tr>
<td>Big bluestem</td>
<td>UWC Field Station</td>
<td>10/17</td>
</tr>
<tr>
<td>Plant Name</td>
<td>Field Station</td>
<td>Date</td>
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<td>--------------------------</td>
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</tr>
<tr>
<td>Little bluestem</td>
<td>UWC Field Station</td>
<td>10/17</td>
</tr>
<tr>
<td>Indian grass</td>
<td>UWWC Field Station</td>
<td>10/17</td>
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<td>Side oats grama</td>
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<td>Switchgrass</td>
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<tr>
<td>Canada wild rye</td>
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<tr>
<td>Bottlebrush grass</td>
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<td>Black-eyed susan</td>
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<td>Compass plant</td>
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<td>Rough blazing star</td>
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<td>False boneset</td>
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<td>Gray-headed coneflower</td>
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<td>Creamy gentian</td>
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<td>Pale purple coneflower</td>
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</tr>
<tr>
<td>Rosinweed</td>
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</tr>
</tbody>
</table>
Plans for Additional Restoration Projects

*See the project map below.

A  Cleared, planted fall 2006
B  To be cleared 2006/2007, planted 2007/2008
The district property represents an important environmental corridor along the northern edge of Nagawicka Lake.
Biodiversity of the Property

*The diverse habitats provide homes for deer, turkeys, coyotes, and many species of songbirds.
*Over 50 species of birds were seen by 7th graders last spring.
*Diverse plant communities are being overtaken by invasive species such as buckthorn, honeysuckle, and garlic mustard.
The Fight to Save Natural Habitats

- Invading plant species have taken over much of Southeastern Wisconsin.
- Research has shown that this makes habitats less suitable for many plant and animal species that are usually found here.
- The photos at the right show how buckthorn has taken over our property.

Projects Completed: Spring 2006

- Carlos Muriel removed 10,500 plants from sites in the south and west of the Outdoor Classroom. Overall, 17 garbage bags full of the plant were removed.
Projects completed: Fall 2006

- Threw 1000 acres of unwanted vegetation
- Cleaned 2 miles of roads
- Updated a program for preventing erosion
Projects in the near future...

- This picture shows the view looking north from the current restoration site to the oak savannah restoration site.
Community resources utilized...

- The following professionals have helped in the design and implementation of the first restoration site.
  * Mike Bourquin, Retzer Nature Center Naturalist
  * Marlin Johnson, Resident Manager of UW-Waukesha Field Station
  * Mike Fort, Invasive Species Project Coordinator at Lapham Peak State Park
  * Greg Bisbee, Biology Teacher at Hartland Arrowhead
  * Matthew Tiller, Environmental Science Teacher at Verona Area High School

Funding projects for the future...

- Thus far, most of the project work has been supported by volunteer labor and donations.

- The LCS Foundation, PTO, and School Board have shown interest in funding the program and related projects.

- Numerous grant opportunities are being investigated.


**LCSD Environmental Project Coordinator**

*Position Description for 2007/2008*

1) Develop “Explore the Outdoors Club” for interested students in grades 6-8 during fall 2007.

- Monthly meetings/outings may include:
  - Installation of interpretive signs along the nature trail
  - Maintenance of the nature trail
  - Restoration/maintenance of the wetland, woodland, and meadow areas
  - Collection of seed for our restoration projects
  - Installation/monitoring of bird nest boxes
  - Development of nature programs for the community
  - Trips to natural areas in Wisconsin

2) Assist other LCS teachers with environmental activities.

- Be a “guest” speaker on environmental topics.
- Arrange other guest speakers.
- Provide standards-based outdoor activities for other grade levels.
- Provide equipment and other resources for activities.
- Lead outdoor tours for staff on the LCSD property.
- Document how the LCSD meets Wisconsin Model Academic Standards for Environmental Education.

3) Manage the LCS Natural Area

- Develop and update management plans for the habitats on the LCSD property.
- Direct the execution of projects outlined in the management plans.

4) Be a Community Environmental Liaison

- Connect with environmental groups or organizations that will partner with LCSD.
- Conduct research to further expand environmental education opportunities at LCSD.
- Offer tours of the property to community members.
- Promote the school as a model for environmental education.
- Promote service-learning opportunities in the community.
Revised Habitat Management / Site Use Plan for Lake Country School District
By Dave Gerhartz, 7th Grade Teacher and LCSD Environmental Project Coordinator
Summer 2008

Introduction

The Revised Habitat Management / Site Use Plan for the LCSD Natural Area was developed to discuss successes of habitat management at the site, establish goals for future habitat management and to discuss how the site could continue to be used for outdoor environmental education. The completion of this plan was based on additional site inventory, ongoing restoration projects, and new activities that were developed to utilize the site.

Habitat Management Successes

Site Inventories Completed

Through three years of observation during the school year, an impressive list of plants and animals has been compiled for the LCSD Natural Area. Avian predators such as green-backed herons and barred owls have been documented. Song birds such as the yellow-throated vireo (state-threatened species) and Brewster’s warbler have been seen. Nesting songbirds include Baltimore orioles, blue-gray gnatcatchers, and indigo buntings. Plants such as white turtlehead, marsh marigold (shown at right), and yellowish gentian grow along the wetland edges.
Trees such as tamarack, shagbark hickory, and bur oak provide food and shelter for many wildlife species. Even though many of the natural areas have been degraded, interesting native specimens hold firm to the landscape as well.

**Purple Loosestrife Control**

Since 2000, some habitat management concerns have been successfully addressed at the LCSD Natural Area. Galerucella spp. beetles were released in 2001 along the wetland areas of Nagawicka Lake. Since that time, the beetles have successfully weakened and killed many invasive purple loosestrife plants in these areas. The success of this beetle has worked to preserve the biodiversity of the site by eliminating competition for native plant resources. These native plants along the wetland edges provide increased stability for the ecosystem and, specifically, provide more suitable nesting and feeding areas for waterfowl.

**Prairie and Savanna Restoration**

Invasive plant species progress has been halted and native species have been given another chance to dominate within the restoration areas on the LCSD property. Since the fall of 2006, over 35 new species of native plants and seeds have been added to the restoration sites. Many of these plants were found to exist on similar sites in the region before European settlement in the early 1800s. Although it is premature to declare victory over the invasive species on the restoration areas, continued maintenance should give native species the upper hand. At the left, parent volunteer David Guerra is shown using his “brush hog” rotary mower attachment for his bulldozer to cut down an extensive stand of common buckthorn beneath native bur oak trees. The cleared area will be seeded with native species and actively managed to create a habitat with greater plant and
animal biodiversity. The site will give students a chance to participate in valuable service-learning opportunities that encourage ecosystem health through the process of land stewardship at the local level.

**Further Improvements in Wildlife Viewing Opportunities**

In the spring of 2007, Matt Kirk, LCS alumni, created additional wildlife opportunities with the construction of a viewing platform at the edge of the wetland. Matt completed this project in coordination with the school as part of his Eagle Scout requirement. The platform currently provides a place for an entire class to sit and observe or discuss what is happening around them.

Birds have been fed along the grassy edge of the natural area. These feeders have provided viewing opportunities for the entire school. In the spring of 2008, five bluebird houses were constructed by students and erected on the school site. Partly because of these habitat improvements, close to 50 species of birds have been observed on the school grounds by students. In the spring of 2008, these birds were recorded through the Cornell Lab of Ornithology's website, eBird.

**Community Resource Connections**

In the last two years, many community resources have been utilized to highlight the natural school site and to enhance the environmental education program at LCSD. Community members such as Marlin Johnson and Herb Rasmussen have volunteered their time to help with habitat projects and education about the local landscape. Professional presenters such as Randy Hetzel (shown on previous page with snapping turtle) and Mary Schmaus have helped out with special events at the school such as Earth Day 2008. Local natural areas of
interest such as Lapham Peak State Park have also been used extensively.

Continuing Habitat Management Concerns

The LCSD Natural Area has been influenced by humans for hundreds of years. The impacts of these influences can be traced today as the natural ecological features of the site have been compromised. Many invasive plant species have spread quickly to cover most of the non-mowed areas. A lack of sound and consistent habitat management practices has caused harm to the native plants and animals. The three most troublesome species on the site include common buckthorn and garlic mustard on the upland sites and glossy buckthorn along the wetland edges.

Restoration Site A

Restoration Site A was cleared in the fall of 2006. The site consisted of mixed shrub and old pasture components. The site was dominated by boxelder, common buckthorn, and Queen Anne's lace. Native plants that existed on the site included bergamot, black-eyed susan and New England aster. It was planted in late fall of 2006 with a mix of nearly 35 native prairie species. The site was mowed in May of 2007 and planted with additional native plants in June and September. During the summer of 2007, Queen Anne's lace was pulled by hand after a rainstorm. This biennial weed became a major problem on this site, but pulling was successful in ridding the plot of the seed bearing plants. Boxelder and common buckthorn regrowth from stumps was cut and treated with herbicide in May 2008.

Restoration Site A needs continued attention because of the biennial weed problem. Some biennial weeds need specific eradication treatments. Since white and yellow sweet clover are difficult to pull, the flowers should be cut off in midsummer to prevent reseeding. Queen Anne's lace can be pulled effectively while it is flowering in July-September. After a rain, the taproot can be completely removed when pulled. Garlic mustard should be pulled in May either before or during flowering. Again, hand pulling is the recommended method in this site because of
the numerous native species that are taking hold in the area.

**Restoration Site B**

This site initially consisted of one mature bur oak and about a dozen young bur oaks and shagbark hickory trees. The understory was completely dominated with common buckthorn and no herb layer was present on most of the site, except along Vettelison Road. A few native species such as black-eyed susan exist near the roadside. In the spring of 2007, David Guerra, a parent volunteer, used a “brush hog” attachment on his bulldozer to cut down the buckthorn shrubs. In late spring the area was sprayed with Roundup by the district’s hired landscaping company. Buckthorn, boxelder, and ash regrowth was noticed by late summer of 2007. In the spring of 2008, much of the coarse mulch that was left from Mr. Guerra’s operation was raked up by 6th and 7th grade students. This exposed the soil and also promoted the growth of a few more undesirable seedlings. Another herbicide application is planned in the summer of 2008 and then the site will be seeded in the fall with a prairie / savanna mix.

Special attention should be paid to nearby sources of undesirable seed such as common buckthorn shrubs and boxelder trees. These woody species need to be removed as soon as possible. Since the area is partially shaded, care will need to be taken to find an appropriate seed mix that is suitable for a savanna/oak opening habitat type. Care should be taken to do management work at this site after most bird nesting seasons. Blue-gray gnatcatchers, black-capped chickadees, downy woodpeckers and many other species have been seen nesting on the site. Since the site is also a popular migration corridor for a wide array of neotropical migrants, care should be taken when applying herbicides or pesticides to the area. Also, the site’s proximity to wetland areas adds concern to the use of these chemicals due to the possibility of surface water contamination.
Future Site Use

Although the Lake Country School District has a wonderful outdoor site for nature study, many opportunities exist for site use improvement. More staff could use the sites for environmental education, specifically, habitat management projects or other service learning opportunities. The Earth Day 2008 event encouraged all staff to be involved with outdoor environmental education at the site. Perhaps more special events such as this will encourage other staff members to use the site for environmental education. Most likely, an event planned only for staff would give a better opportunity for discussion about increased site usage in the future. Interpretive nature trails could also be added to help explain the natural features of the site. A guided “tree tour” of the nature trails within the natural area has been proposed by a past 7th grade student as a scouting project. The project may begin as early as the fall of 2008.

Outdoor Environmental Education Benefits for LCSD

The importance of using the outdoors as a classroom for habitat restoration projects and related topics at LCSD can be summed up in the following points. These activities benefit students by providing:

- LCS students with a model for environmental stewardship
- service learning opportunities for LCS students
- project opportunities for local community groups
- a valuable connection point between staff, students, parents, families, and community members
- students, staff, and community members with a model of what a pre-settlement habitat type looked like
- increased opportunities for classroom involvement in the LCSD Natural Area
- an improved habitat for plants and animals
- a valuable aesthetic improvement of the school grounds
Working Project Map, Summer 2008

Project Map Key
- Restoration Site A
- Restoration Site B
- Nature Trail
- Bird feeders
- Bluebird nest boxes
Appendix D

Advice, Encouragement, and Feedback from

Colleagues, Supervisors, and Students
David,

I got your fax last week. Sorry, I'm catching up today on the office work. This looks like a pretty good mix that Retzer set up for you. There are a few species in this mix that are considered very conservative. That means that it will take several years for them to actually mature and flower. Many of the species in this mix won't even germinate until a burn is conducted. But I'm sure burning is part of your long term plan. In addition to being very slow growing, some of the more conservative species are very expensive. This is simply because they don't produce harvestable seed every year and some produce very small amounts of viable seed. Examples of these species in this mix would be New Jersey Tea, Gray Goldenrod, and Smooth Blue Aster. Most of these species cost upwards of 50 dollars per ounce. There are a few ultra conservative species on this list that I also do not even stock because of their expense.

The other consideration is that when mixes are designed, we almost always use a per acre scale. An acre is just over 43,000 square feet and if your site is 10,000 square feet, you're talking less than a quarter acre. Bottom line is, it's difficult for me to take this mix and set it up exactly the same because I don't know what the "per acre rates" are set at in this mix. I can tell you that in larger scale, it takes between a half ounce and 2 ounces per acre of any given species for it to establish with any success.

I can design a mix for you that has at least 10 additional species of wildflowers (composites or forbs) than this mix and I can even bring it in at a lower rate. My suggestion (since you want to see these species mature within a couple of seasons) is to have me replace several of these ultra conservative species with faster growing and earlier flowering species. The cover crop is either oats or annual rye that is planted at the same time as the natives. It will stabilize the soil and help keep weeds at bay. I wouldn't charge you extra for the cover crop since it's such a small site.

Clay
Dave,

Here are some considerations:

1.) Do any of the seeds you will be collecting need a specific germination treatment? For example- Baptisia benefits from being placed in scalding water to break the seed coat. If you are collecting the basics, bergamot, cone flowers, asters, etc., I would put them all together for simplicity reasons.

2.) If you want to have some plots that have a high percent of forbs versus grasses, then separate the forbs from the grasses. In most cases if you mix all the forb seeds with the tall grasses, the tall grasses will tend to dominate immediately in a small scale planting. So if you want to highlight a specific forb species, separate the seed and plant it in smaller plots.

3.) I collect seed using a 5 gallon bucket with rope tied around the handle. Make a loop that you can put around your neck to free up both hands.

4.) You can store the seeds in a box or paper grocery sacks. Leave them in an unheated garage for the winter. The seeds need at least 6 weeks of freezing temperatures to increase the germination rate.

5.) I will pull together some seed for you. What is your address?

Matt Tiller

Science Instructor
Verona Area High School
300 Richard Street
Verona, WI 53593
Hi Dave,

My wife pointed out the nice article in the Lake Country Reporter about you and the project at school. To save a little work, it might make it easier to construct your 5 year plan if you had another one to look at. It really doesn't need to be all that much. Would you like to see the one I did for Lapham a few years ago? I could leave it in the office or mail it if you send your address. Unfortunately I can't email it.

Mike
April 29, 2008

Dear Dave:

I would like to thank you for the organization of Earth Day this year. I thought the day (despite the rain) went well. The speakers did a great job and your tours were great. Thank you for promoting this place, as I believe we have a great facility and grounds.

Sincerely,

Mark Lichte

Cc: File
7th Grade Science -- Using the Outdoors as a Classroom Survey

*Here are some of the outdoor science activities that 7th graders have participated in this year. Please read all of these and do your best to remember each activity.

*Tree identification
*Wildflower inventory
*Pond bug study
*Lapham Peak State Park Field Trip
(seed collecting, buckthorn removal, tower climb and tour)
*Wetland habitat classification
*Sound mapping
*Winter wildlife tracks
*Bird feeding, bird watching and nest box building
*Habitat management plan
inventory, development and action
*Field trip to Parfrey's Glen and Devil's Lake
*Witnessed native Wisconsin wildlife brought by guest speakers
*Led tours for younger grades in the LCSD Natural Area
*Planting native plants in prairie restoration site

Circle your choice in the questions below.

1. When you learned that a science class would be held outside, your general reaction was that:

4 you were very excited to be going outside
3 you were a somewhat excited to be going outside
2 you didn't care that we were going outside
1 you were disappointed that we were going outside

2. Do you think that the outdoor activities done this school year made science class more enjoyable?

4 yes, a lot more enjoyable
3 yes, somewhat more enjoyable
2 it was about as enjoyable as an indoor science class
1 no, not at all

3. Do you think these outdoor opportunities made the scientific concepts (habitats, competition, etc.) discussed easier to understand?

4 Yes, -the concepts were definitely easier to understand.
3 Yes, -the concepts were somewhat easier to understand.
2 The concepts were understood about the same as if we had stayed inside.
1 No, -going outside did not help me understand the concepts.

4. If you believe the 7th grade science class was enhanced (made better) by outdoor activities, please comment on the importance of these activities on the back of your sheet. In other words, why did you like the outdoor activities?
Appendix E

Environmental Science Activity Lesson Plans and Related Materials
Unit Title: Habitat Management Plan Development and Execution

Grade level: 7-12

Topics: Habitat Management, Wildlife Ecology

Overview:
During this 9 week unit, habitat, plant, and animal site inventory techniques will be modeled at the school site by the facilitator. These activities, in coordination with the study of basic ecological principles in the science classroom, will give students the background knowledge and experience needed to complete these inventories at a natural community site of their choosing. Students will work in groups of 2-3 students and use their data collected to develop a specific habitat management goal for their site. Action steps for completing their goals will also be outlined by the students. Students will execute their action steps. Students will conclude the unit by reporting back to their peers about the process of site inventory, goal planning, and action step development and execution. Students will also give insight regarding future management of their site.

Standards Addressed:

Wisconsin Model Academic Standards for Science

C.8.1 Identify* questions they can investigate* using resources and equipment they have available

C.8.2 Identify* data and locate sources of information including their own records to answer the questions being investigated

C.8.3 Design and safely conduct investigations* that provide reliable quantitative or qualitative data, as appropriate, to answer their questions

C.8.8 Use computer software and other technologies to organize, process, and present their data

C.8.10 Discuss the importance of their results and implications of their work with
peers, teachers, and other adults

C.8.11 Raise further questions which still need to be answered

F.8.2 Show how organisms have adapted structures to match their functions, providing means of encouraging individual and group survival within specific environments

F.8.8 Show through investigations how organisms both depend on and contribute to the balance or imbalance of populations and/or ecosystems, which in turn contribute to the total system of life on the planet

F.8.9 Explain how some of the changes on the earth are contributing to changes in the balance of life and affecting the survival or population growth of certain species

F.8.10 Project how current trends in human resource use and population growth will influence the natural environment, and show how current policies affect those trends.

Wisconsin Model Academic Standards for Environmental Education

A.8.1 Identify environmental issue questions that can be investigated using resources and equipment available (see SC Inquiry; LA Research)

A.8.2 Collect information from a variety of resources, conduct experiments, and develop possible solutions to their investigations

A.8.3 Use techniques such as modeling and simulating to organize information gathered in their investigations (see Mathematics [MAJ] Process)

A.8.4 Use critical-thinking strategies to interpret and analyze gathered information (see SC Inquiry)

A.8.5 Use the results of their investigations to develop answers, draw conclusions, and revise their personal understanding

A.8.6 Communicate the results of investigations by using a variety of media and logically defend their answers (see LA Writing; Math [MAJ] Process)

B.8.5 Give examples of human impact on various ecosystems

B.8.6 Describe major ecosystems of Wisconsin (see SC Life and Environmental Science)

B.8.10 Explain and cite examples of how humans shape the environment
D.8.6 Develop a plan for improving or maintaining some part of the local environment and identify their role in accomplishing this plan

E.8.1 Formulate a personal plan for environmental stewardship

E.8.2 Explain the importance of characteristics (such as, trust, patience, self-discipline, respect, and open-mindedness) that enable people to function together to resolve environmental issues

**Learning Objectives:**

**Students will be able to:**

* complete an inventory of the plants and animals at their site
* create a habitat management goal for their site based on their inventories and other social and environmental factors
* develop action steps that can be carried out to reach the habitat management goal
* carry out their habitat plan action steps
* report back to the class on their goal, action steps, and plan execution

**Required Materials:**

- Computers with Microsoft PowerPoint and Google Earth software
- Field guides for flowering plants, trees, birds, and mammals
- Binoculars (classroom set)
- Clipboard (classroom set)
- Habitat Management Plan Notesheet
- Digital cameras (provided by students)

**Procedure:**

1. Goals for habitat management of the students' site will be developed after 9 weeks of environmental ecology lessons that will discuss the different branches of ecological organization (species, population, community, and ecosystem) within the framework of local habitats. Students will be given sample goals for the habitat management plans to help them get started.
2. Students will use background knowledge from their science course work to complete additional research that will help them describe the importance of their goal.

3. Research will be completed to find out more about the history of the site. For this, students may have to ask park managers, neighbors, or conduct first-hand inventory to uncover how the age structure of the forest and other vegetation could indicate past land usage.

4. A timeline will be created to show how the land has been shaped by natural events and human activity.

5. Habitat, plant, and animal inventory techniques will be modeled at the school site in science class and will then be completed by students at their own sites.

6. Next, students will develop three action steps that could be taken to carry out the management goal. *Goals need to be specific, reasonable, and doable.

7. Students will use Google Earth© to find a satellite view of their site. Exact project sites will be labeled on the map.

8. Students will execute their action steps.

9. Students will conclude the unit by reporting back to their peers about the process of site inventory, goal planning, and action step development and execution. Students will also give insight regarding future management of their site.

**Assessment:**
Students are formally graded for their completion of the Habitat Management Plan Notesheet, their site inventories, and their presentations for their planning and execution of the action steps.
Throughout the process of plan development, student concerns are addressed during computer lab work time. The facilitator should plan consistent meetings with groups to make sure adequate progress is being made both in work time at school and home-based assignments such as the site inventories.
Possible Connections to Other Subject Areas:
- Language Arts (conducting research and presenting information to class)
- Social Studies (creating timeline of historical and cultural land use, investigating how social influences affect land use)
- Math (collecting, organizing, and analyzing data from the site inventories)
- Art (sketching plants and animals for inventories, designing slideshow with original photos)

Extensions:
1. Students could present their management plans to local officials to promote awareness of local habitats and the importance of managing habitats to create a healthier landscape for wildlife and humans.
2. Students could organize a work day at their habitat site to encourage participation from community members.
3. Students could take action to persuade a local government official to make environmental conscious decisions regarding local land use.
4. Students could continue to inventory and manage their site for years to come.
STUDENT MATERIALS FOR HABITAT MANAGEMENT PLAN LESSON

HABITAT MANAGEMENT PLAN NOTE SHEET

1. Management Goal

Slide 1: The title of your management plan should clearly describe your goal. Here are some examples of descriptive titles:

- "INCREASING THE BIODIVERSITY OF THE LAKE COUNTRY SCHOOL NATURE AREA BY REMOVING INVASIVE SPECIES"
- "CREATING SUITABLE NESTING HABITAT FOR SNAPPING TURTLES ON THE LAKE COUNTRY SCHOOL PROPERTY"
- "PROTECTING THE HABITAT OF THE GREAT-BLUE HERON ON THE LCS PROPERTY"
- "PRESERVING THE NATURAL HABITAT BETWEEN LAKE COUNTRY SCHOOL AND NAGAWICKA LAKE FOR MIGRATING SONGBIRDS"
- "TAKING STEPS TO CREATE MORE PLANT DIVERSITY ON THE LAKE COUNTRY SCHOOL PROPERTY"
- "RESTORING A NATURAL PRAIRIE LANDSCAPE ON THE LAKE COUNTRY SCHOOL GROUNDS"
- "CREATING MORE WINTER HABITAT FOR ANIMALS USING THE LCS NATURAL AREA"
- "CREATING A MORE DIVERSE FOREST ECOSYSTEM BY REMOVING INVASIVE SPECIES AND PLANTING NATIVE TREES"
- "ESTABLISHING AND MONITORING A POPULATION OF EASTERN BLUEBIRDS ON THE LCS NATURAL AREA LAND"

Your title: ____________________________

Slide 2: Give specific evidence from research that explains why this goal is important.

Hints:

**A good example might be, “The Wisconsin DNR has explained in a recent research study that Waukesha County’s garlic mustard outbreak has caused 15 important plant species to disappear from the county in the last 10 years.”**
** In other words, give a scientific reason why your goal is important to the ecosystem.

** Keep the concepts of biodiversity and habitat fragmentation in mind.

Notes

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

2. History of the Ecosystem

*Slide 3: What did the land look like before settlement in 1850?*

What types of habitats were found on the site before settlement? Please show this in a picture or a timeline.

For some good info on this, check out:

http://www.uwex.edu/wgnhs/earlyv.htm

or

http://www.ecb.org/exploring/wisms.htm
3. Habitats found at your Site

* Cattail Marsh (Emergent Aquatic)

* Tamarack Bog

* Dogwood/Willow Thicket (Shrub Carr)

* Southern Mesic Forest

* Savannah (Oak Opening)

* Prairie

Here's a website that will help:

http://www.dnr.state.wi.us/org/land/er/communities/

You will also find some helpful information here:

http://www.botany.wisc.edu/wisflora/curtis.asp

Notes

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________
4. Native and non-native plants at the site (TRY TO CHOOSE PLANTS THAT RELATE TO YOUR GOAL!)

**Slides 6 and 7:** Describe 4 native plants (2 trees and 2 herbaceous plants) found on the property

Native species link:

http://www.botany.wisc.edu/wisflora/CNList.asp

**Slides 8 and 9:** Describe 4 non-native plants (2 trees and 2 herbaceous plants) found on the property

Invasive species link:

http://www.dnr.state.wi.us/invasives/

For each plant, please give:

- A picture
- The common and scientific (family, genus, species) name
- Description of what it looks like
- Ecological Importance (Habitat where it is found and the usefulness for animals)
- Human Uses

**Notes**

__________________________________________________________

__________________________________________________________

__________________________________________________________

__________________________________________________________

__________________________________________________________

__________________________________________________________

110
5. Wildlife (TRY TO CHOOSE WILDLIFE THAT RELATE TO YOUR GOAL!)

**Slide 10, 11, 12: Describe 6 animals that are of importance in your natural area**
This should include:

- **Slide 10**: 2 Insects or Spiders
- **Slide 11**: 2 Reptiles/Amphibians
- **Slide 12**: 2 Birds

For each animal, please give:

- A picture
- The common and scientific name (family, genus, species)
- The habitat where it is found
- Its position in the food web (what it eats and what eats it)

**Notes**

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6. Action Steps for Your Management Goal

*For each action step:

- Be realistic!!!!
- Present in a logical order
- Describe how it will be carried out
Describe what materials or resources will be needed

**Slide 13**: Action step #1 of your goal.

Notes

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**Slide 14**: Action step #2 of your goal.

Notes

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**Slide 15**: Action step #3 of your goal.

Notes

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7. Map of the Area with Project Sites Labeled

**Slide 16**: Show a map of your area and describe/show on the map where the habitat areas you have mentioned are located
8. Conclusion

*Slide 17:* Sum up your project in 3 bullet points to leave a lasting impression on the audience.

Notes

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
COMPLETING YOUR ACTION STEPS FOR THE
HABITAT MANAGEMENT PLAN, Spring 2008

1) What additional information do you need to know? ______________________
   ______________________
   ______________________
   ______________________

How will you get this information? ______________________
   ______________________
   ______________________
   ______________________

2) Who do you need to contact? ______________________
   Phone # or email address: ______________________
   ______________________
   ______________________
   ______________________

3) Give a timeline of when you'll complete the project.

<table>
<thead>
<tr>
<th>Date</th>
<th>What you are doing:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

4) How will you present your action project to the class at the end of May or early June? Keep in mind that your presentation will be about 15 minutes long.
# Habitat Management Plan
## Action Steps Presentation Rubric, Spring 2008

<table>
<thead>
<tr>
<th>Points Possible</th>
<th>Points Received</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The goal of the habitat management plan is given.</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>2. Each action step is described in detail.</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>• To describe your action steps, include a narrative of the procedural steps that you had to do to complete each action step.</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>3. The steps are well researched and have a reasonable chance of success.</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>• The steps themselves should be realistic and able to be accomplished. The management steps described show that the planners have adequate background knowledge about their topic.</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>4. An overview of the spring plant inventory is given.</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>• A photo journal of flowering plants is included.</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>• Two plants are identified.</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>5. An overview of the spring wildlife inventory is given.</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>• Wildlife seen or heard are identified and listed.</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>• Two photos are included.</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>6. The timeline of project work is given.</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>• At least three significant dates are noted in timeline.</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>7. Original pictures are included of the habitat and the project work.</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>• An original picture showing the entire landscape is shown.</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>• An original picture of the project work is shown.</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>8. Future habitat management of the project site is mentioned.</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>• Ideas for management of the current project are given as well as the ideas for related projects.</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

**Total Points**

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115
Sample Habitat Management Plan Goal, Inventory, Action Steps and Related Images

Establishing a Nesting Population of Eastern Screech Owls in Lund’s Woods

*All pictures were taken by students.

Site inventory pictures:

Jack-in-the-pulpit

Large-flowered bellwort

Eastern chipmunk

Project pictures:

Finding the right tools for the job

Completed and installed nest box
Winter Wildlife Secrets: Uncovering a Winter Food Pyramid

**Grade level:** adaptable for grades 3-12

**Topics:** Food Chains, Food Web, Food Pyramid, Energy Flow in Ecosystems, Adaptations, Wildlife Observation Techniques

**Overview:**
Students will work in groups of 2-3 students to create a winter food pyramid/web based on all plants and animals seen during a hike through the LCSD Natural Area. The class will search for evidence of seeds, bark, or other plant material that was recently eaten. A combined list of all species seen or detected will be compiled. The students will then be required to place all of these species into a food web and label them as producers, consumers or decomposers. The food pyramid will show students how the energy travels from the producers up to the 1st, 2nd and 3rd level consumers. The students will then understand more completely the inner workings of a native Wisconsin habitat. Students will also discuss how wildlife adaptations enable survival through the harshest conditions of the year.

**Standards Addressed:**

**Wisconsin Model Academic Standards for Science**

C.8.1 Identify* questions they can investigate* using resources and equipment they have available

C.8.2 Identify* data and locate sources of information including their own records to answer the questions being investigated

C.8.3 Design and safely conduct investigations* that provide reliable quantitative or qualitative data, as appropriate, to answer their questions

F.8.2 Show how organisms have adapted structures to match their functions, providing means of encouraging individual and group survival within specific environments

F.8.8 Show through investigations how organisms both depend on and contribute to the
balance or imbalance of populations and/or ecosystems, which in turn contribute to the total system of life on the planet

**Wisconsin Model Academic Standards for Environmental Education**

**B.8.1** Describe the flow of energy in a natural and a human-built ecosystem* using the laws of thermodynamics

**B.8.3** Explain the importance of biodiversity

**B.8.6** Describe major ecosystems of Wisconsin

**B.8.8** Explain interactions among organisms or populations of organisms

**Learning Objectives:**

Students will be able to:

* describe and execute methods used for inventorying plants and animals in winter
* explain the difference between direct and indirect observation
* categorize local flora and fauna as producers, consumers (1st, 2nd, 3rd level), and decomposers
* create a food pyramid that shows relationships between producers, consumers, and decomposers
* describe adaptations of local plants and animals that allow survival through the winter months

**Required Materials:**

* Field guides for mammals and birds
* Field guides for plants in winter (fruit and twig key)
* Binoculars (classroom set)
* Clipboards (classroom set)
* Appropriate footwear for students
* Local area for hiking
* Poster board
* Computers with internet access

**Procedure:**

1. Students will be given brief sessions on binocular and field guide use.
2. Facilitator will lead students on a tour through natural area. Students will record all species of animals that are discovered both directly (seen) or indirectly (tracks or other sign) as a list. Animal behavior will briefly be recorded as well.

3. Plants that have been visibly eaten recently will be recorded next. The facilitator may need to help with the finding and identifying of some of these specimens.

4. Students will research the food habits of the animals discovered. The internet and field guides can be used to find these habits.

5. Based on the feeding habits of each species, they will be placed into a food pyramid and labeled as producers, decomposers, or 1st, 2nd or 3rd level consumers.

6. Students will present project to the class.

**Assessment:**

Students will be given a final project grade based on the demonstration of their understanding of producers, consumers, and decomposers and their overall effort to complete a high quality project.

**Possible Connections to Other Subjects:**

- Language Arts: Students conduct research and present their findings.
- Social Studies: The study of subsistence cultures could be done to show how humans influence the ecosystem by our feeding habits.
- Health: Nutritional studies could be done to determine the amount of energy we attain from plants vs. meat.

**Extensions:**

1. Students could look deeper into winter adaptations of animals, especially birds. Why might it be an advantage for a bird to stay in Wisconsin for the entire year instead of migrating south?

2. This activity could help students understand the needs of wildlife in winter and bring to light some habitat projects that could be done on the school site. Could conifers be added to provide shelter? Could bird feeders be added? Could seed bearing trees give a natural food source during winter?
# Winter Food Pyramid Rubric

<table>
<thead>
<tr>
<th>Section of Project</th>
<th>Expectations not met</th>
<th>Some expectations met</th>
<th>Most expectations met</th>
<th>Beyond Expectations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Producers and consumers labeled correctly</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Animals and plants correctly placed in food web</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winter adaptations given are accurate</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project is neat and easy to read</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
Create a food web/pyramid with the following parts labeled:

1. Animal or plant name
2. Producer/Consumer (what level) /Decomposer?
3. Direct or Indirect Observation? and Habitat Type. (for example: black bear tracks were seen in the tamarack swamp)
4. Winter adaptation fact

- Make sure that you include arrows in your web to show what eats what and to show the direction that energy travels.
- Please take the time to use your paper space effectively and to do a complete and neat job.
- Pictures may be included but are not required for every specimen in the pyramid
- At least 15 animals and plants must be included in the pyramid
Animals and Plants Observed at LCSD Natural Area for 2007/2008

Winter Food Pyramid Activity

**Animals:**
- **Wild Turkey**- seen at bird feeder, tracks throughout woods
- **Barred Owl**- flew out of cedar tree near cattail marsh
- **Eastern Cottontail Rabbit**- tracks throughout woods
- **Gray Squirrel**- seen at feeder and tracks throughout
- **Red Squirrel**- seen near cattail marsh
- **Deer Mouse**- tracks seen in woods and grassy areas
- **Dark-eyed Junco**- seen at bird feeder
- **Black-capped Chickadee**- seen at feeder
- **American Goldfinch**- heard flying over woods
- **White-breasted Nuthatch**- seen on trunk of tree near feeder
- **Northern Cardinal**- seen on feeder and in dogwood thicket
- **American Crow**- seen at feeder and flying over
- **Ring-billed Gull**- seen flying over wetland

**Plants**
- **Thimbleweed**- seed heads seen near feeder on trail
- **Bergamot**- seed heads along grassy edge
- **Black-eyed Susan**- seed heads in restored prairie
- **Glossy Buckthorn**- common along trail – (eaten by rabbits)
- **Smooth Sumac**- common along trail by feeder
- **Black Oil Sunflower**- birdseed used at feeder
- **Red Oak**- large tree at trail entrance by classroom
- **Shagbark Hickory**- seen along trail near savanna restoration
Appendix F

Environmental Club Activity Pictures
Collecting Native Seed at Lapham Peak State Park, November 2007

Environmental Club, January 2008
Bluebird Nest Box Construction

Environmental Club Members Giving Tours to 2nd Graders on Earth Day