Utilization of School Forests in Minnesota

THESIS

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By

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Abstract

Multiple learning theories suggest outdoor education and environmental education are effective teaching tools for a variety of learners. They have been found to be especially effective when students are given the opportunity to do experiential work in an outdoor setting, strengthening students' overall knowledge and critical thinking skills (Peacock, 2006). One resource for outdoor and environmental education is a school forest. Using schools which participate in the Minnesota Department of Natural Resources School Forests Program, this study used survey research to investigate the use and rationale for using school forests by elementary teachers. This study identified positive motivational factors as well as barriers which make it difficult for teachers to utilize school forests more often. The results indicate school forests are underutilized and also offer some suggestions for ways to alleviate the barriers that keep teachers from using them more often.

Acknowledgments

Many thanks to my committee members for their guidance and perspective.

I am grateful I was raised by a family that loves all of creation and believed in me while working on my Master's Degree. Especially you, mom.

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Chapter One

Introduction

Many schools in Minnesota have forests designated for educational purposes. At the time of this study, one hundred schools had registered their school forests with the Department of Natural Resources ("Minnesota School Forests", 2009), yet there was little known about them. To what extent were these lands being utilized? Who was using them, and for what purpose? What factors inhibited teachers from using them?

Background and Setting

School forests are properties owned by schools that provide opportunities for learning beyond the classroom. They have the potential to enhance student learning in multiple subject areas, such as math, geography, art, science and social studies. Moreover, the knowledge students gain from school forests can be applied to the community they live in, thus supporting a more environmentally literate citizenry with a sense of ownership for the area (Dillon, 2007). Dillon notes school forests may also strengthen bonds between students, families, schools and communities by providing outdoor recreation opportunities (2007).

Given all of these factors, there appears to be numerous potential benefits of utilizing school forests. However, little is known about the extent to which these resources are used for educational purposes. A review of the literature has found few formal studies done supporting the effects of school forests as part of students' learning. There is also a need for understanding how school forests are being used and by whom, as such studies are also lacking.

Purpose Statement

The purpose of the following study was to identify who was using Minnesota school forests; determine how and to what extent they were being used; and to determine reasons for and barriers to their use by classroom teachers.

Objectives

1. Determine which teachers in elementary schools were using school forests.
2. Determine the frequency of use of school forests by elementary teachers.
3. Identify ways elementary educators used school forests.
4. Identify barriers to utilization of school forests for elementary teachers.
5. Compare barriers for users and non-users of school forests.

Definition of Terms

Environmental education

Constitutive

"Environmental education is viewed as more than just science education. An environmentally educated citizen must not only understand the scientific basis of an issue or concept, but must also know how social systems interface with environmental issues and be willing to take action as a responsible citizen." (A GreenPrint for Minnesota, 2008)

Operational

Teacher-initiated lessons which utilize school forests to enhance learning by providing opportunities for students to investigate the local environment.

Outdoor education

Constitutive

A blending of adventure and environmental approaches into a program of activities or experiences. Through exposure to the outdoor setting, individuals learn about their relationship with the natural environment, relationships between the various concepts of natural ecosystems, and personal relationships with others and with their inner self (Priest, 1986).

Operational

Teacher-led activities conducted outdoors in a school forest whose objectives include teaching and broadening skills used primarily in outdoor settings. These can be comprised of skills such as dressing appropriately for specific weather conditions, camping techniques, and use of outdoor gear (i.e., handheld GPS), or sports activities such as hiking or skiing.

School forest

Constitutive

A school forest is an outdoor classroom. Students can learn about math, art, science and geography while gaining an awareness and appreciation of natural resources ("Minnesota School Forests", 2009).

Operational

For the purpose of this study, a school forest is considered to be a nature-based property designated by schools for use by teachers, and has been registered with the Minnesota Department of Natural Resources School Forest program.

Formal education

Constitutive

Education which takes place in a classroom setting using a pre-arranged learning environment and structured subject matter. Formal assessments of students' learning are expected and relied upon to determine the progression of their education (Tamir, 1991).

Operational

Education which aims to meet Minnesota state academic standards and is provided primarily in Pre-K-12 schools that includes instruction in classrooms and school forests.

Elementary Education

Constitutive

According to Minnesota classification codes for educational sites, elementary education is considered to be Pre-K-6th grades (Minnesota Department of Education, 2009).

Operational

School grades up to and including 6th grade, with 6th grade representing the highest level in the school building.

Limitations of the Study

- Generalization of the study results beyond the Minnesota registered school forests and the elementary schools which use them must be done cautiously.

- Many of the schools which register with the official school forest program do so in order to access resources they would not have otherwise (Amy Kerber, school forest coordinator with the Minnesota Department of Natural Resources (DNR), personal communication, January 12, 2010), such as assistance writing grants to secure funding for operational expenses. The extent of the effect this aid has on school forest utilization was not covered in this study.
- Responses were self-reported, so actual use and/or outcomes cannot be known.
- No provision was made for tracking which participants completed the survey. Therefore, it was not possible to check the non-response rate or to determine if there was bias from non-respondents towards the survey. In light of this and the relatively low response rate (18%), generalizing from the survey respondents to Minnesota teachers at schools with school forests must be done cautiously.

Basic Assumptions

School forests are accepted as a legitimate part of a Pre-K-6 school facility.

Significance

The State of Minnesota passed a statute to provide for the establishment and maintenance of school forests in 1949 ("School Forest Statute", 2009). Despite the history and proliferation of these properties, there is meager research literature describing the use of these lands and their influence on student learning.

Determining their current state of use may offer suggestions for ways to alleviate the barriers that keep teachers from using them more often. The purpose of this descriptive study was to determine how school forests were being utilized, by whom, and for what purposes. It identified factors which hindered teachers from using them more often and compared barriers between users and non-users. Based upon these findings, common characteristics were determined and recommendations made on how to maintain and improve utilization of school forests.

Chapter Two

Review of Literature

The aim of this chapter is to provide the foundation for the research by reviewing literature applicable to its objectives. The topics covered are environmental education, specifically environment-based education and place-based education, and outdoor education. Research on teacher attitudes, knowledge and behaviors in regards to using the outdoors as a teaching tool; learning theories which support experiential education; and school forest usage were also reviewed. The discussion regarding this literature demonstrates the potential significance of school forests as educational resources.

Environmental Education

Environmental education is a broad field. It is interdisciplinary and may be implemented in a variety of ways, characteristics which can lead to problems when a clear definition is sought. In the state of Minnesota, environmental education has been defined the following way:

> Environmental education is viewed as more than just science education. An environmentally educated citizen must not only understand the scientific basis of an issue or concept, but must also know how social systems interface with environmental issues and be willing to take action as a responsible citizen. (A GreenPrint for Minnesota, 2008)

Minnesota's Department of Education (MDE) academic standards for science are based in part on the Environmental Literary Scope and Sequence (ELSS), a document which was created to help educators integrate environmental education (EE) into their curricula. The core concepts of ELSS stress the importance of students studying how

systems work and learning how natural and social systems interact in order to understand what is happening in the world (Landers, Naylon, & Drewes, 2002). Investigating local ecosystems and human interactions with them is one way to teach these two concepts, and school forests are resources educators can use to enhance student learning in these areas.

Some schools emphasize the use of environmental education throughout their entire curriculum. Environment-based education (EBE) is for K-12 classrooms that use the environment as a context for learning and achieving broad educational goals (NAAEE & NEETF, 2001). The EBE model uses community-based investigations in local natural surroundings as the context for learning (Mann & Coble, 2006). Real-world problem solving offers students opportunities to identify issues in their community they would like to see improved. They may then create plans that implement changes. This process increases students' awareness of the area they live in and gives them a means of acting as responsible citizens. For example, a high school calculus class assisted their town's emergency planning agencies by measuring and documenting coastal areas that were prone to flooding during tsunamis (Smith, 2002).

Similar to environment-based education, place-based education (PBE) uses the local community and environment as the starting place for learning. PBE then adds layers to its objectives by striving to strengthen community bonds and a commitment to citizen engagement (Sobel, 2004). Place-based educators believe educators should prepare students to live and work to sustain the cultural and ecological integrity of the places they inhabit (Woodhouse & Knapp, 2000). Each school's community is unique, so there is no set curriculum for PBE. However, there are five common themes: Nature

studies, cultural studies, real-world problem solving, internships and entrepreneurial opportunities, and induction into community processes (Smith, 2002; Sobel, 2004).

Using local ecology and culture immerses students in phenomena directly related to their lives and the community they live in. Smith (2002) believes doing so can help students learn that the culture and experiences of their families and neighbors are worthy of inquiry, which in turn may create a sense of place that lasts well beyond their school years.

Schools practicing PBE also introduce students to various careers and business opportunities available in their community. Some partner with local employers to arrange internship experiences. Linking school learning with locally available occupational opportunities has the potential to give students the confidence and initiative they need both to remain in their communities after graduation and to be of service to their families and neighborhoods (Smith, 2002).

The last theme of PBE is the most wide-ranging. Sobel notes that induction into community processes enables students to be active members by including them in decision-making via research they have done on a particular issue (2004). Students not only investigate local phenomena; they present the information to the proper agencies in their community. These reports usually include student-initiated recommendations on how to best address the issue. They also may include propositions for student involvement.

For example, students from River Crossing Environmental Charter School in Portage, WI studied their local watershed and tabulated the debris they found around storm drains. They found that residents were generally unaware that water and debris

from these drains did not go to water treatment plants, but into local waterways. When the class gave their records to the city council, they made recommendations for educating the public about the issue. One proposal was to stencil warnings on storm drains – which the students preceded to do (V. Rydberg, personal communication, April 2009).

Sobel (2004) believes that place-based education can create a sense of ownership in students towards their local area; increase parental involvement in school; and generate closer bonds between schools and communities. Reaching these goals is more likely to happen if students develop a long-term, serial relationship with a specific place. One study showed that 68% of students who made repeated trips to an outdoor learning area continued to visit the site after school, often bringing their family with them (Peacock, 2006).

Environmental education, whether done via EBE, PBE or some other form, is useful for teaching more than environmental literacy. Bartosh, Ferguson, Taylor and Tudor (2006) found it can also help students become better readers, writers and thinkers, thereby improving student performance in traditional disciplines. Activities centered on the natural environment are holistic, compelling students to apply knowledge and skills from multiple subjects such as math, social studies, art and geography. A study in Washington compared test scores between schools with a heavy emphasis on EE and those without. Results showed that in every year studied, the EE schools had a higher percentage of students meeting academic standards (Bartosh et al, 2006).

Outdoor Education

The fields of environmental and outdoor education are closely related and often overlap. Outdoor education (OE) might include environmental literacy, but its objectives

center on teaching and broadening skills used primarily in outdoor settings. Outdoor education tends to place an emphasis on physical skills and interpersonal relationships (Priest, 1986).

Examples of outdoor skills include abilities such as dressing appropriately for specific weather conditions and proficient use of outdoor gear (i.e., handheld GPS). These skills can also involve training students in sports-related activities such as hiking or skiing. All of these skills can be readily transferred to students' lives outside of school. This is known as "life-long skills" and is supported by Physical Education Teacher Standards ("Vision", 2010).

This transference is gaining importance as a way to fight against childhood obesity and other health-related problems. Over the last several decades, students have led increasingly sedentary lifestyles. From 1997 to 2003, there was a decline of 50 percent in the proportion of children nine to twelve years old who spent time doing outside activities such as hiking, walking, fishing, beach play and gardening (Hofferth & Sandberg, 2001). Meanwhile, the percentage of children considered to be obese has been climbing. From 1980 to 2006, the rate of obesity among children aged 6 to 11 more than doubled, going from 6.5% to 17%. The rate among adolescents aged 12 to 19 more than tripled, increasing from 5% to 17.6% (National Center for Chronic Disease Prevention and Health Promotion, 2009).

Along with benefits to students' physical health, studies are starting to connect time spent outdoors with positive effects on mental health. The symptoms of Attention Deficit Hyperactivity Disorder (ADHD) may be reduced with exposure to nature, and

may also improve all children's cognitive abilities and resistance to negative stresses and depression (Louv, 2008).

Both students and teachers consistently report that outdoor hands-on learning improves self-esteem and interpersonal skills. Studies have shown that students tend to show positive gains in self-efficacy, conflict resolution, relationships with peers, problem solving, and motivation to learn ("American Institutes for Research", 2005). Teachers also recognize that outdoor education provides opportunities to interact with their students in relaxed, informal environments (Dillon, 2005).

The positive emotions that often accompany outdoor education activities are more than just nice side benefits. Foskett (2000) noted that recent studies have set forth the proposition these affective gains may accelerate cognitive gains. Research suggests the affective and cognitive influence each other and provide a bridge to higher order learning (Dillon, 2007). As in the case for environmental education, outdoor education is an appropriate educational opportunity for enhancing student learning.

Experiential Education and Learning Theories

There is one characteristic environmental education, environment-based education, place-based education and outdoor education have in common: They all incorporate experiential education. Experiential education is a philosophy and methodology in which educators purposefully engage with learners in direct experience and focused reflection in order to increase knowledge, develop skills, and clarify values ("What is Experiential Education", 2007). Multiple learning theories appear to correlate well with experiential education.

The roots of experiential education can be traced to educational philosopher John Dewey, who proposed that children's learning is best facilitated by planning and doing projects with others, a method frequently used in environmental and outdoor education (1910). Another of his hypotheses, the theory of experiential learning, states that lessons need to be authentic (Dewey, 1938), such as touching a tree trunk rather than simply reading about a tree. His work helped lay a foundation for future learning theories.

One of these theories is constructivism, which is widely used in today's classrooms. Constructivism states students learn best by assimilating new knowledge with what they already know (von Glaserfeld, 1989). Teachers who use constructivist methods are enabling their students to construct knowledge individually, through active and meaningful interactions with their environment, rather than by passively receiving transmitted information (Metz, 2008).

Constructivism also encourages educators to make connections between concepts from various subject areas (Driver & Oldham, 1986). Environmental education by its very nature is holistic, often incorporating science, math, writing and other skills into one lesson. Therefore, it appears to fit well with social constructivist learning theory and methodology.

This broad approach also has a strong connection with the theory of multiple intelligences, whose premise is that people use a variety of mental abilities to varying degrees. These include language, mathematics and logic, visual and spatial perception, control over one's own movements, sensitivity to others, and knowledge of oneself (Gardner, Howard, & Perkins, 1974). Individuals differ from one another in the specific profile of intelligences that they exhibit (Gardner & Hatch, 1989). The interdisciplinary

nature of environmental and outdoor education, in addition to cooperative learning techniques and the engagement of the senses and physical motion, can combine to reach multiple intelligences within one lesson. Thus all students, regardless of their dominant learning style, can benefit from lessons taught outside in school forests.

Brain-based learning stresses that the functional organization of the brain that the mind depends on, benefits positively from real-life experiences (Hart, 1983). Students who explore nature and observe natural processes receive various stimuli and give their brains different kinds of information than what is presented in textbooks or lectures.

The theories of constructivism, multiple intelligences and brain-based learning provide a sound foundation for experiential learning, indicating there are multifaceted benefits of environmental and outdoor education. Given that school forests provide locations to use these methodologies, they may be a great resource for educators.

Teachers' Use of the Outdoors as a Teaching Tool

Whether environmental and outdoor education are both considered valuable by formal education teachers is a topic of considerable importance to environmental and outdoor educators. The primary decision makers who choose how and when to use school forests are the classroom teachers. Accordingly, teachers' attitudes, knowledge and behavior towards using the outdoors as a teaching tool have been widely studied.

Palmer, Suggate, Robottom, and Hart (1999) surveyed environmental educators from Australia, Britain and Canada in an attempt to find the leading factors in their concern for the environment. Results indicated that for all three groups, positive experiences in the outdoors had the most fundamental influence on their awareness and

concern for the environment. Ernst (2006) conducted a similar study in the United States and also found that a personal interest in the environment was a strong motivational factor for teachers to implement environmental education. However, by itself, personal interest often does not result in teaching methodologies which reflect this positive attitude. A teacher may be interested in applying nature-based learning to their curriculum yet not do so.

The theory of planned behavior is one way to explain this discrepancy. As depicted in Figure 1, it states that beliefs influence attitudes and perceived behavioral control, which in turn form the intentions that motivate behavior. A meta-analysis of this theory found it to be a reliable predictor of intentions and behaviors (Armitage & Conner, 2001). Perceived behavioral control – the perceived ease or difficulty of performing a behavior - is held to influence both intentions and behaviors. Therefore, while teachers may have a positive attitude towards nature-based education, it may not be enough to overcome negative influences which they think will dampen their chance of success.

Additionally, Ernst (2006) found that along with personal environmental sensitivity, a teacher's environmental knowledge and receptiveness to environmental education may also be strong motivating factors. This appears to correlate with the theory of planned behavior's emphasis on perceived behavioral control. Greater confidence in one's ability to teach and/or more openness to trying new methods should have a positive influence on a teacher's perceptions of using any type of methodology. Accordingly, teachers who have both a positive attitude towards environmental education and a belief they can be successful practitioners are the most likely to apply it to their curriculum.

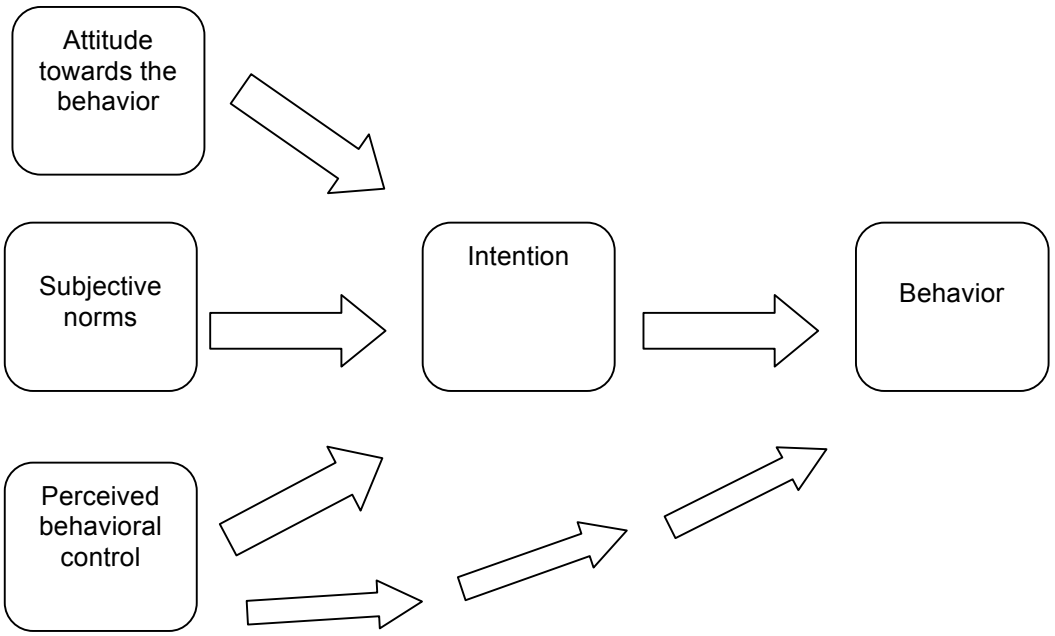

Figure 1. Diagram of the Theory of Planned Behavior (Ajzen,1995).

The willingness and commitment of teachers to implement nature-based learning is of great importance, since there are often several barriers that must be overcome if students are to learn outside on a consistent basis. Fisher (2001) noted that research has shown a recent decline in students doing field study work due to time constraints, testing and curriculum pressures. Other factors which deter teachers from using environmental education outdoors include lack of training, administrative support, funding and transportation (Ham & Sewing, 1988). A school with access to an official school forest would appear to have advantages which can help overcome these obstacles.

School forests registered with the Department of Natural Resources must meet certain criteria. These include the following ("School Forest Criteria", 2010):

- A minimum number of educational activities every year;

Utilization of School Forests

- The formation of a School Forest Committee, which will designate a Site Coordinator;
- The Site Coordinator will file an annual report with the DNR;
- Sufficient funding will be provided to support school forest activities; and
- A School Forest Stewardship Plan will be developed and used to maintain educational activities as well as sustainable forest management.

While fulfilling these criteria, schools will alleviate some of the most common logistical obstacles teachers face when attempting to implement environmental education in their curriculum. The Site Coordinator's role includes providing ideas for student activities, information about land management, and writing grants to secure funding for transportation and other expenses ("School Forests in Minnesota". 2010).

By providing these resources along with consistent access to natural environments, official school forests have the potential to offer teachers positive learning opportunities for their students. This access would be especially beneficial for schools using the EBE or PBE approaches, for as noted earlier, consistent visits to one site can create a sense of place for students within their community.

School Forest Usage

Given the amount of research done on environmental education as a teaching tool and its use by classroom teachers, the lack of work done on school forests in particular is surprising. Most studies found on utilization of school forests have been done for specific sites by the school districts that own them. The University of Wisconsin – Stevens Point, a national leader in forest management and strong proponent of school forests, has twelve theses in its database whose research included a question regarding

school forests. (J. Solin, personal communication, October 23, 2009). Most of these focus on natural resource management and sustainability.

Wisconsin has a K-12 forestry program called Learning, Experiences, & Activities in Forestry (LEAF) which was established in 2001. In 2007, it conducted a survey about the status of school forest activities around the state. It was the first time a survey like this had been published, illustrating the lack of information available about the use of school forests. The results suggested that approximately 130,000 students visited school forests in 2007. Out of twenty school administrators who replied, 83% believed the school forest increased students' learning ("Results of the First Annual School Survey," 2008).

No such data has been collected for the state of Minnesota, according to the DNR (A. Kerber, personal communication, January 12, 2010). One of the goals of this study was to begin to address this need.

Summary of Literature Review

School forests have the potential to be valuable resources for educators in Minnesota, especially those who wish to practice environmental education, environment-based education, place-based education or outdoor education. Each of these fields are heavily influenced by experiential education methodology. The effectiveness of experiential learning is supported by multiple learning theories, and research is starting to show its positive benefits on overall student achievement. Many teachers are receptive to using the outdoors as a teaching tool, but often lack the time and resources to do so. School forests can provide educators with consistent access to nature-based sites, making

them a potentially valuable resource for school districts. However, there is no data on the frequency of use in Minnesota.

This study's scope was school forests registered with Minnesota's Department of Natural Resources. Its purpose was to identify who used these school forests; how frequently; how they were being used; why teachers did or did not utilize them; and to identify whether users and non-users of school forests had the same barriers. The next chapter explains the procedures used to gather this information from educators within the state.

Chapter Three

Methodology

The purpose of this study was to determine how school forests are currently utilized, by whom, and for what purposes. It also attempted to identify factors which hinder teachers from using them more often and if these barriers were the same for users and non-users.

Research Design

The study utilized a cross-sectional survey in the form of a self-administered survey which consisted of mostly close-ended questions. The results were intended to give data which can be generalized to a larger population, and a survey is an effective way to collect information from a large sample. This instrumentation is also advantageous for the population being studied, as surveys using close-ended questions take less time to complete.

Participant Selection

The study's population was comprised of teachers in Minnesota who have access to a school forest which has been registered with the Minnesota Department of Natural Resources. A current list of these forests was provided by Amy Kerber, the DNR's School Forest Coordinator (Personal Communication, January 12, 2010). The schools listed in the DNR database serve students from early childhood through high school and identify themselves in a variety of ways: Elementary, early elementary, late elementary, middle school, and high school. Within each of these categories is an array of grade levels. Some elementary schools go up to 5^{th} grade while others range up to 6^{th} or 8^{th}; middle schools were mostly 6^{th} to 8^{th} grade but went as low as 5^{th}; and while high schools

were generally 9th to 12th, a few started at 7th. To simplify the categorization of these schools, Minnesota state standards were used to separate them into two groups: Elementary, identified as Pre-K – 6th, and secondary, which is 7th – 12th ("School Site Classifications", 2010). Then the Minnesota Department of Education website ("Directories", 2009) was used to find the exact grade levels served by each school building.

One of the major differences between elementary and secondary schools is teacher licensure. Secondary teachers acquire licenses in specific subject areas. Elementary teachers obtain a standard license for grades K-6 and may then add a specialty. For the purposes of this study, it was assumed this distinction would have significant effects on the way teachers manage their classrooms, including trips to school forests. To make the data more meaningful, the scope of this study was limited to elementary teachers, who were chosen for two reasons. First, the standard K-6 license provides a common foundation in their training not found at the secondary teaching level. Second, there are more elementary schools in the DNR database than middle schools or high schools, giving the study a larger population to draw from.

As noted earlier, schools may vary in their designations of elementary and secondary grade levels. Middle schools which include 6th graders were not included in the group of elementary schools because they are often departmentalized, requiring teachers to be licensed in specific subjects much like high school teachers. Moreover, three schools which house grades K-8 were also included with the secondary group after checking their websites and finding that staff members taught specific subject areas. The

final result was 93 schools from the DNR database designated as elementary and 72 as secondary.

The Minnesota Department of Education website provided the current enrollment at every school ("Directories", 2010), and a recent study showed that Minnesota currently averages 24 students per self-contained elementary classroom ("Staffing Survey", 2009). Applying this class size to the 39,052 students represented by the 93 schools, an estimated 1,627 elementary teachers made up the population of the study. Assuming a 5% margin of error and a 95% confidence level, the completed sample size should be 311 Pre-K-6th grade teachers ("Sample Size", 2010). To create a large enough pool of teachers, thirty schools were invited to participate in this study.

Random sampling was used to acquire teacher participants. To eliminate bias in the selection process, the thirty schools invited to participate were chosen using a table of random numbers. This table is made up of four digit numbers and is random in that each digit from 0 to 9 has an equal chance of appearing in a sample (Bartz, 1988). The first two digits of the four-digit numbers were used. The table digits were matched to numbers assigned to schools on a map posted on the Department of Natural Resource's website ("School Forest Listing", 2010).

Instrument

The instrument was a cross-sectional survey designed specifically for this study and was constructed as a self-administered survey (Creswell, 2009). The majority of the questions were categorical; the others were ranking questions (Ernst, Monroe, & Simmons, 2009). The survey was kept brief to increase the response rate. To reduce the amount of time required by teachers to participate in the study, the distribution method

was an email. The email contained a link to www.surveymonkey.com, an online survey administration site. Utilization of this website gave the teachers some anonymity because the IP addresses were not detailed enough to disclose which individual computers were used, and it also kept the data secure by storing it in a protected server.

Potential survey participants included all teachers in each school. One section was written for both users and non-users of school forests to identify factors which create barriers towards the utilization of school forests. Another section was devised for use only by teachers who use school forests and focused on their frequency of use and the ways they use them. When non-users came to this section, they were automatically forwarded to the questions regarding why teachers do not use school forests more often.

The questions were guided by the literature review, most notably articles which concentrated on reasons why teachers do or do not use environmental education methodology (Dillon J. et al 2005; Ham & Sewing, 1988; Palmer et al 1999).

A panel of six experts tested the survey for content validity. The panel included the three professors serving on the study committee, an environmental education coordinator, and two teachers, one of whom had no experience in environmental education. The survey was given to the professors for review. Based on their feedback, the questions were revised accordingly before being sent to the rest of the panel for one final evaluation. The final survey is in Appendix E.

Procedures

After approval by the Internal Review Board and a field test of the survey with the teachers from the panel of experts, principals from thirty schools were contacted by email and/or phone and asked to forward the survey to all of the teachers in their school.

Whenever a principal declined to participate or was unresponsive, another school was randomly chosen. This continued until thirty principals agreed to pass the survey to the staffs in their buildings. See Appendix A for the letter which was sent to the principals and Appendix B for the introduction to the survey teachers received.

Teachers were given ten school days to respond to the survey. In an effort to increase the response rate, a second email was sent five school days after the initial survey. One final email was sent at the end of the study to thank teachers for their participation and provide one last opportunity. Each of the three emails – the introduction, the reminder and the thank you – included the link to the survey and information about the consent process. There was no provision made for recovering information from teachers who chose to not participate.

Data Analysis

Before data was collected, a spreadsheet was created to convert all responses to numbers. This included open-ended questions, whose answers were assigned code numbers. Descriptive statistics was used to analyze the data.

Chapter 4

Results

The following chapter presents the results of a cross-sectional survey which was administered to elementary school teachers in Minnesota who have access to school forests sponsored by the DNR.

Teacher Survey

The survey questions were designed to measure the following objectives: To determine if teachers use the forests, and if so, how often; what subjects are taught in the forests; why teachers use school forests; and factors which create obstacles to using the forests more often. The data was also analyzed by grade levels, amount of teaching experience, and users versus non-users.

Study Sample Size

In order to create a large enough pool of teachers, the survey was sent to 30 principals who had agreed to participate by forwarding it to all of the teachers within their buildings. The resulting desired sample for this study was 311 Pre-K-6th grade teachers.

Fifty-seven people responded (18% response rate). It is not known how many schools were represented from the 57 respondents because of anonymity of respondents. One survey was discarded because it had been filled in by an administrator who did not teach in a classroom. Of the 56 remaining, five responded only to the initial question (Do you ever use your school forest for educational purposes?) and consequently did not indicate why they did or did not use their school

forest. Therefore, the total final number of respondents who answered the entire survey was 51.

Respondents Characteristics

To simplify data analysis, grades were condensed so responses were represented by two grades rather than one. Pre-K and K teachers were grouped together, as were 1st and 2nd; 3rd and 4th; and 5th and 6th. Some of the respondents (27%) taught more than one grade level, so the total is more than 51. Figure 2 shows that the respondents were distributed fairly evenly across grade levels.

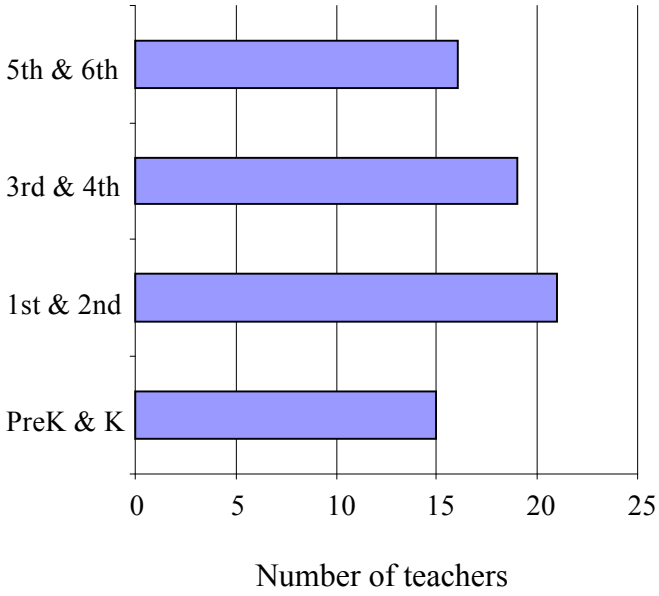

Figure 2. Grade Levels Taught by Survey Respondents (n = 51).

One of the unique features of elementary education is that teachers usually teach multiple subjects and/or fewer subjects at multiple grade levels. For this particular survey, nine respondents taught only one or two subjects, such as physical or special education, but at multiple grade levels. Among the remaining 42 respondents, the

average teacher taught five subjects, with many of them covering six or seven. Figure 3 shows the distribution of classroom subjects taught by the respondents.

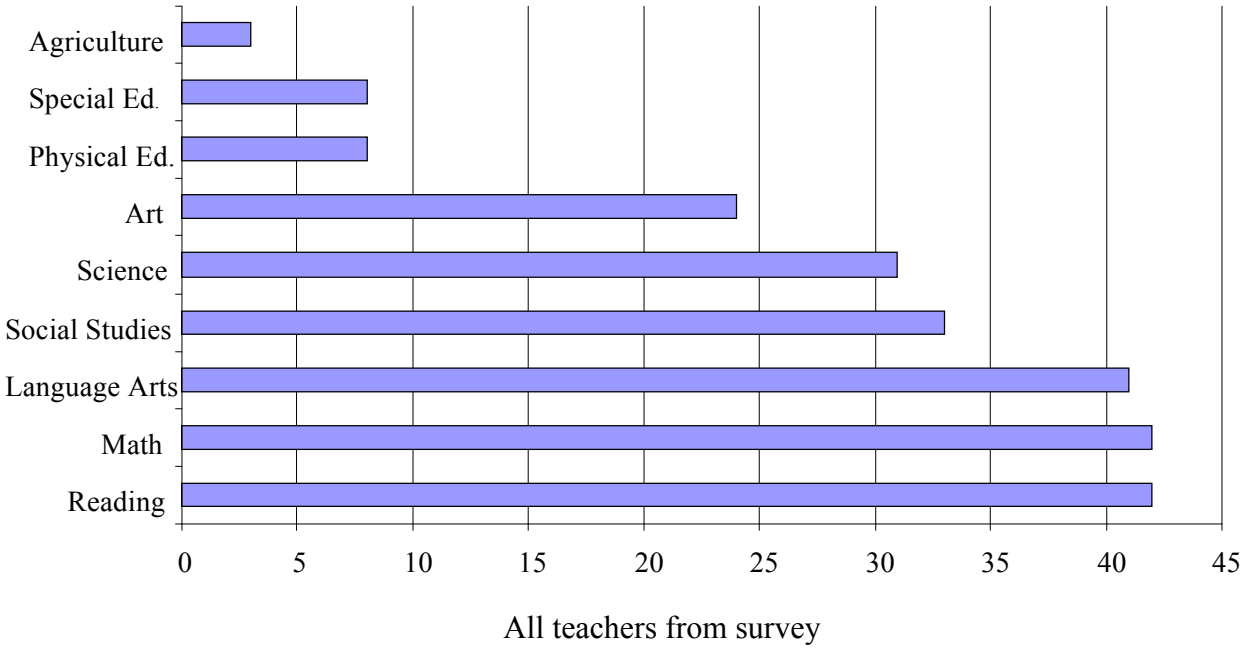

Figure 3. All Classroom Subjects Taught by Respondents (n = 51).

The last demographic data concerning the respondents was the number of years they had been teaching. The majority of them were the most experienced teachers, with 34 of the 51 respondents (67%) having taught for 11 years or more. Six teachers had taught for 6 – 10 years, another six for 3 – 5 years, and five had less than three years of teaching experience.

Distribution of Users and Non-Users

Survey participants were first asked whether or not they used their school forest for educational purposes. Of the 51 respondents, 40 (78%) indicated they used it at least once a year, while 11 (22%) did not.

Figure 4 shows how the users and non-users were distributed among grade levels. The Pre-K and K teachers had the highest percentage of users of the school forest, followed by 3rd and 4th, then 1st and 2nd grade teachers. The lowest percentage of teachers who used the school forest was among the 5th and 6th grades.

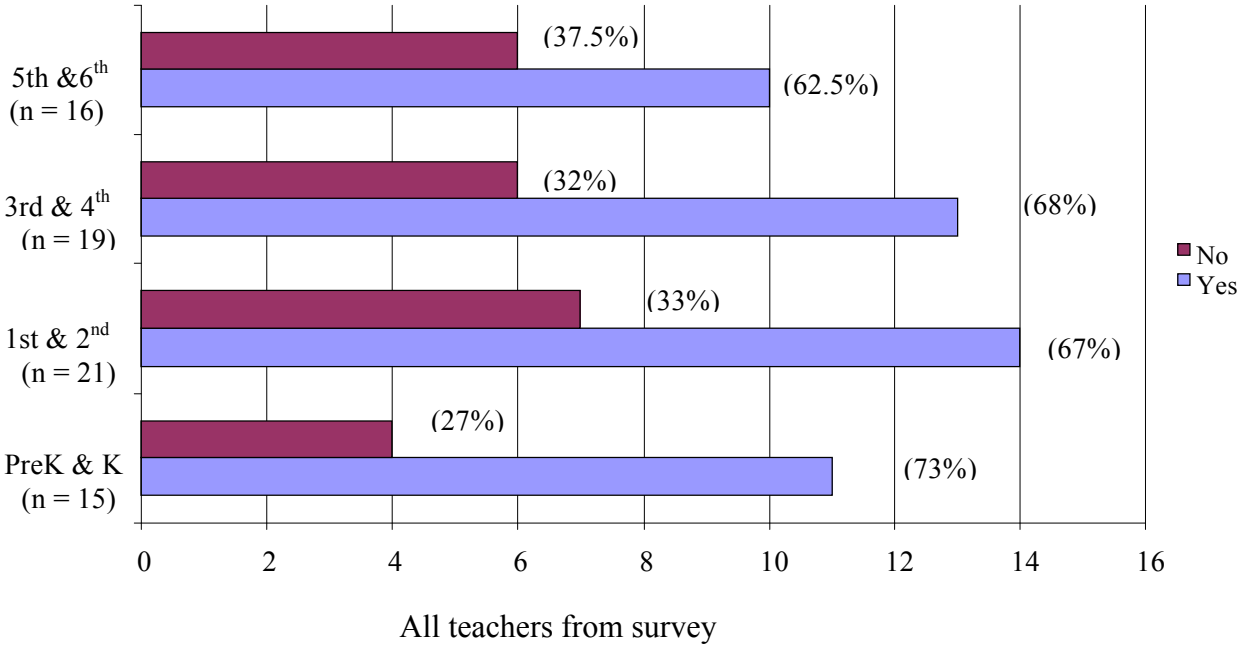

Figure 4. Teachers' Use of School Forests by Grade Levels (n = 51).

Differences between users and non-users are examined later in this chapter. The following section focuses on the data provided only by the users, including frequency of use by grade levels and teaching experience; subjects taught in the school forests; and reasons users brought students to school forests.

Utilization of School Forests

Users' Frequency of Utilization by Grade Level

The 40 respondents who used the school forests were asked to indicate how many times they took students to them during the school year. Frequency of use varied

widely within each grade level. The most commonly reported amount of use among grade levels was 10 more times a year. Results are recorded in Table 1.

Frequency of Use	Pre-K & K	1st & 2nd	3rd & 4th	5th & 6th
1 – 3 times/year	3 (20%)	9 (42.8%)	6 (31.6%)	8 (50%)
4 – 6 times/year	5 (33.3%)	3 (14.4%)	4 (21.1%)	0 (0%)
7 – 9 times/year	0 (0%)	0 (0%)	2 (10.5%)	2 (12.5%)
10 + times/year	7 (46.7%)	9 (42.8%)	7 (36.8%)	6 (37.5%)
Total by grade	15 (100%)	21 (100%)	19 (100%)	16 (100%)

Table 1. Frequency of Use of School Forests by Grade Levels.

Frequency of Use and Teaching Experience

There was no distinct pattern of usage that could be discerned given the small sample size. Table 2 shows the results when teaching experience is cross-tabulated with frequency of use. The largest faction of respondents were those who had spent the most time in the classroom, with 27 teachers (53%) having taught for 11 or more years. Ten (37%) of the most experienced teachers brought their students to their forest 10 or more times during the school year while 11 (41%) utilized them one to three times.

	< 3 yrs exp.	3-5 yrs exp.	6-10 yrs exp.	11+ yrs exp.
1 – 3 times/year	2 (5%)	3 (7.5%)	1 (2.5%)	11 (27.5%)
4 – 6 times/year	1 (2.5%)	0 (0%)	2 (5%)	5 (12.5%)
7 – 9 times/year	0 (0%)	1 (2.5%)	0 (0%)	1 (2.5%)
10 + times/year	0 (0%)	2 (5%)	1 (2.5%)	10 (25%)
Total by exp.	3 (7.5%)	6 (15%)	4 (10%)	27 (67.5%)

Table 2. Frequency of use of school forests by teaching experience (n = 40).

The purpose of the first part of this study was to find out who was using school forests and how often. A majority (n = 27, 67.5%) of users had at least 11 years of teaching experience. The teachers who responded to the survey were fairly evenly distributed among grade levels. At every grade level, 38% or more of teachers utilized their school forests a minimum of 10 times a year. Having established the 'who' and 'how often', the next part of the study focused on the 'why'. Do teachers bring students to school forests for strictly academic reasons, or are there alternative motives as well? Academically, what is being taught? What other reasons would a teacher have for utilizing the forests? What were the most important reasons teachers had for taking students to the school forest? The next part of the study sought to determine how school forests are being used.

Subjects Taught in School Forests

One of the advantages of using elementary teachers for this study was that all of the respondents taught multiple subjects. This provided an opportunity to see what topics teachers were most likely to cover while utilizing school forests, since they had their choice of subjects to choose from. Figure 5 shows what subjects were taught in school forests.

Science was taught in the school forests far more than any other subject at every grade level. The majority (n = 37, 93%) of teachers did so, followed by Reading and Language Arts. Of the more common academic subjects, social studies was taught the least (n = 7, 18%).

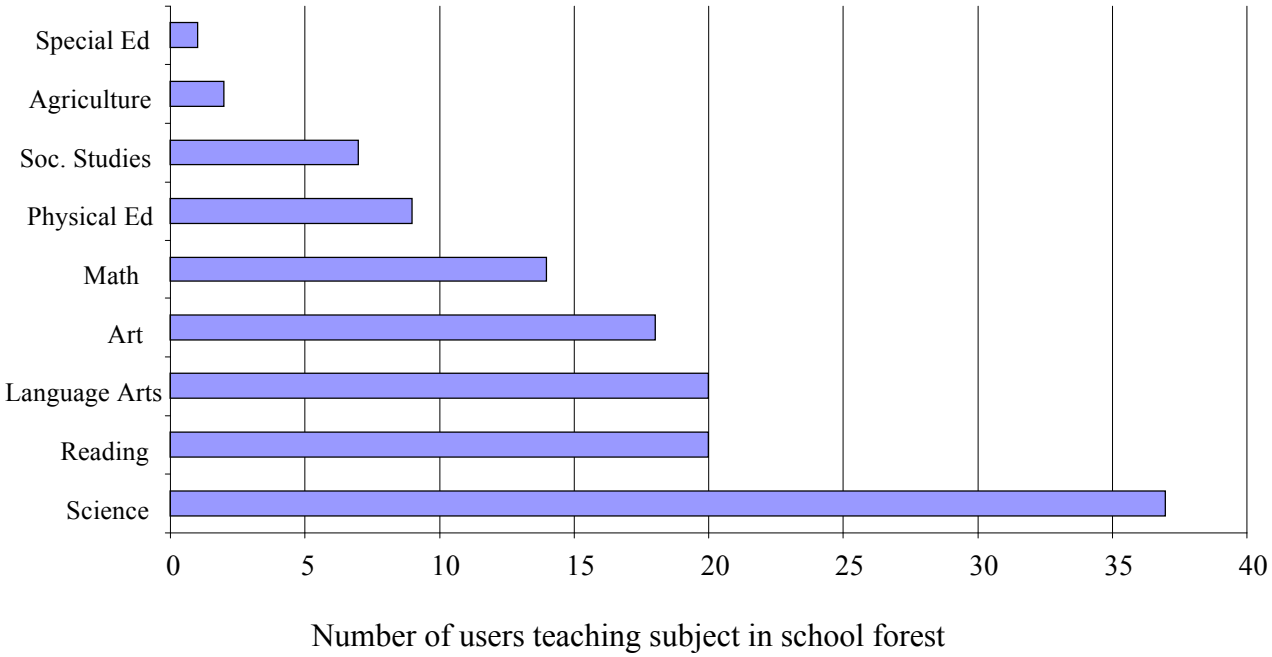

Figure 5. All Subjects Taught by Users while in School Forests (n = 40)

Reasons Teachers Brought Students to School Forests

As noted in chapter 2, school forests have the potential to provide benefits for students that are not strictly academic. The survey asked teachers to identify all the reasons they utilize their school forests. See the survey in Appendix E for the list of responses. Teachers were also given the option of providing an answer not included on this list. No one did so.

When checking all of the answers that applied, initial results indicated the majority of teachers (92%) checked the box, "to teach natural science" as one of the reasons they used school forests, and 71% wanted to increase their students' environmental literacy and create a sense of place. Artistic inspiration, including writing, was another draw for 66% of the teachers. Using a trip to the school forest for a change of pace from the normal classroom routine was cited by 53% of respondents and 42% did activities that promoted teamwork among the students. Improvement in

critical thinking skills was one of the reasons 39% of teachers utilized school forests, and using trips as a reward for their students was indicated by 37%. Community action projects, such as planting trees for Arbor Day, were undertaken by 21% of teachers. Another 21% brought classes to school forests in part because they thought their students behaved better afterwards.

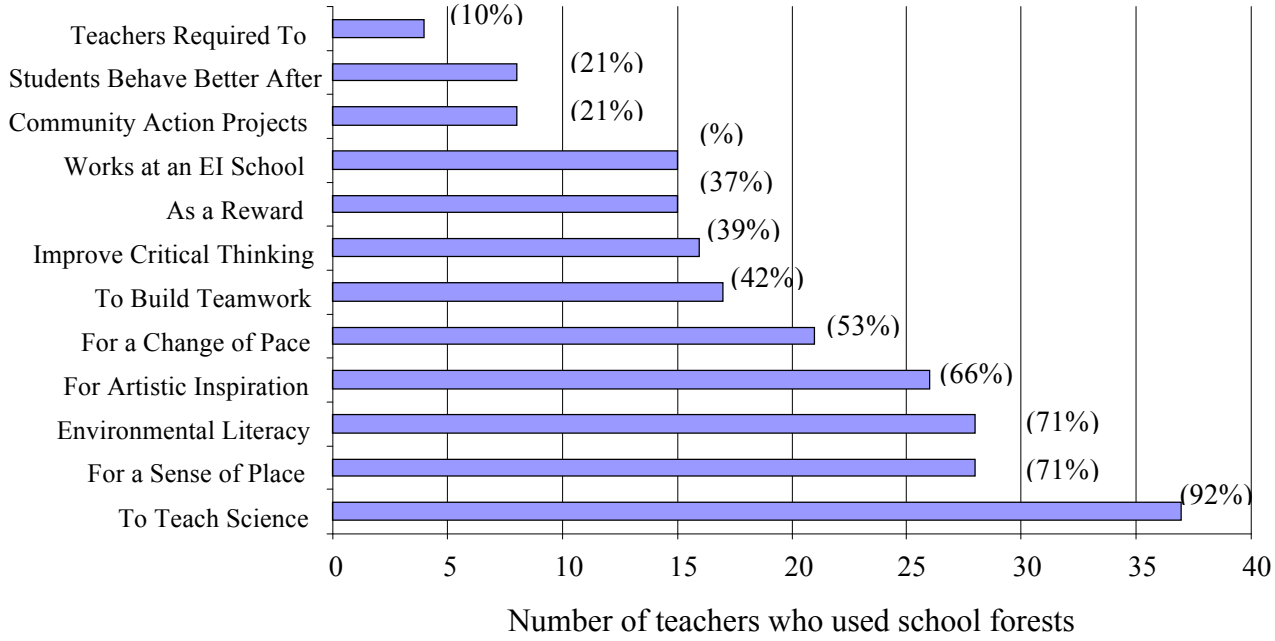

Figure 6. All Reasons Teachers Used School Forests (n = 40).

After checking all the reasons they use school forests, the teachers were then prompted to rank their two primary motives. Teaching natural sciences was still the top reason for utilizing school forests (53%), followed by improving environmental literacy and providing a sense of place, both at 25% (see Figure 7).

Less than 10% of respondents' top reasons included using school forests for the following reasons: Improvement in students' behavior afterwards (3%); community action projects (5%); as a reward (5%); a desire to improve students' critical thinking

skills (8%); and providing a change of pace (8%). None of the respondents indicated one of their top reasons was because they were required to.

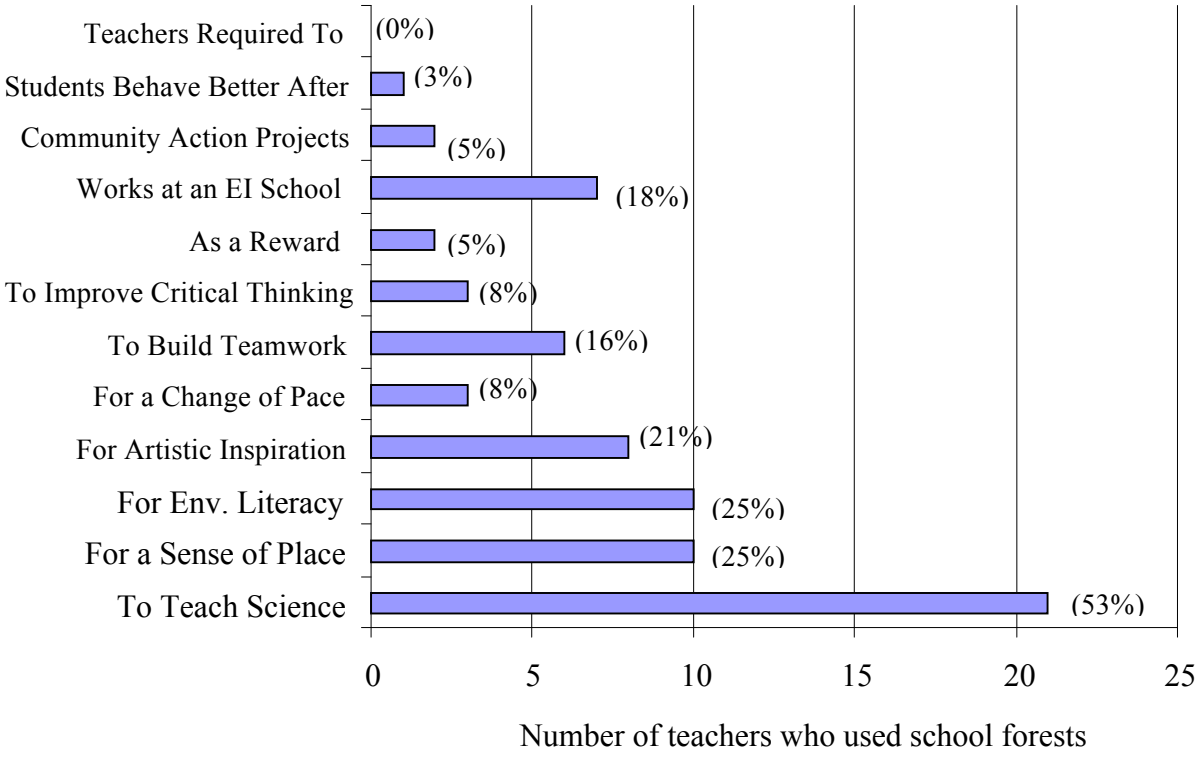

Figure 7. Top Reasons School Forests were Used (n = 40).

The survey data was also used to compare top reasons between grade levels. As shown in Table 3, results show that from Pre-K to 6th, the primary reason to take students to the forest was to teach natural sciences. (Note: Table 3 eliminates reasons which were not checked by any of the respondents.)

For teachers at the 5th and 6th grade levels, science lessons were their main motivation 40% of the time. Their next primary reasons were significantly lower at 10% or less.

For 3rd and 4th grade teachers, the most important reason to use a school forest after science (46%) was artistic inspiration (15%). The 1st and 2nd grade teachers utilized school forests were to teach science first (31%), then environmental literacy (23%). At the Pre-K and K levels, after science lessons (33%), the other top reasons were tied at 11%.

	Teach Science	Sense of Place	Env. Literacy	Artistic Inspiration	Change of Pace	To Build Teamwork	As a Reward	EI School
Pre-K & K	33%	11%	11%	11%	11%	0%	0%	11%
1st & 2nd	31%	15%	23%	0%	0%	0%	0%	23%
3rd & 4th	46%	8%	0%	15%	0%	0%	8%	8%
5th & 6th	40%	10%	10%	10%	0%	10%	0%	10%

Table 3. Top Reasons School Forests Used by Grade Level.

In summary, survey results showed that while teachers had a variety of reasons for utilizing school forests, at every grade level their primary purposes was to teach natural sciences.

Barriers to Utilization of School Forests

The purpose of this study was to not only get an indication of how often school forests are used and for what purposes, but to also try to determine why they are not used more often, or in some cases, not at all. Therefore, the survey asked both users and non-users to first identify all the reasons they do not utilize their school forests more often, then choose the top two.

Barriers for All Respondents

When given the opportunity to check all of the answers that applied, results indicated lack of time was a major obstacle. Over half of the teachers, 59%, said they

did not have enough time for an additional/supplemental activity, and 27.5% did not have enough time for lesson preparations. Liability and safety issues were a hindrance for 23.5% of the teachers, and 18% indicated the utilization of school forests was not essential for teaching standards/testing (see Figure 8).

Travel time was an issue for 12% of the respondents. One special education teacher was not able to use the forest because it was too far for her Title 1 classes, which are 30 minutes long.

Some teachers felt their students were harder to manage outside; 12% noted this kept them from using school forests more often. And a lack of environmental knowledge was a deterrent for 10% of the respondents.

The rest of the barriers were less of a problem, and two areas were not a hindrance for any of the respondents: Lack of interest from students and/or parents; and lack of funding.

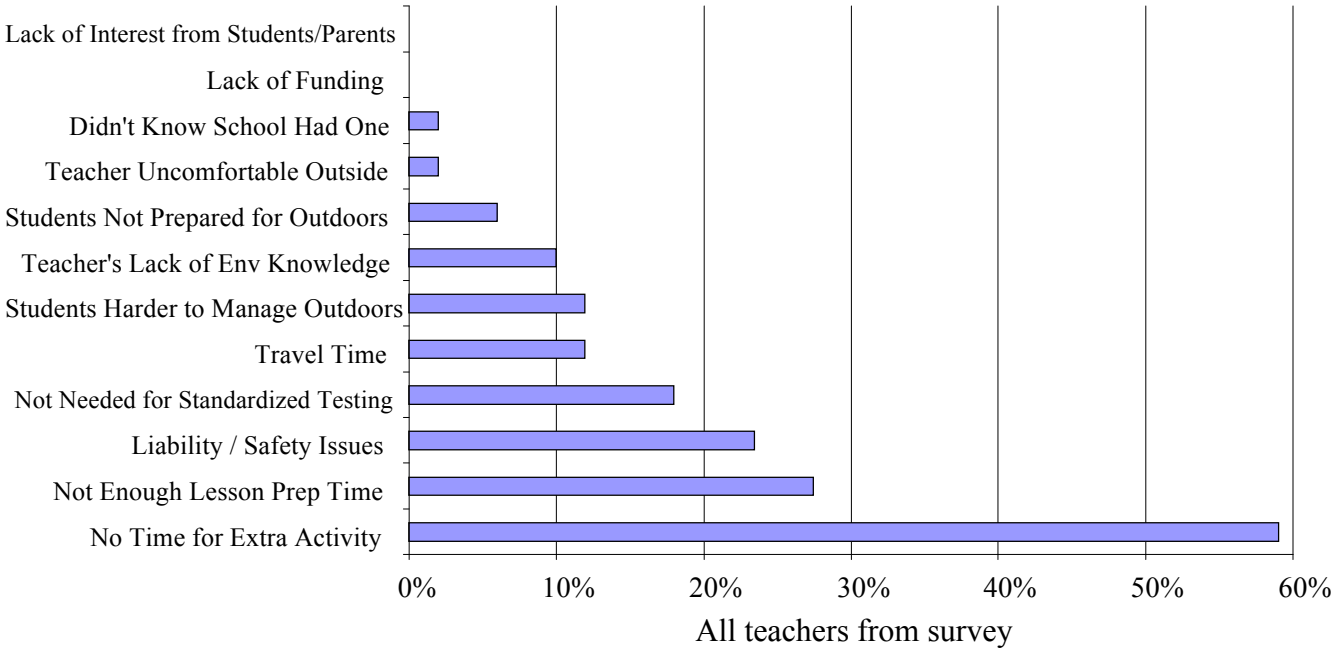

Figure 8. All Barriers to School Forest Usage – Users and Non-Users (n = 51).

Barriers by Grade Levels

After checking all of the barriers that kept them from using the school forest more often, teachers were then asked to choose the two that prohibited them the most. Table 4 shows the results. Answers which were not checked by any of the respondents are not shown. These include a lack of funding; lack of interest from students/parents; didn't know school had a forest; and teacher uncomfortable outside.

At every grade level, lack of time for an extra activity retained its position as the most important obstacle. The second major problem, not having enough time for lesson planning, also kept its ranking among all grade levels, though it was less of a problem for Pre-K and K teachers than for those of higher grades.

Top Barriers	Pre-K & K	1st & 2nd	3rd & 4th	5th & 6th
No Time for Extra Activity	36%	25%	26%	40%
Not Enough Lesson Prep Time	14%	20%	37%	20%
Liability / Safety Issues	14%	15%	10.5%	7%
Not Needed for Testing	0%	15%	5%	7%
Travel Time	14%	15%	5%	7%
Teacher's Lack of Env. Knowledge	7%	5%	5%	7%
Students Not Prepared for Outside	7%	0%	0%	0%
Students Harder to Manage Outside	0%	0%	5%	0%

Table 4. Top Two Barriers for All Respondents by Grades (n = 51).

At all grade levels, the next barrier after those centered on a lack of time was liability/safety issues. This was reported more often among lower grade levels. The

maturity level of the students could have been a major factor, with younger children requiring more supervision, such as keeping them from touching poison ivy.

Barriers of Users vs. Non-Users

The survey instrument also provided data to determine whether the barriers that hinder teachers from using school forests more often are the same as those that keep non-users from utilizing them at all.

As noted earlier, neither lack of funding nor a lack of interest from students and parents was a barrier for any of the respondents. Figure 9 shows the results for the rest of the categories.

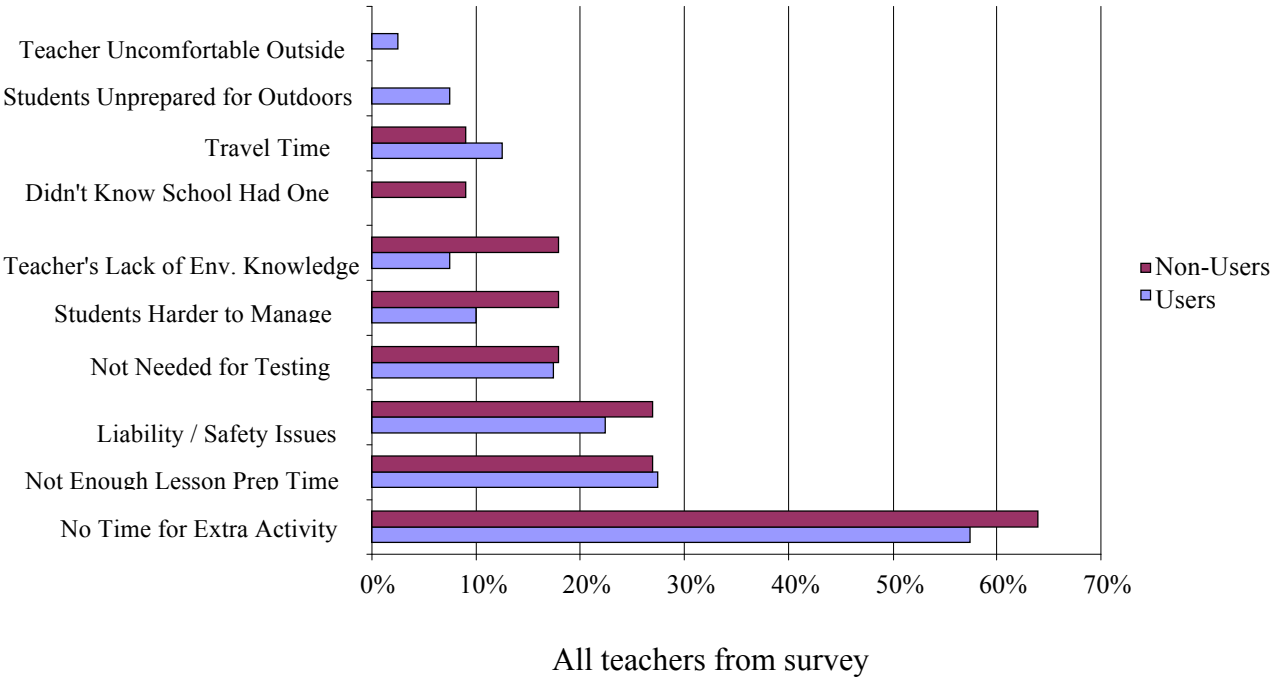

Figure 9. Barriers for Users (n = 40) vs. Non-Users (n = 11).

When compared side by side, results show that the top barriers are the same for both users and non-users. No time for an extra activity was a hindrance for 57.5% of users and 64% of non-users. Lack of time for lesson planning was a problem for 27.5%

of users and 27% of non-users. And liability/safety issues were an obstacle for 22.5% of users and 27% of non-users.

Both groups indicated that not having a direct link to testing/standards was something to consider when deciding whether or not to use school forests. It was a virtual tie, with 17.5% of users and 18% of non-users regarding it as an obstacle. Non-users indicated they found students harder to manage in an outdoor setting than users did (18% vs 10%). They also had a higher response rate in regards to a lack of environmental knowledge (7.5% vs 18%). The most obvious difference between users and non-users was that one of the non-users (9%, n =11) did not know they had access to a school forest.

In summary, the biggest hindrance that kept both users and non-users from taking students to school forests more often was a lack of time. Time for creating activities teachers deem to be additional or supplemental to the rest of their curriculum; and time for preparing lesson plans that correlate with what they are already teaching. The next barrier was liability and safety issues, especially for younger grades.

The issues of meeting standards and doing well on testing were on the minds of both users and non-users, suggesting teachers do not believe trips to school forests will help their students' test scores.

The most notable differences between non-users and users were that non-users appeared to have less knowledge of their local environment; found it more difficult to manage students outside; and were more concerned about liability and safety issues.

Summary of Results

Respondents to this survey were Pre-K – 6th teachers, most of whom (53%) have been teaching multiple grade levels for at least 11 years. The majority of respondents (78%) utilized their school forests. Of those who used the school forests, the most important reason for doing so at all grade levels was to teach natural science. For both users and non-users, at all grade levels, the strongest barrier to utilizing school forests was a lack of time, either for preparing lesson plans or for planning additional activities. Liability and safety issues were also a major concern, though more for those at lower grade levels. Potential barriers which had no effect on respondents' utilization of school forests were a lack of funding and lack of interest from students and parents. Results also indicated that non-users considered their lack of environmental knowledge to be more of a deterrent, along with the difficulty of managing students outside. They also were more concerned about liability and safety issues.

Chapter 5

Discussion

The purpose of this study was to identify who is using Minnesota school forests; determine how and to what extent they are being used; and to find out why teachers may or may not be utilizing them. The Department of Natural Resources' school forest program was chosen for its easy access to a large list of schools. Since the program offers assistance for the management of school forests, the results of this study may not apply to teachers at schools who manage their forests without Minnesota DNR cooperation. Another limitation of this study was the lack of provision made for recovering information from teachers who chose to not participate. The survey had a low response rate of 18% (N = 311), so results cannot be generalized to the population.

One possible reason for the low response rate could be the same one cited by teachers as the main obstacle to using school forests: A lack of time. Issues with the accuracy of the list of schools caused the delivery of the survey to be pushed back to the middle of May. Most schools in Minnesota finish the year during the first week of June, so May has traditionally been very busy for teachers. Students often turn in large projects at this time that require more time for teachers to evaluate. Many schools schedule field trips this month because it is the only month in the spring that tends to have good weather and no testing (which is done in April). Lastly, teachers are often attempting to cover content their students have not yet received. Therefore, it is likely that many of the teachers' schedules were hectic enough to render the survey

superfluous when compared to all of the other activities that occur during the closing of an academic year.

Due to the study's limitations and the low response rate, caution must be exercised when interpreting its results. However, the findings of the research still offer some insights into how often teachers use school forests; what teachers are doing with their students when there; why teachers utilized school forests; and why they do not use the properties more often.

Frequency of Use

A majority (78%, n = 51) of teachers who responded to the survey utilized their school forests. There is a possibility this number is skewed upward because only the most motivated teachers – those who favor using school forests - would make the effort to report what they did while using them.

Several questions on the survey referenced the teachers themselves. Would grade levels affect the frequency of use of school forests? Older students need less assistance getting prepared to go outside; would this extra time mean they were more likely to be taken to the school forests than Pre-K and Kindergarten children who need more help getting their snowsuits on? Would safety concerns also limit how often the younger children were taken? One teacher specifically mentioned safety issues, noting that the younger children went to the school forest more often during the last half of the school year because they were better developed by then.

The survey results indicated the younger children were actually more likely to be taken to the forest than the older ones, with 73% of Pre-K and K teachers utilizing the school forest at least once during the school year compared to 62.5% - 68% of other

grades. The Pre-K and Kindergartners also had the highest percentage of teachers who frequented school forests the most with ten or more visits per year. One reason for the higher frequency of use could be that lesson plans for younger children focus on a more basic form of science. State standards set for kindergarten students include sorting objects into natural and man-made objects; and identifying living and non-living things within a natural system (Minnesota Academic Standards, 2009). At this level, Pre-K and K teachers may have a stronger belief in their ability to teach environmental concepts. This coincides with the theory of planned behavior and Ernst's study that showed a teacher's confidence in their environmental knowledge may be a strong motivating factor in their willingness to implement environmental education (2006).

Another teacher characteristic was length of teaching experience. Would experienced teachers be more likely to take students to school forests because they were more comfortable managing them in new arenas, including the outdoors? Or would they prefer to stick to their routines? Were younger teachers more apprehensive about managing students outside of the classroom, or skilled enough in classroom management to schedule extra activities like trips to the school forest? Or had they been trained in methods that gave them confidence they could handle students in an outdoor situation and/or organize their classroom schedule to create more time?

The least experienced teachers had the lowest frequency of school forest usage. This might indicate a lack of confidence in their ability to manage students outside or in finding ways to create time in their schedules to include trips to their school forests. However, the sample size of least experienced teachers was also very small, with only 3 survey respondents registering as teaching for 3 years or less. Therefore, the survey

results do not provide a strong connection between minimal teaching experience and frequency of use.

The largest sample size was those with the most teaching experience, with 68% (n = 38) of respondents having spent 11 or more years in the classroom. Survey results show the highest and lowest frequencies of utilization representing the two largest groups. The most experienced teachers brought students to school forests the most often (38%, n = 28). They also brought them the least often (39%, n= 28). Therefore, the survey results do not give a clear indication that more experience has an effect on the utilization of school forests by teachers.

Subjects Taught in School Forests

The classroom subjects the respondents taught the most were reading, math and language arts, in that order. Science was the most frequently taught subject in school forests despite being the fifth-ranked subject taught in classrooms.

The gap between science and the second leading subjects, language arts and reading, was quite large (93% vs 50%). This may indicate that while teachers are aware they can utilize school forests in a multidisciplinary manner, they still tend to gravitate towards biological topics when they consider ways to incorporate school forests into their curriculum. As noted in chapter 2, constructivism can be used by educators to make connections between various subject areas (Driver & Oldham, 1986). If teachers were more conscience of the link between constructivism and the multidisciplinary nature of environmental education, perhaps they would apply this to their lesson plans. This in turn could increase the frequency of utilization due to more subjects being taught in the forest.

Reasons Teachers Use School Forests

As noted above, the most frequently taught subjects in school forests are science, language arts and reading. These compare well with the topmost reasons teachers utilize school forests. Teaching science and improving environmental literacy were the topmost reasons, followed by establishing a sense of place and providing artistic expression. Scientific work and environmental literacy are obvious factors for teaching science. And trying to describe intangibles like a sense of place, or learning how to compose a poem about trees, align well with language arts.

Other less frequently reported reasons to utilize school forests included using outings as rewards and improving students' behavior. Given the pressure teachers feel to raise test scores, this may indicate they usually justify field trips by associating them with specific scholastic goals.

Despite this emphasis on academics, just over a third (39%) of teachers cited the improvement of critical thinking skills as a reason to utilize school forests, and only 8% rated it as one of their top two reasons. Perhaps if teachers were more cognizant of the fact that their students could become better readers, writers and thinkers (Bartosh et al, 2006), the frequency of use of school forests would be higher.

None of the teachers who utilized their forest listed "I'm required to use the school forest" as one of their top motivations, indicating there were other, more positive reasons to take students.

Barriers to Use of School Forests

The second part of the study considered barriers which kept all of the participants from using them more often or in some cases not at all. Obstacles checked by the greatest number of respondents are addressed in detail, with special attention given to barriers which appear to be greater for non-users of school forests.

Minor Barriers

One of the unforeseen findings of this study was that lack of funding was a non-issue for teachers desiring to utilize school forests more often. Given the chronic struggle teachers seem to have gathering the resources they need – Minnesota students often have to provide most of their classroom materials, from pencils to tissues – it was a surprise to learn costs were not a hindrance. One possible explanation could be the proximity of the school forests to the teachers' buildings. Some forests are located on campus, eliminating the need to bus students. Additionally, the DNR's support services include assistance writing grants, so perhaps some of these funds were used to cover costs. The limitations of this survey instrument precluded pursuing this further.

Factors which were reported as barriers but at low frequencies included teachers not knowing their school had a forest; teachers not feeling uncomfortable outside; and students not prepared to spend time outside. The latter could signify that Minnesotans, used to harsh winters and changing seasons, simply know how to dress for the weather. The clothing and gear students use during recess are substantial enough to allow them to be outside for a typical 50 minute class.

One other barrier not frequently reported, but potentially debilitating, was travel time. Even a short distance from campus can impact the frequency of use if teachers

have difficulty adhering to students' schedules. In this study, most of the respondents did not consider travel time one of their top barriers.

Users vs. Non-Users

When comparing users and non-users of school forests, their responses were similar when ranking barriers in order of importance. The biggest difference among the participants was in the teacher's lack of environmental knowledge, with 18% of non-users citing it as a barrier compared to 7.5% of users. This coincides with the theory of planned behavior (Ajzen, 1995): Teachers with less confidence in their ability to teach environmental concepts would have less perceived behavioral control, lessening the probability of bringing students to school forests. Further study could be done to determine where these different levels of confidence come from (personal experiences, teacher training programs, etc.).

Major Barriers

There were four barriers both users and non-users reported as the most important: Utilization of school forests was not useful for standardized testing; liability and/or safety issues; not enough time to prepare lesson plans; and not enough time for an extra activity.

Testing

For both users and non-users of school forests, the fourth most important barrier was connecting utilization of school forests to standardized testing. Given the weight placed upon test scores in today's school systems, at first glance it is somewhat of a surprise more respondents didn't rate this barrier higher. But it may be due to the fact

that in the minds of many teachers, utilization of school forests is considered an "extra activity"; thus the question becomes redundant, since extra activities are not covered by the tests.

As noted in Chapter 2, Bartosh, Ferguson, Taylor, and Tudor (2006) found environmental education can help students become better readers, writers and thinkers, and EE schools had a higher percentage of students meeting academic standards on test scores. The mindset that environmental education is not necessary for testing indicates that teachers are potentially unacquainted with the benefits it provides in these areas. One way to increase awareness would be to include research articles on the DNR's website and in its support materials it gives to schools.

Liability and Safety Issues

Other than two teachers listing poison ivy as a barrier, specific concerns regarding liability and safety issues are not known because they were not asked for in the survey. Are teachers wary of students wandering off on their own, whether intentionally or accidently? Or were their reservations due to natural factors such as bee stings, poison ivy, etc.?

When comparing grade levels, teachers of 5th and 6th graders were the least concerned about liability and safety issues, most likely due to the advanced physical and mental development of their students. It could be that younger children are more likely to run off, more apt to pick up a harmful item, etc.

If future studies also find liability and safety issues to be mitigating factors in the utilization of school forests, the schools and/or DNR may want to consider

undertaking projects that will alleviate the perceived threats, such as eradication of poison ivy from areas of school forests that are heavily used.

Time for Lesson Planning

The majority of grade school teachers cover multiple subjects in their classrooms. There were 8 respondents in this study who taught only one or two subjects, but did so for multiple grade levels, mostly special education teachers. The rest of the teachers taught an average of at least five different classes every day.

Environmental educators have done a good job creating "canned" curricula. There are many lesson plans available from programs such as Project Wild and Project Learning Tree that include everything instructors need to know to lead an effective class. Teachers who participate in the DNR's school forest program have access to some premade lesson plans via its website. Are teachers aware of this service? If so, why are they not taking advantage of these curricula?

One way to both raise awareness and help teachers feel more comfortable with the curricula is to include it in teacher training programs. In-service training could include hosting one of Project Wild's short workshops in the school forest. Teachers would not only receive lesson plans, but would learn how to use them with their students in the school forest.

Extra Activity

The number one reason teachers do not use school forests more often, according to the survey, is lack of time for an extra activity. Apparently, most classroom teachers consider environmental education an accessory rather than a necessity. This is understandable, since the typical school system has spent generations focusing on one

subject at a time, in a classroom setting, with all of the students sitting at their desks doing teacher-led lessons. How can a systemic methodology be altered?

One way to create change is to raise awareness of new research. Environmental education is a young field. As seen by the dates in the reference section of this paper, credible research based on years of data has just started to create a foundation on which to build a case for incorporating it into standard curricula. Including this research in teacher training programs, especially when focused on learning theories such as constructivism, brain-based learning, multiple intelligences, and experiential learning, would be an effective way to increase the legitimacy of environmental education among classroom teachers. This may lead to an increase the frequency of utilization of school forests by giving teachers more motivation to use them.

Another means that can help change the standard school system's perception of environmental education is to correlate EE lessons to state and national standards. Many EE programs and nature centers are including state standards in their lesson plans. For example, Project Wild has done this with the National Science Education Standards and also at the state level with 26 states thus far ("Correlations to the National Science Standards", 2012). The North American Association for Environmental Education (NAAEE) has worked with the National Science Foundation (NSF) and National Oceanic and Atmospheric Administration (NOAA) to develop a framework for assessing environmental literacy (www.naaee.org). Perhaps most importantly, the Environmental Protection Agency (EPA) is working to advance environmental education and has funded the Environmental Education and Training Partnership ("Environmental Education", 2012).

One way to counteract the perception of environmental education as an extra activity teachers don't have time for is to stress its multidisciplinary nature. Workshops within the school forests can facilitate this by providing teachers an opportunity to brainstorm lesson plans that span two or three subjects. A teacher who covers both math and science in the classroom could scout the forest for a location to use for a population study of white pine trees. Art and language arts could be combined by having students use the school forest as a backdrop for an illustrated book.

The multidisciplinary use of school forests can be promoted further if teachers are allowed to work together on lessons. When school administrators allow teachers to merge their classes into one large block of time, various subjects can be combined. For example, physical education and geography teachers can create a lesson plan using two class periods during which students snowshoe while following a map and/or handheld GPS.

Participants of this study were not asked if they taught subjects in the school forest separately or in a multidisciplinary fashion. Further research could be done to determine how subjects are covered and how often teachers are allowed to work together in school forests.

Summary

The results of this study show that the school forests were underutilized, but the majority of respondents, elementary teachers, were willing to use their school forests and to do so more often. Pre-K and K teachers were slightly more likely to utilize school forests than other grades. No correlation can be made between teaching experience and frequency of use of school forest. At all grade levels, the main

motivations for taking students to school forests were to teach science and improve their environmental literacy.

The most significant barriers for all grades and levels of teaching experience were time-related. Teachers didn't feel they had time to create more than their current five (or more) daily lesson plans. They also had a tendency to consider trips to school forests as extra activities. The biggest difference between users and non-users was their lack of environmental knowledge.

As noted earlier, the effectiveness of experiential learning is supported by multiple learning theories, and studies are starting to show its positive benefits on overall student achievement (Bartosh et al, 2006; Foskett, 2000). Many teachers and administrators are receptive to using the outdoors as a teaching tool already, but may be further motivated to use school forests if made aware of this research. Environmental education is being incorporated into state and national standards, further legitimizing its use in standards-based curricula. Utilization of school forests could also increase if teachers receive training on site in environmental education curricula and are given opportunities to work together on multidisciplinary projects.

Recommendations for Further Research

Exploratory research should be pursued to:

1. Further explore the differences between users and non-users of school forests. One specific question could compare teachers' frequency of use to the amount of training they have received in environmental knowledge.
2. Further investigate the motivations of teachers who overcome barriers to the utilization of school forests.

3. Among teachers who utilize school forests, explore their intensity of use. Are students brought for one long day and/or for numerous single lessons?
4. Further explore what is being taught in school forests. Are lessons focused on one subject or are they multidisciplinary?
5. Compare utilization of school forests not managed by the Department of Natural Resources to those that are. If there are significant differences in funding, requirements for use, the presence of a school forest coordinator, etc., differences in frequency of utilization could shed more light on barriers.
6. Compare the behaviors of students from classes that utilized school forests with those of students who stayed indoors for the same lesson.

Recommendations for Increasing the Utilization of School Forests

1. Include research regarding the effectiveness of environmental education on students' critical thinking skills and overall scholastic achievement into pre-service and in-service training of teachers and school administrators.
2. Offer teachers in-service training in environmental education by a leading EE curriculum provider such as Project Wild or Project Learning Tree. Conducting such a workshop on school forest grounds would demonstrate how the curriculum works, thereby reducing the time required for lesson planning, one of the top two barriers for all respondents. It might also improve teachers' environmental knowledge of their local area, lowering the barrier non-users found significantly more difficult to overcome.

3. School administrators can provide teachers opportunities to create interdisciplinary lesson plans that utilize their school forests. School forest coordinators would facilitate by providing guidance for combining subjects.
4. School forest coordinators can educate teachers and administrators how environmental education lessons taught in their forest can be used to meet state and national standards.
5. The Minnesota DNR school forest program website could provide more links to sites which provide research on the effectiveness of environmental education, such as the EPA and EETAP.
6. The Minnesota DNR could use its school forest program to collect data from participating schools to further evaluate why teachers do not utilize school forests more often, and then use the information to refine its offerings to teachers and administrators.

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Appendix A

Email Recruitment Letter for Principals

Dear _____,

My name is Sharon Krause and I am conducting research on the use of school forests which have been registered with the Minnesota Department of Natural Resources. Your school has been randomly selected from a list complied by the DNR.

The purpose of the study is to determine why teachers may or may not be using school forests, and if they do, how often and for what purposes. I'd like your permission and cooperation in sending a short online survey to your staff. It contains a maximum of 11 questions and takes 3 to 5 minutes to fill out. It would be sent to all classroom teachers in your building, both those who use the school forest and those who do not.

Your cooperation in this study would require you to forward this email to all of your classroom teachers and then return this email back to me. Doing so is implied consent. Please do NOT respond to this email if you opt to not participate.

No identifying data will be collected about either the teachers or your school from the survey, so all information will remain anonymous. No benefits accrue you or your teachers, but your responses will be used to make recommendations concerning the future use of school forests. Any discomfort or inconvenience to you derives only from the amount of time it takes to respond to this email. Any discomfort or inconvenience to your teachers derives only from the amount of time it takes them to complete the survey. Your decision whether or not to participate will not prejudice your future relationship with the DNR or the University of Minnesota-Duluth.

Once teachers receive this email, they may simply click on the following link to take the survey: www.surveymonkey.com

If you have any concerns or questions, my contact information is below.

Thank you for your time and consideration.

Sincerely,

Sharon Krause

Graduate student
University of Minnesota-Duluth
kraus095@d.umn.edu
218.726.8677
Center for Environmental Education
1216 Ordean Court
Duluth MN 55812-3032

Appendix B

Survey Introduction for Teachers

Your school has been selected to be part of a survey concerning school forests which are registered with the Minnesota Department of Natural Resources. I am striving to find out the extent of their use for educational purposes. As a teacher, I would like to know whether or not you use the school forest, and if so, how often and for what purposes. I also want to identify factors which hinder you from using it more often.

Your principal has given permission for this survey to be sent to you, and your responses are anonymous. There are no questions which will identify either you or your school, and answers will be collected and tallied by an automated website. Any discomfort or inconvenience to you derives only from the amount of time taken to complete the survey.

There are 11 questions which will take 3 to 5 minutes to complete. To take the survey, please click on the following link: www.surveymonkey.com

If you are not directed to the website, please copy the link address and paste it into your browser.

Your decision whether or not to participate will not prejudice your future relationships with your school, the DNR, or the University of Minnesota-Duluth. If you decide to participate, you are free to discontinue participation at any time without prejudice.

Please feel free to ask questions regarding this study. My contact information is below. Thank you for your time and participation.

Sincerely,

Sharon Krause
Graduate Student
University of Minnesota-Duluth

Contact information:

Sharon Krause
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Appendix C

Mid-Survey Reminder for Teachers

You were recently asked to participate in a survey regarding the use of school forests which have been registered with the Minnesota Department of Natural Resources. I would like to express my appreciation to you if you have completed it. Your responses will be used to make recommendations concerning the future utilization of school forests.

If you have yet to complete the survey, please strive to do so within the next school week. There are 11 questions which will take 3 to 5 minutes to complete. To fill in this brief survey, please click on the following link: www.surveymonkey.com

If you are not directed to the website, please copy the link address and paste it into your browser.

Your decision whether or not to participate will not prejudice your future relationships with your school, the DNR, or the University of Minnesota-Duluth. If you decide to participate, you are free to discontinue participation at any time without prejudice. Your principal has given permission for this survey to be sent to you, and your responses are anonymous. There are no questions which will identify either you or your school, and answers will be collected and tallied by an automated website. Any discomfort or inconvenience to you derives only from the amount of time taken to complete the survey.

Please feel free to ask questions regarding this study. My contact information is below.

Thank you for your time and participation.

Sincerely,

Sharon Krause
Graduate Student
University of Minnesota-Duluth

Contact information:

Sharon Krause
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Appendix D

Thank You Letter

I would like to take this opportunity to thank all of those teachers who have completed the survey recently sent to them regarding the use of school forests. I realize your time is limited and I am grateful for your cooperation. The analysis of the data collected will begin soon and should provide the Department of Natural Resources, environmental educators, classroom teachers and school administrators with information which can be used to guide future decisions regarding school forests.

If you have not yet participated in the survey, you have two more days to do so. To fill in the brief survey, please click on the following link: www.surveymonkey.com

As before, your decision whether or not to participate will not prejudice your future relationships with your school, the DNR, or the University of Minnesota-Duluth. If you decide to participate, you are free to discontinue participation at any time without prejudice. There are no questions which will identify either you or your school, and answers will be collected and tallied by an automated website. Any discomfort or inconvenience to you derives only from the amount of time taken to complete the survey.

Please feel free to ask questions regarding this study. My contact information is below.

Once again, thank you for your time. Have a great end to your school year!

Sincerely,

Sharon Krause
Graduate Student
University of Minnesota-Duluth

Contact information:

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Appendix E

Teacher Survey

1. Do you ever use your school forest for educational purposes? (If no, please wait while you are automatically directed to Question #7.)
    - Yes
    - No
2. How many times do you take students to your school forest during a typical school year?
    - 1-3
    - 4-6
    - 7-9
    - 10-12
    - 13-15
    - 16+
3. What subjects do you teach in the school forest? (Check all that apply.)
    - Reading
    - Language Arts
    - Science
    - Math
    - Art
    - Social Studies
    - Physical Education
    - Other (Please specify): _____

4. Why do you take students to the school forest? (Check all that apply.)

- To increase their knowledge in natural sciences
- For inspiration in the arts, including writing
- To work on projects which strengthen their critical thinking skills
- As a reward for good behavior
- To improve their connection to the local ecosystem; their sense of place
- To increase their environmental literacy
- They behave better after they've been outside
- For a change of pace
- I'm required to
- Our school integrates environmental education throughout its curriculum
- To get them involved with community action projects
- To improve their teamwork and communication skills through group work
- Other (Please specify): _____

5. Using your answers from #4, list the two most common reasons you bring students to the school forest:

1. _____

2. _____

6. What factors hinder you from using the school forest more often? (Check all that apply.)

- Lack of funding
- Travel time

- Not enough time for lesson preparation
- Lack of interest from students and/or parents
- I'm not comfortable outside
- Lack of time for additional/supplemental activities
- Students are harder to manage in an outdoor setting
- I don't know much about the local ecosystem
- Students are generally unprepared for being outside
- Not essential to teaching standards/testing
- Safety / Liability concerns
- Other (Please specify): _____

7. Using the answers from question #6, list the two most important factors that hinder you from taking students to the school forest more often:

   1. _____

   2. _____

8. How many years have you been a classroom teacher? Include previous experience at other schools.

   - Less than 3
   - 3 - 5
   - 6 - 10
   - 11+

9. How many years have you been teaching in a school with a school forest? Include previous experiences at other schools.

   - Less than 3
   - 3 - 5
   - 6 - 10
   - 11+

10. What grade level(s) do you teach? (Check all that apply.)

   - Preschool
   - Kindergarten
   - 1st
   - 2nd
   - 3rd
   - 4th
   - 5th
   - 6th

11. What subjects do you teach in the classroom? (Check all that apply.)

   - Reading
   - Language Arts
   - Science
   - Math
   - Art
   - Social Studies

- Physical Education
- Other (Please specify): _____

Thank you very much for making the time to respond to this study.

Appendix F

List of Elementary Schools with DNR School Forests

Schools by County	School Forest Name	#Students	Principal
Rippleside Elementary	Aitkin School Forest	657	Allen Albertson
Hill City Public Schools	Hill City School Nature Area	165	Dean Yocurn
McGregor Public Schools	McGregor School Forest	223	Paul Grams
East Bethel Community School	East Bethel/Cedar Creek School Forest	764	Angie Scardigili
Cedar Creek Community School	Cedar Creek/East Bethel School Forest	1122	Darin Hahn
Linwood Elem. School	Linwood Community Park & SF	559	Roche Martin
Ramsey Elementary	Ramsey Elementary SF	1070	Jeff Clusiau
Westwood Elem. School	Westwood School Forest & Panther Park	453	Judi Kahoun
Jefferson Elementary	Jefferson Nature Area	748	Kimberly Pavlovich
Frazee Public School	Frazee-Vergas SF	561	Troy Haugen
Blackduck Public Schools	Blackduck School Forest	329	Robert Doetsch
Central Elementary	Horace May SF	174	Particia Welte
Horace May School	Horace May SF	399	William Burwell
J. W. Smith	Horace May SF	295	Particia Welte
Kelliher Public School	William Thayer School Forest	107	Kenny Newby
Lincoln Elementary	Horace May SF	514	Thomas Kusler
Northern Elementary	Horace May SF	520	Bruce Anderson
Solway Elementary	Solway SF	173	Tama Wesley
Bayview Elementary	Bayview Waconia School Forest	505	Chuck Anderson
Chaska Elementary	Chaska Elementary	566	Roger Hunt
Pillager Public Schools	Pillager School Forest	368	Wanda Bell
Pine River Elementary School	Pine River School Forest	371	Jackie Bruns
Longville Elementary	Longville School Forest	70	Mary Wilke
Hawley Elementary	Hawley Prairie Nature Center	429	Wayne Lepard
Bagley Elementary	Minerva Tract	566	Linda Schmidt
Clearbrook Public Schools	Clearbrook-Gonvick SF	256	Diane Lehse
Emily Charter School	Emily SF	73	C. Thomas Shinabargar
Pine Bend Elem.	Pine Bend School Forest	475	Ruth Ann Moore
Brownsdale Elementary	Brownsdale SF	116	Diana Orr
Miltona Magnet School	Miltona School Forest	110	Lisa Pikop

Oak Grove Elementary	Oak Grove Forest	882	Brian Ingemann
Scenic Heights Elementary	Scenic Heights OLC School Forest	518	Joe Wacker
Northrop Urban	Northrop Environmental Learning Center	391	Kathy Alvig
LaPorte School Forest	LaPorte School Forest	141	Gregg Parks
Nevis School	Nevis SF	265	Sharon Hadrava
Park Rapids Elementary	Delpha Hayes White SF	590	Mitchell Peterson
Keewatin Elementary	Nashwauk-Greenway SF	281	Peter Hardy
Vandyke Elementary	Greenway School Forest	405	Rae Villebrun
Ogilvie Public School	Ogilvie SF	301	Duwayne Hass
Trailview Elementary	Trailview / Jim McCollough SF	409	Mark Antonson
Northome Elementary School	Northome SF	97	Shannon Avenson
Falls Elementary	ISD 361 SF	659	Jerry Hilfer
William Kelley Elementary	Bird Hill School Forest	222	George Starkovich
North Shore Community School	North Shore Elementay SF	280	
Lake of the Woods School	Baudette SF	299	Jeff Nelson
Ogema Elementary	Waubun SF	223	Mitch Anderson
Waubun Elementary	Waubun SF	80	Mitch Anderson
Hutchinson Park Elementary	Rollie Johnson Ecology Site	881	Dan Olberg
Hutchinson West Elementary	Rollie Johnson Ecology Site	571	Anne Broderius
Milaca Public Sch.	Milaca Public Sch.	943	Steve Voshell
Royalton Elementary School	Royalton HS SF	344	Philipp Gurbada
Dover-Eyota Elem School	Dover-Eyota SF	617	Jeanne Svobodny
Goodridge Elementary	Goodridge School Forest	97	Tim Lutz
Finlayson Elementary	Finlayson School Forest	81	Larry Edgerton
Willow River Public School	Willow River School Forest	219	Steve Wymore
Cowern Elementary	Cowern Habitat Area School Forest	398	Sonya Czerepak
J A Hughes Elementary	J A Hughes School Forest	181	Jan Anderson
Warroad School	Warroad SF	335	Nick Smieja
Roseau Elementary School	Roseau SF	601	Gary Olson
Five Hawks Elementary	Five Hawks OLC School Forest	706	Tim Bell
Clearview Elementary	Clearview School Forest	404	Paula Foley
Bayview Elementary	Bayview Proctor School Forest	448	Jon Larson
Pike Lake Elementary	Pike Lake School Forest	141	William Gritzmacher

Floodwood Elementary School	Floodwood SF	187	Robert Bestful
Lakewood Elem.	Lakewood Nature Trail	278	Kris Teberg
Cotton Elementary School	Cotton SF	76	N/A
Roosevelt Elementary	Virginia SF	372	William Spelts
Motley Elementary	Motley Elementary	146	Gwynne Gildow
Menahga Elementary	Menahga FFA SF	412	Joleen Delahunt
Sebeka Elementary	Harrington Woods	287	David Fjeldheim
Marine Elementary School	Marine Elementary School Forest	145	Lynn Bormann
Stonebridge Elementary	Stonebridge School Forest	470	Heather Nelson
Harambee Elementary School	Crosswinds School Forest	390	Kristine Black
Armstrong Elementary	Bailey School Forest	502	Tom Berg
Cottage Grove	Bailey School Forest	630	Carl Aegler
Crestview	Bailey School Forest	480	Rich Ramano
Gordon Bailey	Bailey School Forest	737	Molly Roeske
Grey Cloud	Bailey School Forest	622	Laura Losheck
Hillside	Bailey School Forest	631	Erin Shadick
Liberty Ridge	Bailey School Forest	875	Michael Moore
Middleton	Bailey School Forest	847	Julie Nielsen
Newport	Bailey School Forest	310	Aaron Krueger
Pine Hill	Bailey School Forest	476	Terry Lizakowski
Pullham	Bailey School Forest	530	Ed Ross
Red Rock	Bailey School Forest	752	Andrew Caflisch
Royal Oaks	Bailey School Forest	569	Theresa Blume-Thole
Woodbury Elementary	Bailey School Forest	654	Kristine Schaefer
O. H. Anderson Elementary	O. H. Anderson Elementary SF	620	Kirsten Bouwens
Columbus Elementary	Columbus Elementary SF	453	Neal Fox
Lewiston-Altura Elem. (K-4)	Lewiston - Altura SF	280	David Riebel
Lewiston-Altura Elem. (5-6)	Lewiston - Altura SF	111	David Riebel
Hanover Elementary	Hanover Elementary SF	462	Jeff Olson
93		**39,052**	

The original school listing was obtained from the Minnesota Department of Natural Resources in January 2010 and updated in April 2010. (Amy Kerber, personal communications, January 12, 2010 and April 19, 2010). Student enrollment and principal names were gathered from the school directory of the Minnesota Department of Education ("Directories", 2010).