

DESIGNING AND INSTITUTIONALIZING A PLACE-BASED WATERSHED
CURRICULUM IN BALLSTON SPA, NEW YORK

By

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A SENIOR CAPSTONE PROJECT IN ENVIRONMENTAL STUDIES

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ABSTRACT

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We designed a place-based watershed curriculum to supplement the existing indoor ecosystem unit for a fifth-grade classroom in Ballston Spa, New York. We surveyed student environmental knowledge, behaviors, and attitudes prior to program implementation. Additionally, to determine the challenges to institutionalizing a place-based based watershed curriculum, we conducted interviews with five fifth-grade teachers and four elementary school principals within the district, and teachers completed a survey designed to assess the benefits and barriers of teaching outside. We found that students have positive environmental attitudes and behaviors, but spent little time outside. These favorable environmental attitudes may be attributed to the media's influence, and consequently may be global, not local, in scope. Watershed place-based education may help transfer these attitudes to the local community. Teachers were enthusiastic about the idea of teaching outdoors, but cited mandated curriculum, discomfort in the outdoors, and unfamiliarity with the educational material as major barriers to doing so.

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There is no doubt that the generation of citizens currently moving through the public school system will be forced to deal with environmental problems that current and past generations have cultivated. Central to this obligation is an implied proficiency in problem solving skills and strategies, and the ability to encourage and facilitate change on local, state, national, and international levels. The local community provides ample educational opportunities that can encourage civic engagement in children and develop the skills necessary to be a vector for social change, while still meeting the educational goals outlined in school or state standards.

The fundamental principles of environmental education are central to developing an active citizenry. According to William Stapp, who wrote the introduction to *The Journal of Environmental Education* upon its creation, environmental education seeks to “produce citizens who are knowledgeable about the biophysical environment and its problems, aware of strategies that can be used to deal with those problems, and are actively engaged in working towards their solution” (1969). Recently, however, many educators have gone beyond this original definition, and now identify “a commitment to place” as a central component in developing socially engaged students. “Place-based education,” seeks to ground environmental education principles in a local community, and is defined as:

The process of using the local community and environment as a starting point to teach concepts in language arts, mathematics, social studies, science, and other subjects across the curriculum. Emphasizing hands-on, real-world learning experiences, this approach to education increases academic achievement, helps students develop stronger ties to the community, enhances student’s appreciation for the natural world, and creates a heightened commitment to serving as active, contributive citizens. Community vitality and environmental quality are improved through the active engagement of local citizens, community organizations, and environmental resources in the life of the school. (Sobel 2004)

Grounding education in the local community provides an appropriate setting to develop environmentally responsible behavior. The Tblisi Declaration of 1977, produced at the foundational international conference on environmental education, emphasizes that environmental stewardship must be preceded by an awareness of the local environment (UNESCO/UNEP 1977). A sustained commitment to this place can help foster children's environmental awareness and concern (Hart 1997, Sobel 1996, Vaske and Kobrin 2001). This commitment begins with a functional attachment (place dependence – ex. a house that contains food and provides shelter), leads to emotional attachment (place identity – ex. stream behind the house used for fishing and swimming), and emotional attachment is positively correlated with environmentally responsible behavior (Vaske and Kobrin 2001). Thus, the longer a place remains in a child's life, the greater the place identity and consequently, the greater the enthusiasm to protect it. This childhood environmentalism may be carried into adulthood. In a study by Louise Chawla, the two most commonly cited influences on environmentalists later in life are experiences in natural areas and family influences (1999).

An education grounded in place provides the opportunity to learn by identifying problems and proposing solutions. Once a connection to place is established and students are invested in the well-being of the community, social action can follow. David Sobel outlines the appropriate age ranges for the development of a place-based curriculum, and suggests that ages three to seven are appropriate ages to encourage empathy between the child and the natural world, ages seven to eleven is the appropriate time to encourage exploration, and by age eleven, students will feel inclined to begin to exhibit social action (2007). Opportunities for civic engagement exist within the built environment in addition to the natural environment. For example, if students come from a dangerous neighborhood, teachers can focus science learning on the restoration of

vacant lots or derelict housing (Fisman 2005). In the natural environment, The STRAW Project in Marin County, California has involved students in the restoration of riparian zones to recreate habitat for the endangered California freshwater shrimp (The Bay Institute 2008). These projects represent ideal versions of a place-based approach to learning, and contrast directly with traditional education that is found in many public schools across the county.

Traditional educational practices emphasize teaching to the test, and consequently foster a fundamental disconnect between children and their surrounding community. This disconnect threatens to cultivate a body of citizens unable to address pressing local issues and demonstrate critical thinking skills necessary to solve environmental problems facing our world today. One way education promotes this divide between young children and the environment is by introducing abstract environmental disasters beyond their geographic realm of understanding. By focusing on large-scale concerns like rain forest destruction or climate change, the main message portrayed to children is fear. David Sobel refers to this cultivated fear as “ecophobia” (1996). By bestowing unprecedented fear in children, educators are driving them away from the environment and rendering them unfit and unwilling to address pressing issues. In addition, Penelope L. Firth argues that humans have created a cultural buffer between society and the environment, which she attributes to a shift in human values and customs (1998). As a result, people are not directly affected by the consequences of their actions and are less inclined to change their lifestyles (Firth 1998). However, she suggests that this disconnect can be bridged through education, because “education is most effective when coupled to discovery and discovery is most rewarding when coupled to education” (1998). However, this idea of “discovery” continues to dwindle as a result of various standards and customs accepted in our society.

This observed shift in lifestyle has negative repercussions for children's health and well-being. Richard Louv coined the term "nature-deficit disorder" in his book *Last Child in the Woods*; he argues that a disconnect between children in the natural world is creating an unhappy, unhealthy generation of children. Louv claims that nature deficit disorder can be linked to alarming childhood trends such as rises in obesity, attention disorders, and depression (Louv 2005). A survey looking at families of ADHD children showed that "green" activities, including camping and fishing, significantly reduced attention-deficit symptoms (Louv 2005). Place-based education has the potential to invoke similar results, as it reconnects children with their local community and surrounding natural environment, and may consequently improve children's concentration skills.

Actively integrating place-based curriculum into schools has relied on a number of educational strategies that differ from those used in traditional curriculums. Firstly, Lieberman and Hoody suggest a breakdown of the traditional boundaries between disciplines to allow for an interdisciplinary, dynamic curriculum (1998). Although we recognize this as an effective means of approaching place-based education, our capstone project will focus strictly on the natural sciences because of time restraints. However, a watershed curriculum offers opportunities to expand to include the language arts, social studies (and social action), and mathematics, and could be addressed in a future project. Secondly, the importance of hands-on outdoor activities and problem solving provide the medium for educational exploration. There has been a reduction of class field trips and hands-on experiences as a result of the strict testing requirements implemented in schools, and their reintroduction to the schools is essential in developing an engaged student body (Sobel 1996). Team teaching and adaptation to individual students' needs will encourage interdisciplinary exploration, and enhance learning in school systems (Lieberman

and Hoody 1998). Watershed studies incorporate many of these place-based education strategies, and can encompass all standard elementary school disciplines. As the California STRAW program has demonstrated, watershed studies are an ideal geographic scale at which to blend academics with social action, as the scientific and social aspects of the watershed allow students to conduct science that will have real implications in the community (The Bay Institute 2008). Firth agrees that freshwater systems are an effective means of motivating citizens to consider their actions (1998).

Education grounded in place has been linked to improved academic performance, and these improvements cascade through the community. For instance, students that have participated in a community-based environmental education program demonstrate critical thinking skills that are equal to or exceed those of college students in several American universities, and those that participated in the program for four years showed an increased disposition towards critical thinking (Ernst 2004). Additionally, students perform better on standardized measures in all subjects of academic achievement, including science, mathematics, social studies, and reading (Hoody and Lieberman 1998). In Hoody and Lieberman's review of the Environment as an Integrating Context for Learning (EIC) program located in hundreds of school districts throughout the country, they found that EIC students scored higher on three out of four standardized science measures than students who were not involved in the environmental program (1998). Additionally, students involved with EIC were able to apply their knowledge to the outside world by approaching problems in their school, home, and community in an interdisciplinary manner. One survey showed 99% of these students were able to understand scientific concepts from hands-on experiences, and apply these processes to the real world via data collection, observation, and analysis. Additionally, 98% of these students showed increased

enthusiasm and interest in learning about their community and natural surroundings (Hoody and Lieberman 1998). Furthermore, when evaluating how students responded to the EIC program from all disciplines, teachers and administrators noticed a reduced need for discipline, increased engagement, and an increased self-respect in children's accomplishments.

The benefits of outdoor place-based education are not only academic in scope. Outdoor studies in the local environment have been linked to heightened environmental knowledge, attitudes, and behaviors. Outdoor environmental education programs have been linked to increases in environmental knowledge (Bogner 1998; Cronin-Jones 2000). Additionally, outdoor environmental education programs have been shown to positively influence students' environmental attitudes and behaviors (Cronin-Jones 2000; Jaus 1982, 1984), although Bogner (1998) found that if students are to retain these attitudes one month after the curriculum is implemented, students must be exposed to a minimum of five days of outdoor environmental education.

Despite the visible benefits that place-based education has had in schools where it has been implemented, a number of barriers delay its integration into existing public school systems. Often, the unwillingness or inability of teachers to integrate community-centered learning into their classroom restricts its' integration. This can be traced, in part, to the lack of pre-service methods training in higher education in environmental education, where the majority of the time is dedicated to the core, "testable," subjects like math, language arts, and social studies (Powers 2004). Often, students taking classes in education are unqualified to teach science, or approach the subject with "fear" and unease (Powers 2004). Ham and Sewing (1988) identified that teachers consider a lack of knowledge about environmental education to be a significant barrier to the institutionalization of environmental education, which translates into a lack of teacher

confidence (Hanna 1996). By relying on unambiguous material, teachers increase the ease of the job – heavily structured lessons allow for more control, fit into space and time restriction of the existing curriculum, and increase the ease of grading and the ease of explaining the grade to both the student and the parent (Stevenson 2007).

The school and state curriculum standards additionally impose barriers to the integration of place-based education in public schools. Schools were developed as institutions for the education of the masses, and the resulting curriculums rely on the memorization of basic facts, theories and concepts whose “intended function was not to promote social change or reconstruction” (Stevenson 2007). In recent times, the No Child Left Behind Act of 2001 has led to an increased focus on the testable subjects, at the expense of social studies and the sciences. In a study by Ham and Sewing (1988), teachers identified ‘lack of time in the school day’ and ‘lack of preparation time’ as two of the principle barriers to implementing environmental education. Other barriers that teachers identified to implementing environmental education included lack of funding, lack of instructional materials, and lack of administrative support (Ham and Sewing 1988, Hanna 1996).

To address this problem, the No Child Left Inside Act of 2008 has been proposed to Congress, and was passed by the House of Representatives in September 2008 (Chesapeake Bay Foundation 2008). This act supports the implementation of environmental education in school systems and promotes learning of math, science, writing, and reading skills through engaging activities. However, although these stagnant curriculums are still the norm today, many schools have succeeded in integrating place-based education into their public school curriculum. The State of Vermont recently added two new educational standards that focus on place and sustainability, making it easier to incorporate place studies in the classroom (Powers 2004).

Ultimately, the integration of place-based education is dependent on the enthusiasm and energy of the teacher, as testable material that meets state standards can be incorporated into a place-based curriculum.

The opportunity presently exists to bridge these barriers in the Ballston Spa, New York School District. The elementary school administration and science teachers have applied for a grant to obtain temperature and dissolved oxygen probes for use in water quality testing on the Kayaderosseras Creek. This enthusiasm to incorporate outdoor activities into the science curriculum, and the proximity of the school to the Kayaderosseras Creek eliminates any suggested barriers of a lack of teacher enthusiasm or a hesitance to incorporate place studies in the classroom. The remaining barriers, including principally the emphasis on testing and the need to meet state standards, can be breached with proper planning and curriculum development.

In our project, we will institute a place-based watershed curriculum in a fourth or sixth grade classroom in Ballston Spa, New York. We have three goals: (1) to create a curriculum within the already existing science framework such that we meet the New York State education standards, (2) assess our curriculum qualitatively and quantitatively via questionnaires, interviews, and mapping activities, and (3) overcome the challenges of institutionalizing a watershed curriculum by determining the obstacles and recording them in a journal for future reference. By working closely with a teacher in the school system and using this case study as a means to determine the challenges of institutionalizing a watershed curriculum, we expect that our work will be passed on to future classes and hopefully will encourage the development of place-based curriculums in other disciplines. Encouraging the active engagement of students in local issues will ultimately lead to inquisitive, critically minded individuals capable of identifying local problems, proposing solutions, and enacting these solutions.

Methods

We had three goals for our project: (1) evaluate students' environmental knowledge, attitudes, and behaviors, (2) identify the challenges to institutionalizing a place-based curriculum, and (3) to design an outdoor watershed curriculum to supplement the current fifth grade ecosystem unit. To accomplish these goals, we worked in the Ballston Spa Central School District in Ballston Spa, New York, with Jean Hoins, a fifth grade teacher in Milton Terrace North Elementary School. Diane Irwin, the science coordinator for this district, informed us of a two thousand dollar grant the school had recently received to purchase science materials that could be used for our supplementary activities and arranged for us to work with Ms. Hoins because of her enthusiasm to teach outdoors and on the Gordon Creek nature trail behind the school.

To evaluate student environmental knowledge, attitudes, and behaviors before the implementation of our curriculum, we had Jean Hoins administer student surveys (Appendix A) on March 30th, 2009 to forty-eight students in three fifth grade classrooms. We developed six environmental knowledge questions based on the major concepts presented in the current ecosystem curriculum, with the addition of important watershed issues incorporated in our outdoor supplemental activities. Topics include: watersheds, food webs, erosion, biotic factors, macroinvertebrates, and populations. Secondly, we evaluated student environmental attitudes by presenting eight statements in which they responded on a five-point scale (strongly agree to strongly disagree). Lastly, we had students' report how often they participated in certain environmental behaviors such as turning the water off when they brush their teeth or how often they recycle (often, sometimes, rarely, never). There were a total of eight questions about the frequency of their environmental behaviors.

To identify the challenges to institutionalizing a place-based watershed curriculum in the Ballston Spa Central School District, we interviewed five out of eleven fifth-grade teachers and the four principals of the elementary schools, including Milton Terrace South Elementary School, Milton Terrace North Elementary School, Wood Road Elementary School, and Malta Avenue Elementary School. We asked teachers about the challenges and benefits of outdoor education, how much time they currently take their class outdoors, and their general teaching philosophies (Appendix C). We asked principals similar questions (Appendix D), focusing more on the administrative and district constraints of implementing an outdoor curriculum. We also administered teacher surveys prior to interviewing them (Appendix B). These questions looked at teacher comfort, perceived student outcomes from outdoor education, appropriateness of Gordon Creek as a teaching resource, worries, need for training, and perceived hazards of teaching outside. Many of these questions were adapted from Simmons (1998), 'Using natural settings for environmental education; perceived benefits and barriers.'

We established an outdoor place-based science curriculum consisting of sixteen lesson plans, with a focus on watershed education. To come up with our outdoor lesson plans, we carefully reviewed the ecosystem unit currently used in Ballston Spa and established the key concepts emphasized in the curriculum. For fifth grade, these include: food webs, green plants, animals, soil, air, and water monitoring, growth limitation, pollution, acid rain, fertilizer runoff, erosion, and fluctuation in populations. Our lessons plans allow teachers to reach these conceptual goals, meet the educational standards previously included in the science curriculum, remain focused within the watershed and tie into the larger theme of water quality. Jean Hoins has piloted our curriculum in her ecosystem unit beginning in spring 2009. Our watershed curriculum will culminate with a final photo journal created by the students that reports on the

environmental health of Gordon Creek. This will consist of photographs of Gordon Creek and the environmental issues they studied throughout the ecosystem unit, as well as nature journal entries they documented throughout their studies of the watershed.

Studying stream health and the health of the surrounding land will ultimately require students to consider the impact that irresponsible land use can have on aquatic and terrestrial ecosystems as well as natural and built environments in the direct locality and in the watershed. Thus, students will extrapolate their knowledge to consider their impacts on a broader geographic scale. By focusing our study within the local community, students may feel a sense of ownership over the study area and feel more inclined to act responsibly with respect to Gordon Creek and the Saratoga Lake watershed. Additionally, by proposing solutions to improve stream health, students will learn that their contribution to their community is valued, and they may feel more inclined to act with positive community intentions in the future.

Results

Student Pre-Evaluation

The majority of students within three fifth grade classes at the Ballston Spa Elementary Schools spend zero to four hours outside every week (35.6%), and 26.7% of students spend only five to nine hours outside every week. Only 4.4% of students spend greater than twenty hours outside in a week (Figure 1).

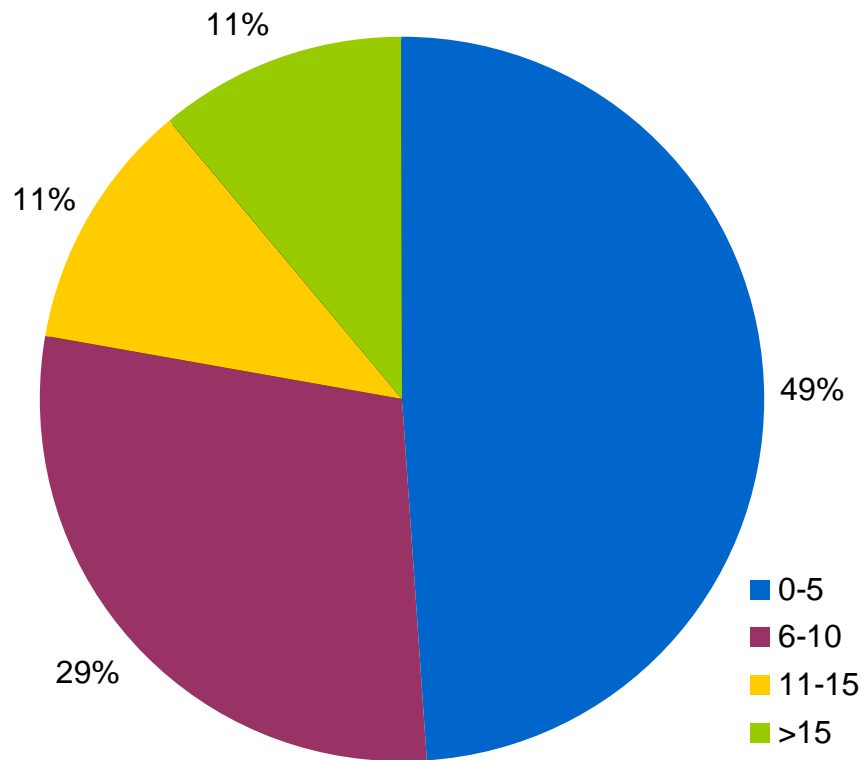


Figure 1 Hours students from three fifth grade classrooms spend outside per week

The responses we received from Jean Hoins' fifth grade class regarding environmental attitudes and stream cleanliness showed that no students strongly agreed they would swim, drink, or eat fish from Gordon Creek. Consequently, 47% of students disagreed that they would swim in Gordon Creek, and a large majority strongly disagreed they would drink water from the creek (41.2%) or eat fish from the creek (47.1%)(Figure 2).

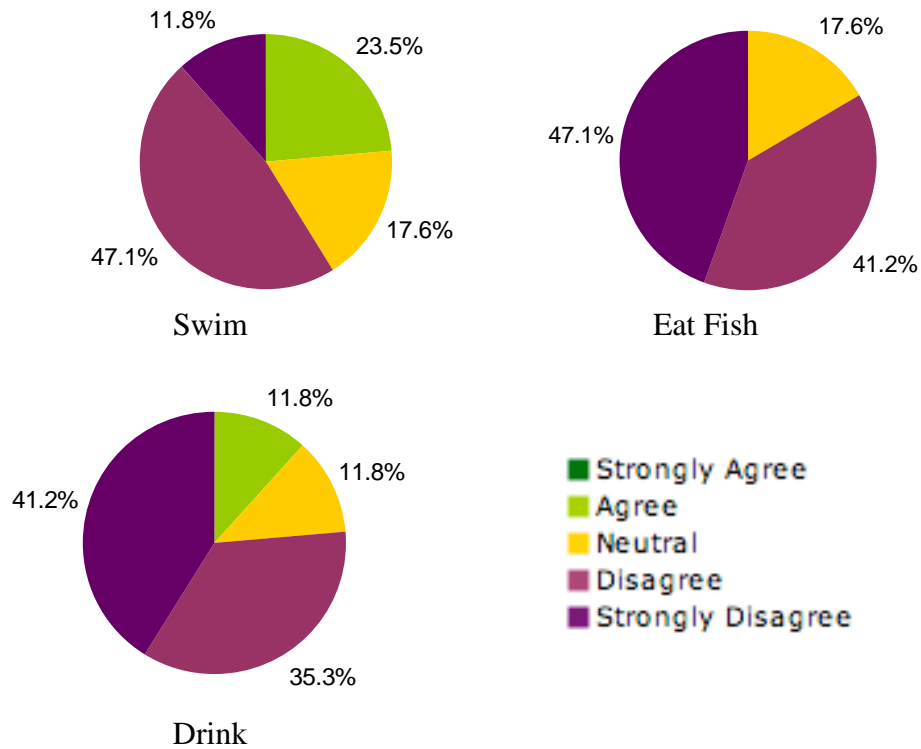


Figure 2 Student responses to “I would [swim in, drink from, or eat a fish I caught in] Gordon Creek

Students in Jean Hoins’ fifth grade class demonstrated overwhelming agreement with statements pertaining to general environmental attitudes (Table 1).

Table 1 Student responses to questions pertaining to environmental attitudes

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
I would swim in the creek behind my school	6.67%	28.89%	8.89%	37.78%	17.78%
I would drink water from the creek behind my school	4.44%	11.11%	11.11%	31.11%	42.22%
I would eat a fish I caught in the creek behind my school	4.55%	2.27%	18.18%	40.91%	34.09%
My actions impact the health of lakes and streams	28.89%	35.56%	15.56%	13.33%	6.67%
Streams and lakes are an important resource for humans, plants and animals	82.22%	17.78%	0.00%	0.00%	0.00%
We should protect our lakes and streams so that humans and animals can use them	68.89%	20.00%	4.44%	0.00%	6.67%

If I had to choose between protecting a natural area or building a home for humans, I would protect the natural area	46.67%	33.33%	15.56%	4.44%	0.00%
I am interested in spending time helping to clean the creek	43.18%	40.91%	15.91%	0.00%	0.00%

Fifty seven point six percent (57.6%) of students strongly agreed with the statements provided, and 29.4% agreed. Of the remaining students, only 4.8% either disagreed or strongly disagreed, and the responses were split evenly between the two (Figure 3). Responses to specific attitude questions are presented in Table 1.

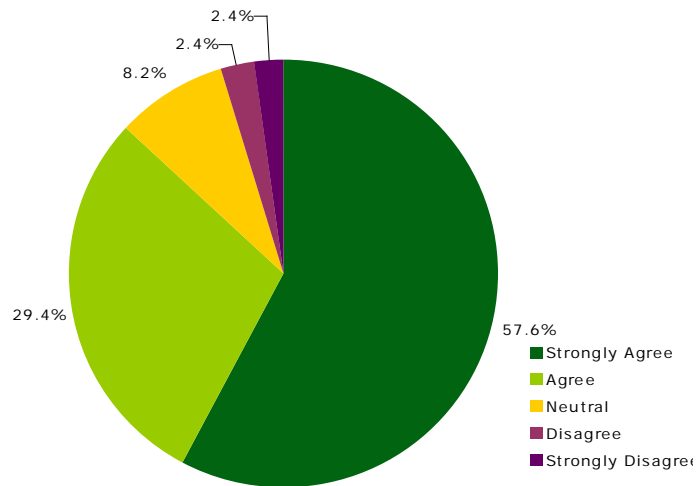


Figure 3 Student responses to general environmental attitude questions

Student survey results also indicated that 53% of students “usually” partake in environmentally responsible behaviors, while 28% of students “sometimes” do. Only 8% of students said they “never” act with environmental responsibility (Figure 4). Responses to specific behaviors are presented in Table 2.

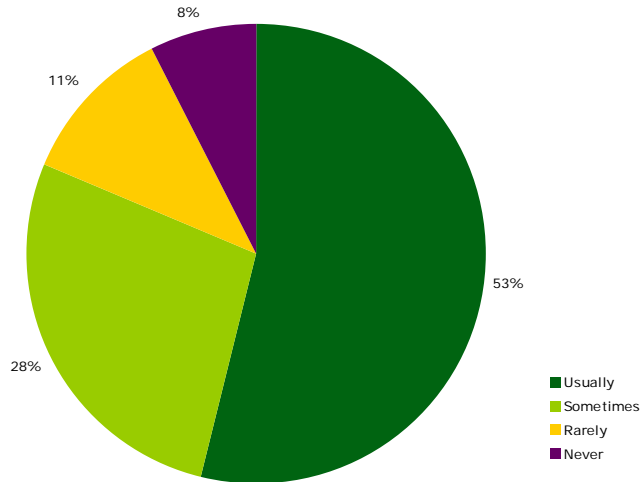


Figure 4 Frequency of environmental responsible behaviors among 5th grade students at Milton North Elementary School

Table 2 Student responses to questions about frequency of environmental behaviors

	Usually	Sometimes	Rarely	Never
I turn the water off when I am brushing my teeth	77.78%	11.11%	6.67%	4.44%
I recycle	77.27%	18.18%	2.27%	2.27%
I choose to play outside rather than play a video game	66.67%	24.44%	6.67%	2.22%
I go hiking and camping with my family	40.00%	33.33%	22.22%	4.44%
I worry about global warming	60.00%	22.22%	6.67%	11.11%
I help my family make environmentally responsible decisions	44.44%	24.44%	13.33%	17.78%
I read books about the natural world	35.56%	20.00%	31.11%	13.33%

The majority of students responded incorrectly to environmental knowledge questions that addressed concepts regarding watersheds, food webs, erosion, and biotic/abiotic factors (Table 3). A greater number of students answered questions correctly about the use of aquatic insects in stream study, and predator/prey interactions.

Table 3 Student responses to environmental knowledge questions

	Correct	Incorrect
A watershed is (a)	31.11%	68.89%
A food web is ©	40.00%	60.00%
The word erosion is ©	48.89%	51.11%

An example of a biotic factor in an ecosystem is ©	13.33%	86.67%
Why are aquatic insects helpful when studying streams (a)	51.11%	48.89%
A population of trout drops in numbers from 100 to 50. What could cause this decline in population? (d)	68.89%	31.11%

*Benefits of Place-based Education, Challenges to Institutionalization:
Teacher and Administrator Interviews*

All of the teachers we interviewed commented on the varied benefits of bringing students outdoors to learn. These benefits included a greater richness of discussion material, a heightened appreciation for nature and willingness to “take better care of what we have in our backyard” (pers. comm. Chaucer, 4/8/2009), increased physical activity and movement, increased “internal confidence, community, [and] friendships” (pers. comm. Selkis, 4/8/2009) that result from project-based curriculum, and increased general happiness. Additionally, Jean Hoins, fifth-grade teacher at Milton North Elementary School identified the ability to develop “that sense of your own body” (pers. comm. Hoins, 4/22/2009) as a crucial element of taking students outdoors. Hoins also commented that nature experiences help students learn to “take ownership of their experience out there,” by individually determining what they would like to learn more about on their own, rather than having the teacher always directing their learning. This view is consistent with “inquiry-based learning,” in which classroom studies are driven by students’ questions and curiosity to learn more.

Despite the general consensus that playing or learning outdoors is beneficial for children, all the teachers and all but one of the administrators agreed that children are affected by ‘nature-deficit disorder,’ and are spending less time outside than children used to. Administrators cited this trend both at home and at school. Joe Lopez, Principal of Milton South Elementary School

stated that he only sees kids outside “to play organized sports” (pers. comm. Lopez, 4/8/2009). He additionally commented that “I don’t think you see kids exploring or parents taking them up to the park as much as perhaps it used to be.” The effects “[infiltrate] every level of our educational system,” (pers. comm. Selkis, 4/8/2009) states Michael Selkis, Principal of Wood Road Elementary School. Only one administrator, Sharon D’Agustino, Principal of Malta Avenue Elementary School, the one urban elementary school in the district, said “I’m not so sure that [nature deficit disorder] is a problem” (pers. comm. D’Agustino, 4/7/2009). Hoins mentioned that her students exhibit “symptoms” of nature-deficit disorder, in that they “have at least a guarded fear of going into the natural world,” as do their parents. According to Hoins, this fear is in part derived from television, as “half the shows on TV promote that culture of fear, like ‘When Deer Attack,’ or ‘When Chipmunks Go Wild’” (pers. comm. Hoins, 4/22/2009).

This fear of nature may be derived from our obsession with structure and organization that pervades many aspects of our society. Hoins highlights that “people are scared for their children. Almost from the minute they’re born, we’re scared to feed them the right thing, we’re scared to talk to them the wrong way...” The “soccer mom phenomena” ensures that “everything is structured,” and our children “don’t get a chance to go out and try to climb that tree, fall out of it and go, I’m OK, and go home” (pers. comm. Hoins, 4/22/2009). This fear of nature cultivates a body of children that are deprived of the natural world. The school- yard may be the place to reintroduce them to their natural world.

However, there are a variety of challenges to institutionalizing an outdoor place-based ecosystem unit. One common concern among teachers was that they lacked the support services to safely manage a large class of students in the woods. One teacher had taken her students out for class earlier that day and mentioned “crazy behaviors,” which she attributed to the fact that

“very few of them hike with their families, go in the woods.” Another teacher from Malta Avenue Elementary School reinforced this point, suggesting, “it’s all management.” Hoins saw an additional detriment to taking a class of misbehaving students outside because of the fear that they will be “wrecking things, killing things, and destroying stuff.”

Further hesitance to take students outside was derived from terrain features that made nature walks messy, challenging, and disorienting. One teacher cited a fear of “kids slipping,” given that the “terrain is not the easiest.” Another teacher mentioned that varied terrain elevation would make it easier for her to get lost. Ill-preparedness for the terrain and environmental conditions lead to an unpleasant wet-feet experience for one teacher and her class, and she “ [hasn’t] been back since.”

Teachers also expressed hesitance to bring their students outside because of a lack of knowledge in the subject area. One teacher expressed her inability to teach effectively by saying “oh boys and girls look at this. I don’t know what it is, but look.” Administrators echoed these concerns; Joe Lopez stated: “most staff members don’t know what to do out there” (pers. comm. Lopez, 4/8/2009). Another teacher, however, identified a creative way to get around a lack of knowledge in the woods: “if they ask questions [that I don’t know the answer to] I always encourage that and say lets look that up, or lets write that down and look that up.” This inquiry-based approach is echoed by Hoins, who embraces the fact that “no one knows everything, and the kids know that so who are we fooling” (pers. comm. Hoins, 4/22/2009).

Undoubtedly one of the largest challenges to institutionalizing a place-based watershed ecosystem curriculum, as identified by both teachers and administrators, is the limited time teachers’ have to take students outdoors. Strict scheduling to accommodate district standards limits the amount of time teachers’ can freely choose additional activities. Michael Selkis clearly

articulated this challenge, stating “a teacher has about 300 minutes to fit in about 400 minutes of what they are required to teach... it’s very hard for them to let go of what they know they are going to be held accountable for and take big chunks of time to go outside” (pers. comm. Selkis, 4/8/2009). Joe Lopez additionally identified the trade-offs required with such a decision, stating, “if I’m going to do [an outdoor lesson], what aren’t I going to do?” (pers. comm. Lopez, 4/8/2009). The overwhelming district emphasis on standardize testing leaves teachers stressed out and overworked; one teacher expressed with relief that following the completion of the standardized tests, “we can be real teachers again.”

A lack of outdoor lessons in the existing curriculum may be attributed to the institutionalized traditional teaching practices, which require significant impetus to change. Currently, schools are lacking this impetus. This force of change often comes in the form of one person, and according to Selkis, “unless you have a Jean Hoins at your school, it isn’t a lightning rod and you usually need that one person who is really involved” (pers. comm. Selkis, 4/8/2009). Significant will power and instigation is necessary to face up against “the institutionalization of ideas that older, sorry, more experienced teacher have,” which Selkis calls “one of the biggest detriments.” However, Hoins is more optimistic: “we have a new Superintendent, and we have a new President, and No Child Left Behind is under scrutiny right now and a lot of data is showing it isn’t the best way to teach, so something is going to change.”

Additional challenges to incorporating outdoor lesson plans into the existing curriculum included financial constraints and proximity to natural spaces. D’Agustino heavily emphasized the need for funding in order to incorporate outdoor lessons into the school day, given their urban location and need for transportation to natural spaces. However, when prompted of the close location of Kayaderosseras Creek and potential education opportunities at the creek,

D'Agustino was perceptive to the educational value of the site. Ultimately, says D'Agustino, "if you have a park right next to you and you have a nature trail or whatever, I think teachers tend to utilize it more than if you have a classroom and you don't have those things in your proximity" (pers. comm. D'Agustino, 4/7/2009).

Despite these challenges to institutionalization, teachers and administrators proposed a number of solutions that would help overcome these barriers. A number of teachers cited 'more supervision support' as a primary resource that would increase their willingness to go outside. A second common suggestion was specialized teacher training. One teacher from Wood Road Elementary School said she would "feel more at ease if I have someone to physically take me out and tell me everything I should be aware of." Another teacher suggested mentorship, in which more experienced teachers be paired with less experienced ones when leading outdoor expeditions. Selkis identifies that professional training all "comes down to just removing the fear factor and getting them familiar with it" (pers. comm. Selkis, 4/8/2009). For teachers that are especially uneasy with the idea of visiting the nature trails, Lopez suggests teachers can "start exploration around the school yard first" (pers. comm. Lopez, 4/8/2009).

Hoins echoes the benefit of schoolyard exploration as one way to ease unconfident teachers into teaching outdoors. She suggests, "you can go out and work in the butterfly garden or you can go out and just sit and read by the trees or just go observe something" (pers. comm. Hoins, 4/22/2009). Teachers, she says, are intimidated by the daunting task of taking their students out in "waist deep snow [to] identify animal tracks." Although administrators and teachers suggest that professional development would help teachers become more confident using the outdoors, Hoins believes otherwise. "I've done professional development before and I get the same people every time," she says, "so I've decided on payday Fridays I was just going to

have Coffee by the Creek so everybody can bring their coffee and just go walk through the woods.” It is her hope that acclimating teachers to the natural environment will help foster their own sense of curiosity and wonder, without burdening them with the “this is a this and that’s that” associated with professional development.

Ultimately, institutional changes that increase the amount of outdoor education must be initiated at the district level. Selkis suggests that implementing this change at a district-wide level helps remove the accountability from the shoulders of principals, “because then the principals will say, OK, I’m not going to be held accountable” (pers. comm. Selkis, 4/8/2009). A divergence from current mandatory practices at an individual school level may lead to a failure to meet district-wide educational goals.

Teacher Surveys

Perceived student outcomes of the existing curriculum are high (mean: 1.5); teachers believed that the existing ecosystem curriculum increases students’ appreciation, understanding of impact, and environmental consciousness (91.7% of teachings strongly agreed or agreed with these statements; Figure 5).

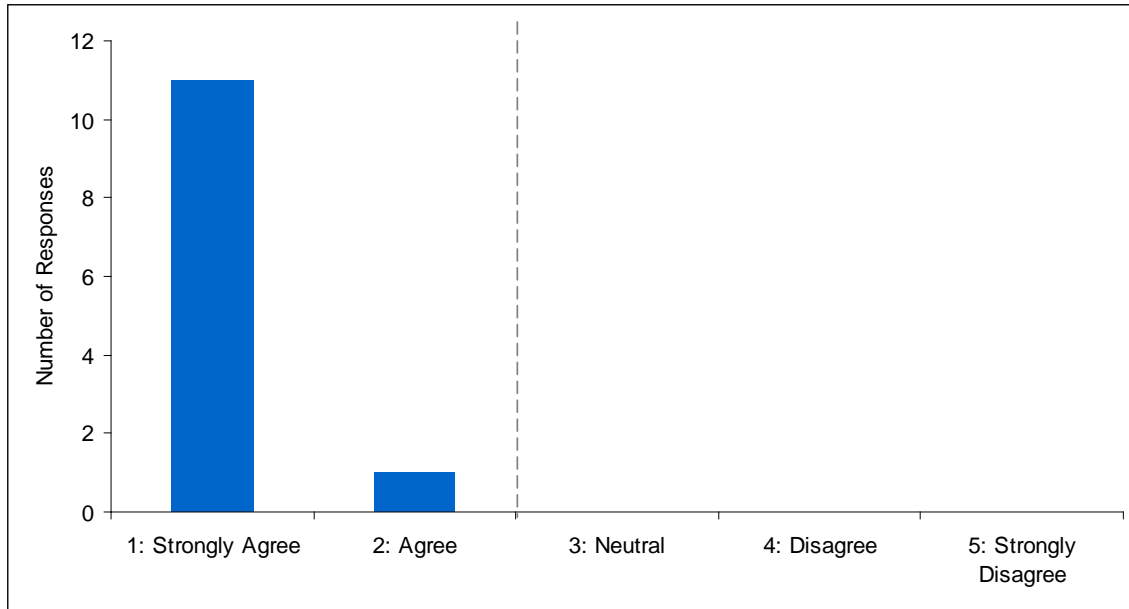


Figure 5 Distribution of responses of teachers pertaining to perceived student outcomes

Teachers showed overwhelming support for statements suggesting students will gain more environmental knowledge, awareness and behaviors from an ecosystem curriculum that utilizes Gordon Creek to supplement the indoor curriculum. All respondents strongly agreed with the statement ‘my students will gain more knowledge from an ecosystem curriculum that utilizes Gordon Creek in addition to the indoor ecosystem curriculum’ (mean=1.0) and ‘my students will gain more environmental awareness from an ecosystem curriculum that utilizes Gordon Creek in addition to the indoor ecosystem component’ (mean=1.0). One teacher agreed, rather than strongly agreed to the statement ‘my students will feel more compelled to act on behalf of their local environmental and community after completing an ecosystem curriculum that utilizes Gordon Creek and the Saratoga Lake watershed’ (mean=1.3).

Teachers expressed an overwhelming comfort with teaching class outdoors (Figure 7). The majority of teachers strongly agreed or agreed that they would feel comfortable ‘teaching an altered curriculum on similar material that includes an outdoor lab section’ (mean=1.8), they feel comfortable ‘with the idea of taking my students outdoor for class’ (mean =1.6), and 80% of

teachers say they are comfortable ‘adjusting my lesson plans on the fly to accommodate student interest’ (mean=1.6).

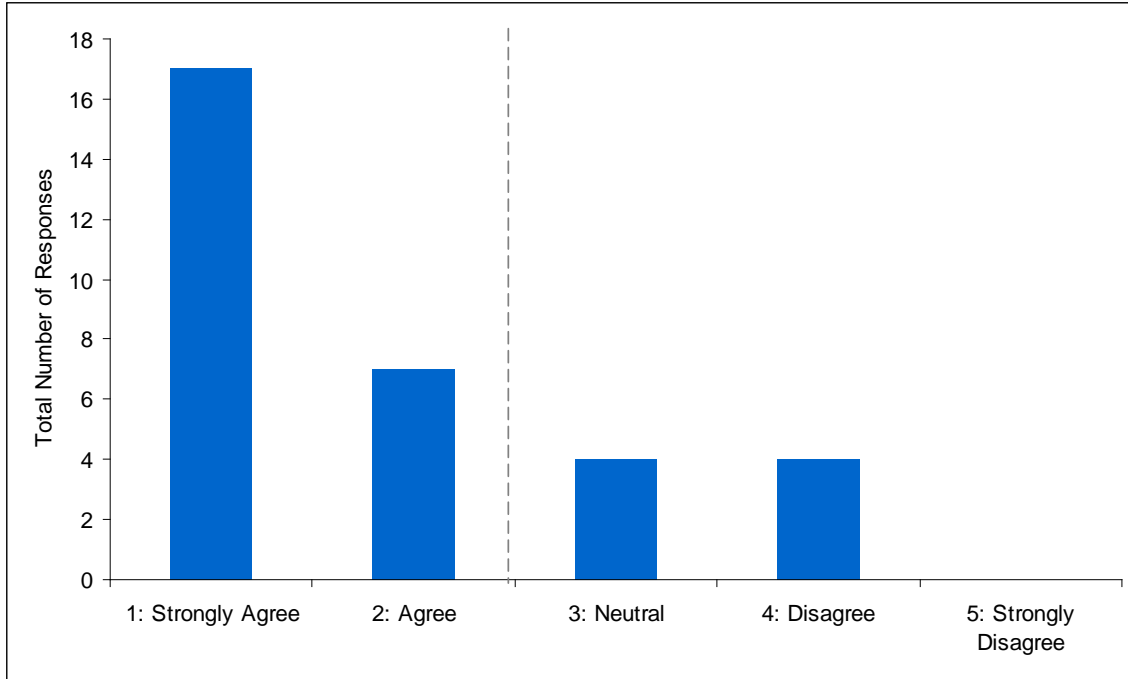


Figure 7 Distribution of responses on questions pertaining to teacher comfort

Teachers also felt that Gordon Creek was an appropriate setting for teaching outdoors (Figure 8). All of the teachers surveys either strongly agreed or agreed that ‘a trip to Gordon Creek is an important part of the Ecosystem curriculum,’ (mean=1.3) even though few teachers said in their interviews they had visited or planned on visiting the creek during the ecosystem curriculum. Teachers strongly supported the statements ‘It’s important for my students to experience a place like Gordon Creek,’ (mean=1.3), ‘my students would enjoy going there’ (mean=1.0), and ‘I’d like to share a place like Gordon Creek with my students’ (mean=1.3). None of the teachers agreed with the negative statement, ‘trips to a place like this are not worthwhile’ (mean=5). Overall, teachers agreed that Gordon Creek was an appropriate teaching setting, and that a trip to Gordon Creek would be worthwhile (mean=1.1).

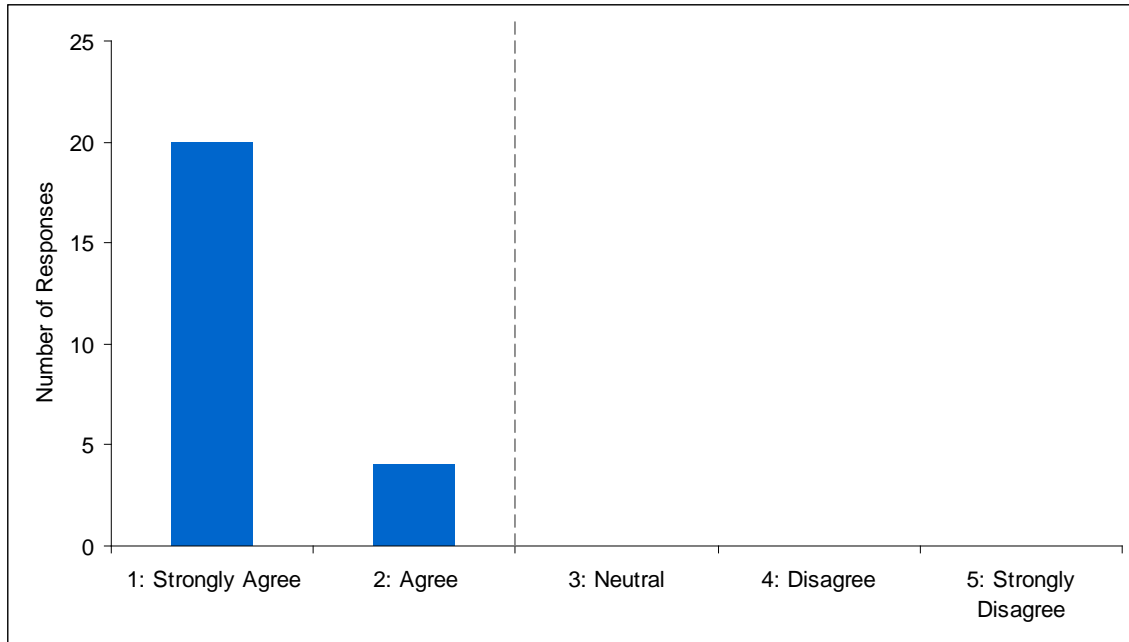


Figure 8 Distribution of responses to questions pertaining to the appropriateness of Gordon Creek as a teaching setting

Despite teacher comfort with outdoor education, teachers expressed less comfort when presented with statements targeting local outdoor opportunities. Teachers were less comfortable ‘navigating the trail system behind our school’ (mean=2.5), and 75% of responses indicated teachers are not familiar with ‘environmental issues impacting the Saratoga Lake watershed’ (mean=3.3). Teachers also expressed hesitance about their relative comfort ‘modifying the components of the Ecosystem Unit to focus on the Saratoga Lake watershed rather than the Chesapeake Bay watershed’ (mean=2.0).

Although teachers expressed comfort with the idea of teaching outdoors and support for outdoor programming, there was less agreement with statements pertaining to teaching practices and preparation; teachers did not feel as prepared as they did enthusiastic about the idea. The majority of teachers (60%) felt that they know ‘what teaching techniques to use’ in an outdoor setting (mean=2.2), although one teachers disagreed with this statement. Even fewer teachers agreed with the statement ‘I have adequate lesson plans available’ (mean=2.6) indicating a lack

of appropriate resources may be a barrier to taking students outside. The majority of teachers (60%) agreed with the statement ‘I have the background to teach successful lessons’ (mean=2.2), and teachers also agreed ‘I know what to do with the students’ (mean=2.0).

Teachers did express some worries about taking their students outside for class (Figure 9). An even distribution of teachers agreed (40%) and disagreed (40%) with the statement ‘I’d worry about safety’ (mean=3.0). Twenty percent of the teachers agreed with the statement ‘I’d worry about other people causing trouble’ (average=3.4), while the majority of teachers (40%) disagreed with this statement. One teacher expressed concern that her class would be too large, however, 75% of teachers disagreed or strongly disagreed with this statement (mean=3.5). Teachers expressed strong disagreement with the statements ‘taking my students there would be difficult to arrange’ (mean=4.6), and ‘it would be too dangerous to take students to Gordon Creek’ (mean=4.6).

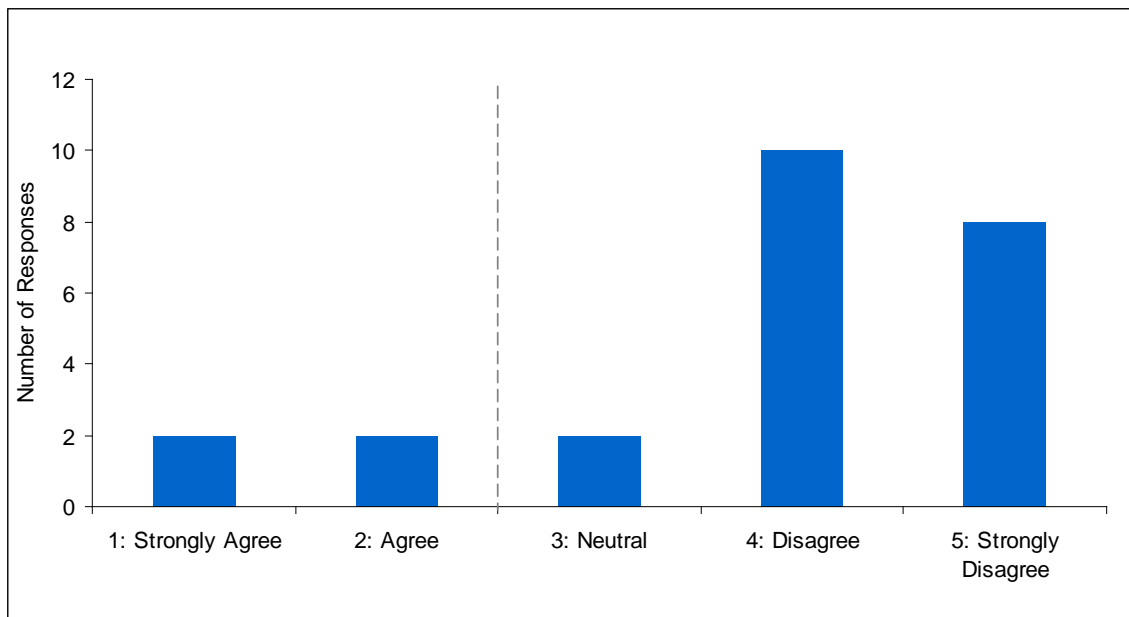


Figure 9 Distribution of responses to questions pertaining to teacher worries

Responses to questions pertaining to the need for teacher training were variable and centered on a neutral attitude (Figure 10). On average, teachers agreed that they would like more training before taking their students to the nature trails (mean=2.9). Forty percent of teachers strongly agreed that they would be afraid they ‘wouldn’t know the answers to questions my students ask’ (mean=3.2) while 60% of teachers disagreed or strongly disagreed with this statement. Average responses for the statement ‘taking students there would require special training’ indicated a neutral attitude toward this statement (mean=3.0); forty percent of teachers agreed or strongly agreed with this statement while 60% disagreed. Teachers agreed on average (mean=2.6) that they would ‘like more training before I took my students to this place.’

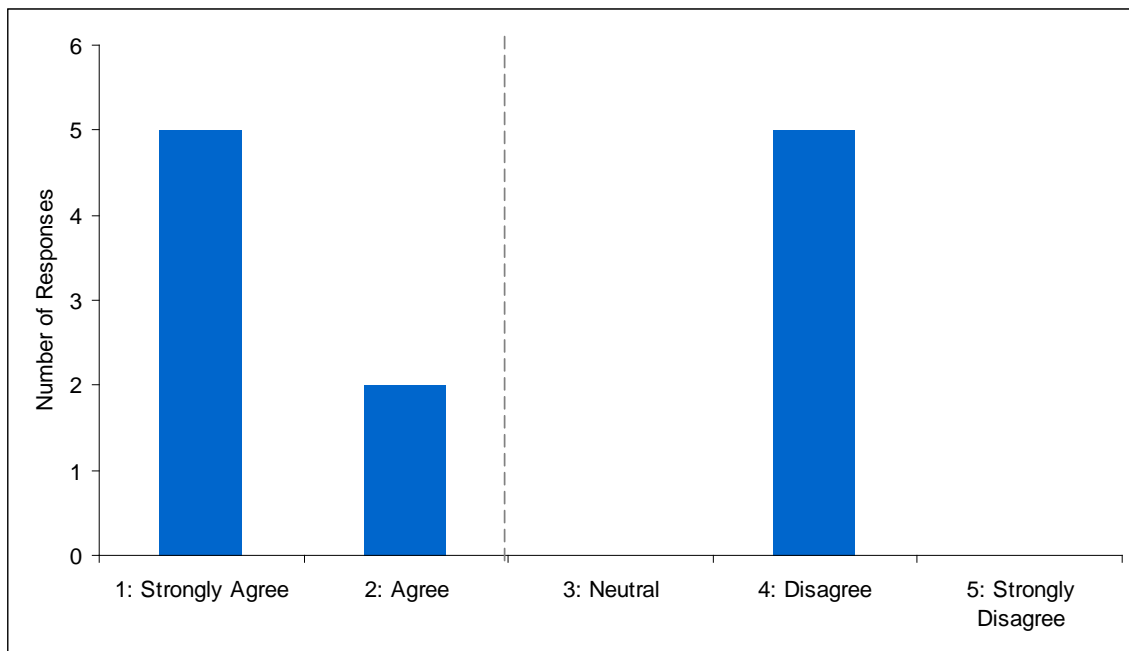


Figure 10 Distribution of responses to questions pertaining to teachers’ need for training

Responses to questions pertaining to perceived hazards were equally variable? (Figure 11). Overall, teachers disagreed with the statements ‘I would worry about getting lost’ (mean=3.8), I’d worry about poisonous plants’ (mean=3.2), and expressed even more

disagreement with the statement 'I'd worry about the threat of animals' (mean=4.0). A summary of results can be found in Appendix C.

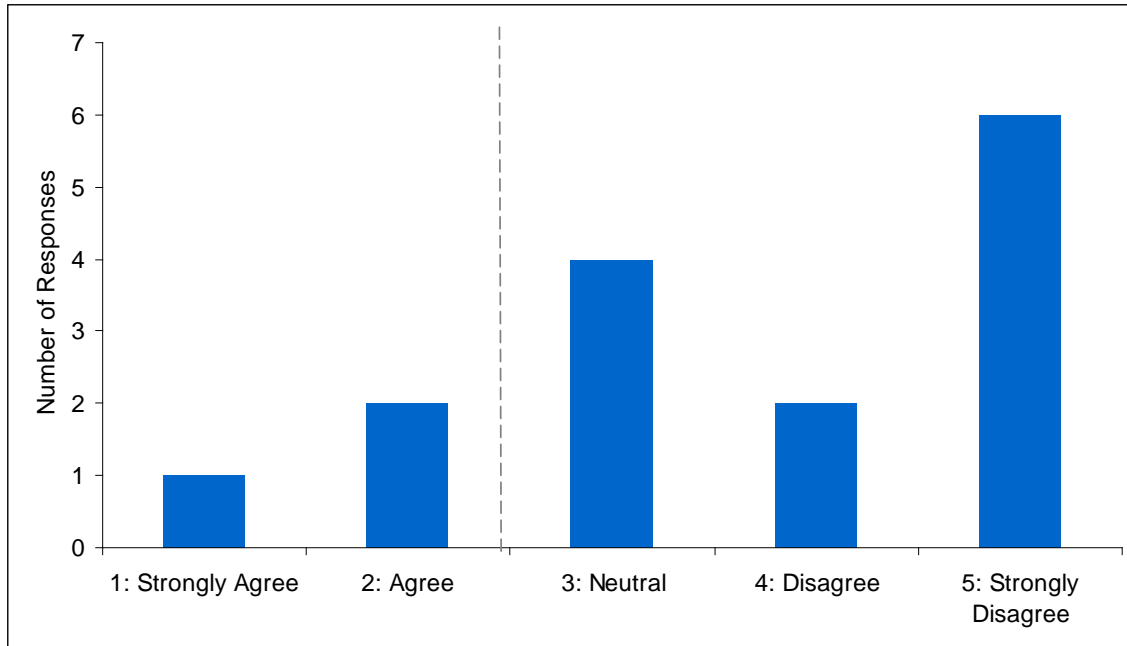


Figure 11 Distribution of responses to questions pertaining to perceived hazards

Discussion

Student survey results showed overall positive environmental attitudes and behaviors. Ironically, 49% of students surveyed spend between zero and five hours outside each week and a total of 78% spend less than ten hours outside each week. Thus, their enthusiasm to protect their streams and lakes and desire to clean Gordon Creek, as well as their consciousness to recycle and turn the water off when brushing their teeth, do not correlate positively with time spent outdoors. These environmental attitudes and behaviors must be coming from some other source besides personal experience. We attribute this disparity between high environmental attitudes and behaviors and little amount of outdoor time to “bumper sticker environmentalism,” a media-influenced political view of the environment.

Our survey results support Richard Louv’s claim that children are suffering from ‘nature deficit disorder,’ and the cultural shift indoors has caused children to spend more time watching television, playing video games, and surfing the Internet. Increased time spent indoors with technology has resulted in a false sense of environmentalism; one in which children’s values are defined by the bombardment of the media’s tagline environmental phrases like “global warming,” and “recycling.” Student environmental values center around global issues and political agendas portrayed by the media (Paehlke 1997). They do not feel a sense of place, community stewardship, or responsibility for their local environment, but instead are overwhelmed by global issues that they feel are unattainable in geographic scope and consequently impossible to fix. It is also possible that we are seeing high environmental attitudes and behaviors because students are sensitized to the purpose of our survey, and may not actually agree entirely with the statements provided or act with environmental consciousness as frequently as indicated. Additionally, students may have said they spend small amounts of time

outdoors because they were surveyed immediately after the winter. We may have obtained different results if they were surveyed during warmer months of the year.

By focusing on smaller scale issues that students can relate to and experience in their own backyards, they begin to take responsibility for their actions, and help protect their natural environment. Our outdoor place-based curriculum teaches students about the local watershed, the nature trails and Gordon Creek behind their school, and the effects of pollution on a living ecosystem. We hope to transition students from a global mindset, in which environmental issues seem distant and unrelated, to having a sense of place, in which they feel accountable for their actions and inclined to help protect and maintain their local ecosystem.

The current ecosystem unit used in the Ballston Spa Central School District emphasizes the importance of ecosystem health through study of the Chesapeake Bay Watershed. However, most students are unfamiliar with Chesapeake Bay, and must learn about ecosystems using a distant and ambiguous model. Additionally, they observe how an ecosystem functions through a plastic bottle. Both methods of teaching about ecosystems fail to incorporate environmental issues within the local geography.

Yet, with the Ballston Spa Elementary Schools' (Milton Terrace North, Milton Terrace South, and Wood Road) apparent accessibility to Gordon Creek, it's surprising they do not use this valuable resource more often. The fourteen lesson plans we created cover the major concepts illustrated in the ecosystem unit; however, they put them in context with the local watershed and stream. By observing water quality issues and pollution in and around Gordon Creek, students feel a greater sense of place and stewardship for the land.

In addition to identifying the challenges to institutionalizing a place-based curriculum, we were able to tackle some of these challenges on a small scale. Our project facilitates the

preparation work necessary for teachers who may be turned off from outdoor lessons because they lack the time to develop the material. Additionally, by piloting our study with Jean Hoins, a teacher very comfortable with the nature trails and local environment, we hope she will introduce it to other interested and willing teachers in the future.

Teacher attitudes indicated that they were highly receptive to the idea of taking their students outdoors for class. All of the teachers surveyed agree or strongly agreed that an outdoor place-based curriculum would increase student environmental knowledge, behaviors, and attitudes. Additionally, all of the teachers surveyed agreed that Gordon Creek was an appropriate teaching setting. Prior to conducting the surveys, we did not expect to receive such favorable ratings in these categories; rather we expected that some teachers would have neutral feelings or would disagree with statements regarding the appropriateness of the teaching setting.

Responses to questions designed to address the challenges to taking students outdoors for class trended towards responses indicating relative comfort in the outdoors, although there was more scatter in these results than there had been in the teacher attitude questions. This indicates that although the majority of teachers are comfortable taking their students outdoors, there are some teachers who may be hesitant to take students outside even though they understand the benefits of doing so. Thus in some cases, attitudes may not necessarily coincide with practice; this is, by definition, the “barrier to institutionalization” that we have sought to identify.

Our survey may be biased toward teachers that have an affinity for the outdoors to begin with. We were only able to sample five of the eleven fifth grade teachers in the Ballston Spa schools, and therefore it is very possible that the five that agreed to be interviewed and complete our survey had heard about our project and were interested in participating. One teacher mentioned to us that she thought “other teachers aren’t responding because they think you’ll

make them go outside.” However, we cannot discount the possibility that time constraints or other engagements prevented teachers from responding to us.

When we conducted interviews with the same teachers, they identified more concerns with taking students outdoors than they had indicated on their surveys. There are a number of possible explanations for this. First, and most likely, teachers may have been predisposed to the type of answers that we were looking for because they completed the survey before we interviewed them. We could mitigate this potential source of error in future studies by conducting interviews prior to conducting surveys. Secondly, teachers may have identified more challenges to taking students outdoors when interviewed (rather than when surveyed), because they perceived these to be challenges that would influence other teachers. Finally, teachers likely figured out what we “wanted” to see as results when they were completing our survey, and therefore had answered in a way that demonstrated their affinity to the outdoors. Then, when being interviewed they may have been more honest about the challenges associated with teaching outdoors.

There are a number of future studies that could potentially come out of the work we have done this year. First, our study relies heavily on previous research, which shows that outdoor place-based education can help improve environmental knowledge, attitudes, and behaviors. However, we do not yet have any way of knowing whether this holds true for our curriculum. Future WRI capstone students or teachers at the Ballston Spa elementary schools could conduct both a pre-curriculum and a post-curriculum survey (much like the one we distributed to the students prior to curriculum implementation) of attitudes, behaviors and knowledge to determine if it has any impact on students. These results could be compared to a classroom in which our curriculum is not implemented, and students conduct the ecosystem unit indoors. If the results

show that our curriculum fails to accomplish these goals, students or teachers could revise the curriculum for future years to pilot again. In this way, our curriculum can be improved over time.

A second beneficial follow-up project could focus on developing a parent-participation model to supplement the outdoor curriculum. Getting parents involved in this process would not only mitigate the problem of a lack of supervision outdoors, but would help transfer environmental values that may be cultivated in the school yard to the home environment. Encouraging students to investigate the outdoors in the same way they do at school will help reinforce that environmental protection is a lifestyle, not a chore.

Finally, a future project could focus on developing a professional development “curriculum” to help mitigate the challenges we identified to institutionalizing a place-based curriculum. We have developed a number of suggestions for what this course might look like. To improve a lack of teacher confidence with the educational material, it would be beneficial to establish some sort of mentorship program in which less experienced teachers could go out on the nature trails with more experienced teachers and their classes to see how experienced teachers guide class explorations. More experienced teachers should make an effort to model possible lesson plans that could be conducted in the outdoors. Additionally, teachers may benefit from structured outdoor experiences, which would help familiarize them with the flora and fauna located on the nature trails. For example, Jean Hoins has mentioned that she is considering a “Coffee by the Creek” to celebrate payday Fridays, during which teachers can simply enjoy a walk on the nature trails. She expects that encouraging this informal gathering on the natural trails will encourage teachers to look around and develop questions based on their own sense of curiosity.

A second component of a professional development course for teachers should focus on mitigating teacher discomfort in the outdoors. One way that teacher fears could be alleviated is by providing teachers with parental supervision on outdoor excursions. This would be an excellent component of the parent participation model, as it would not only help ease teacher fears, but it would also help parents see what is going on in the classroom so they could bring the lessons home. Making maps and other navigational tools more accessible to teachers could also diminish teacher fears. Finally, developing a standardized emergency protocol for teachers who are taking field trips in the woods may help teachers feel more comfortable that others know where they are and how to get in touch with them when they are by the creek.

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Appendix A: Student Survey

Water, Water Everywhere!

5th Grade Student Survey

We are interested in your ideas about the **environment** and your **community**.

There are no right or wrong answer! Please answer every question and give our completed survey to your teacher. Thanks, we appreciate your help!

- I am comfortable taking this survey and agree to let Hannah Phillips and Sarah Whateley look at the results when I have completed it.

Background

Classroom Teacher: _____

I usually spend _____ hours outside every week.

How often do you play outside after school – 4-5 days a week 2-3 days, 0-1 or some other variant.

Part One: Environmental Attitudes

This part of the survey is designed to determine environmental attitudes. There are no right or wrong answers, only differences of opinion. **CIRCLE** the letter that reflects your true feelings.

1. *I would swim in the creek behind my school.*

A	B	C	D	E
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

2. *I would drink water from the creek behind my school.*

A	B	C	D	E
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

3. *I would eat a fish I caught in the creek behind my school.*

A	B	C	D	E
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

4. *My actions impact the health of lakes and streams.*

A	B	C	D	E
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

5. *Streams and lakes are an important resource for humans, plants and animals.*

A	B	C	D	E
---	---	---	---	---

Strongly Agree Agree Neutral Disagree Strongly Disagree

6. *We should protect our lakes and streams so that humans and animals can use them.*

A B C D E
 Strongly Agree Agree Neutral Disagree Strongly Disagree

7. *If I had to choose between protecting a natural area or building a home for humans, I would protect the natural area.*

A B C D E
 Strongly Agree Agree Neutral Disagree Strongly Disagree

8. *I am interested in spending time helping to clean the creek.*

A B C D E
 Strongly Agree Agree Neutral Disagree Strongly Disagree

Part Two: Environmental Behaviors

This part of the survey is designed to identify your environmental behaviors. There is no right or wrong answer to any of these questions, so don't worry if you have never done any of these things. We ask only that you be truthful as you answer all of these questions.

Mark the answer that is closest to the right answer for you:

- N – stands for never or no
- R – stands for rarely (three or four times a year)
- S – stands for sometimes (three or four times a month)
- U - stands for usually, or yes (most of the time you have the chance)

	N	R	S	U
I turn the water off when I am brushing my teeth.				
I recycle.				
I choose to play outside rather than play a video game.				
I go hiking and camping with my family.				
I worry about global warming.				
I help my family make environmentally responsible decisions.				
I read books about the natural world.				

Part Three: Knowledge

The section of the survey is designed to determine YOUR knowledge about water issues in your community and related things. **CIRCLE** the letter that reflects what you think is a correct response to the statement or question. This is not a test! Don't worry if you can't answer many of these. Very few people can. If you don't know the answer, guess!

1. A watershed is:
 - a. An area in which all water flows downhill into a central body of water.
 - b. A building used to store water.
 - c. The name of the area surrounding one major river.
 - d. A water treatment facility used to clean our drinking water.
2. A food web is:
 - a. Food, water, sun, rain, minerals.
 - b. Sun → plants → insects → fish
 - c. Multiple food chains woven together.
 - d. A structure created by a spider to catch dinner.
3. The word *erosion* means:
 - a. The animal behaviour inside of a den or nest.
 - b. A build-up of rocks or sediment along a river bank.
 - c. The transport of rocks and sediments by a river current.
 - d. A plant's unique ability to absorb water through its roots.
4. An example of a biotic factor in an ecosystem is:
 - a. Rock
 - b. Rain
 - c. Squirrel
 - d. Water
5. Why are aquatic insects helpful when studying streams?
 - a. They are good indicators of water quality
 - b. They are easy to catch.
 - c. They jump out of the water when conditions are not suitable
 - d. They change the shape of the stream with their feeding habits.
2. A population of trout drops in numbers from 100 to 50. What could cause this decline in population?
 - a. A decrease in food
 - b. An increase in predators
 - c. A decrease in water health
 - d. All of the above

Appendix B: Teacher Survey

TEACHER ATTITUDE SURVEY

Gender:	Male	Female		
Age:	20-29	30-39	40-49	50-59
60-69				
Years of Teaching Experience:	Less than 5	6-10	11-15	More than 16

Please answer the following questions using this 5-point scale:

<i>Strongly Agree</i>	<i>Agree</i>	<i>Neutral</i>	<i>Disagree</i>	<i>Strongly Disagree</i>
1	2	3	4	5

My students gain an appreciation for the environment through our Ecosystem Unit 4 5	1 2 3
My students understand the impact their daily actions can have on the natural world 4 5	1 2 3
My students environmental consciousness is increased after completing our 4 5 Ecosystem Unit.	1 2 3
I feel comfortable teaching the material in our Ecosystem Unit 4 5	1 2 3
I would feel comfortable teaching an altered curriculum on 4 5 similar material that includes an outdoor lab section	1 2 3
I am comfortable with the idea of taking my students outdoors for class 4 5	1 2 3
I am comfortable with adjusting my lesson plans on the fly to accommodate student interest 4 5	1 2 3
I feel comfortable navigating the trail system behind our school 4 5	1 2 3
I am familiar with environmental issues impacting the Saratoga Lake watershed: 4 5	1 2 3
I'd feel comfortable modifying the components of the Ecosystem Unit to focus 4 5 on the Saratoga Lake watershed rather than the Chesapeake Bay watershed.	1 2 3

Outdoor v. Indoor

My students will gain more knowledge from an ecosystem curriculum 4 5	1 2 3
that utilizes Gordon Creek in addition to the indoor ecosystem component.	
My student will gain more environmental awareness from an ecosystem 4 5	1 2 3
curriculum that utilizes Gordon Creek in addition to the indoor ecosystem component.	
My students will feel more compelled to act on behalf of their local environment 4 5	1 2 3
and community after completing an ecosystem curriculum that utilizes Gordon Creek and the Saratoga Lake watershed.	

The following questions were derived from Simmons, D. 1998. Using Natural Settings for Environmental Education: Perceived Benefits and Barriers. The Journal of Environmental Education 29 (3): 23-31.

Please answer these questions as they relate to the Gordon Creek Nature Trail.

Appropriateness of Teaching Setting

I feel a trip to Gordon Creek is an important part of the Ecosystem curriculum. 4 5	1 2 3
It's important for my students to experience a place like Gordon Creek. 4 5	1 2 3
My students would enjoy going there. 4 5	1 2 3
I'd like to share a place like Gordon Creek with my students. 4 5	1 2 3
Trips to a place like this are not worthwhile. 4 5	1 2 3
I'd be willing to take my students there. 4 5	1 2 3

Teacher Practices

I know what teaching techniques to use. 4 5	1 2 3
I have adequate lesson plans available. 4 5	1 2 3
I have the background to teach successful lessons. 4 5	1 2 3

I know what to do with the students. 1 2 3
4 5

I feel I am well trained to teach at Gordon Creek. 1 2 3
4 5

Worries

I'd worry about safety. 1 2 3
4 5

I'd worry about other people causing trouble. 1 2 3
4 5

I'd be concerned about my class being too large. 1 2 3
4 5

Taking my students there would be difficult to arrange. 1 2 3
4 5

It would be too dangerous to take students to Gordon Creek. 1 2 3
4 5

Need for Training

I'd be afraid I wouldn't know the answers to questions my students would ask. 1 2 3
4 5

Taking students there would require special training. 1 2 3
4 5

I would like more training before I took my students to the place. 1 2 3
4 5

Hazards

I'd worry about getting lost. 1 2 3
4 5

I'd worry about poisonous plants. 1 2 3
4 5

I'd worry about the threat of animals. 1 2 3
4 5

Appendix C: Teacher Interview Questions

How do you think your students would describe your teaching style?

How would you describe your teaching style?

If you were to write your own personal “teaching philosophy,” what values would play a dominant role?

How do you know when you have done a good job teaching?

How frequently do you take your students outdoors for class?

What limits the amount of time that you teach class outside?

What types of class activities do you teach outdoors?

What do you perceive the benefits to teaching outdoors to be?

What do you perceive the challenges to teaching outdoors to be?

Appendix D: Principal Interview Questions

When we refer to “outdoor place-based education,” we are referring to field-based science lessons that supplement the existing ecosystem curriculum.

What do you think about this idea of ‘nature deficit disorder;’ that students are spending too much time living in the technological, indoor world. Is it a real problem?

What motivates a teacher to take their students outside? Why might some teachers be hesitant to do so?

What do you think about outdoor place-based education? Is it a worthwhile investment of teacher’s time?

What do you see as the benefits to outdoor, place-based learning?

What do you see as the challenges to outdoor, place-based learning?

How do parents respond to the idea of having their children go outside for class during the day?

What sort of services do you think would help you teachers become more comfortable teaching outside, and is the school willing to provide these services?

Is an outdoor component of the ecosystem curriculum something you could ever feel comfortable about requiring of you teachers?

How important is it to you that students have hands-on learning experiences in the local environment. In other words, where does this fall in your list of priorities?

Appendix E1: Teacher Interview Transcriptions, Karen French and Jen Tetu

Interview with Karen French and Jen Tetu
Fifth-Grade Teachers, Wood Road Elementary Schools
3/25/2009

Karen: Do you want me to go first? Ok, um. I'm very structured, I try to be creative and have fun with the students and I'm also very flexible with my scheduling. You could say that you're flexible with your scheduling.

Jen: Yea uh yea I guess I'm probably pretty eclectic I think my lessons are all different and I try to offer a variety of types of instruction to my students. (Karen: Oh that's good, you differentiate). I've done everything from standard you get up and you lecture something to cooperative group activities, I take them on the trails. Right now we're doing research, you know sort of inquiry. Karen and I have talked with the Science administrator about incorporating more hands on into the science and the scientific method. We don't have a lot of materials, the ecosystem kit is really our main way to get that through we've tried to supplement that with some of our other units but their really lacking. And with ecosystem kits, you know actually do more scientific method on it than maybe we have in the past.

Q: Would you describe your teaching style in any different way than your students would?

Jen: I don't know what they'd say.

Karen: They'd say whaaat?

Jen: Um no, I'd say that they'd probably agree with what I said kinda thing. I think that its clear to me they would love more hands on, and would love more of that. And if I could offer that. Now, part of the conflict we've had is we've had this new basal series Story Town and we've been mandated to do 120 minutes a day which has cut into our science and social studies time and that time when you would do more projects so this year its been more kinda as not as what we would like although fifth grade is kind of pulling away from that requirement and we're not being held to that same level of 120 minutes we're allowing. The principal is allowing us now to do more projects and he is aware of the ecosystem unit coming up and how we would devote more time.

Q: What values would you say play a dominant role in your teaching philosophy

Karen: Being honest.

Jen: I think trying to reach a variety of learning styles so... and I do like *how regarding our* multiple intelligences and we don't all learn the same way. So, that's why I tend to teach in a variety of ways because what would work for you isn't going to work for you isn't going to work for her, so maybe this lesson or this unit I am more this type of teaching that I recognize doesn't work for every kid, so then I try to do something else that would be more hands on or would be

more visual or would be something else that they would have a strength in to do that. I try not to be the same all the time.

Karen: I think you're going to have to do a little more of differential, I will need to because I have varying levels in my classroom kids that are significantly below grade level to kids that are significantly above grade level and then those in the middle so I know that for this unit I am going to have to do some modifying and also enrichment for some of those kids that will need it, they'll be bored.

So how do you know when you've done a good job during the day?

Karen: When I go home in a good mood (laughs). As simple as it is, that's honestly if you feel like... you know we all have those bad days and we all have those lessons that you think 'I just didn't do a good job.' And you just have that feeling because you just know like I just did not teach that to the best that it could have been done. You just have that feeling and you go home like days that you know especially I teach science at the end of the day some of my lessons have not been great because I have not had the materials to make it an awesome thing, or the time to really elaborate more on other things and I just feel like...

Jen: and I think the kids reaction. You know like today, to see the kids excited, and afterwards generally what I'll do is, we'll talk about making your observations and noticing and I was pointing out things along the trail as we were going and they were writing things down, minus the kid who lost his pencil, so we get back and its really nice out and I was going to make them come in and sit down and reflect ad basically part of the almanac that we're doing is this transition over time so they have to write about their hike from their perspective of what they saw or whatever happened and so I said do you want to sit outside and they were like "oh yes" so I let them sit on the hill so I think seeing them being happy lets you know that your teaching is and they're excited about what they're doing. You know. They're like, if I have to say "we're going to read story town" they're all complaining. But like in the library when they're researching something, they're like "oh wow do you want to know this" they're sharing, "look at this", they keep wanting me "look at this" and that was with the deer poop. Someone called it rabbit poop (You were able to identify scat? Jen: There was so much of it, let me tell you, it was frightening") So anyway, they're reaction lets you, know that they're excited about what they're doing. And the ecosystem unit is a huge excitement for them because there's live animals. And it's not pleasant when they die. And I make the dead fish stay. They want to flush them and I won't let them... make them disintegrate. But I've had babies born, because they give birth to live babies, you know the fish, and in the other class "oh my god it just had a baby." Seriously, this thing was giving birth to like a baby every five minutes. Unbelievable, but it was a great thing for them to see. So, its fun.

Q: How frequently do you take your students outdoors?

Well we take them out to the courtyard here at recess time when it's nice out, so we take them if it's nice every day, for twenty minutes.

Jen: We both really believe in recess for kids and a time to release after lunch and before they kind of sit down and do their thing. Um, definitely I've done the trails different times. Like, now

we may be going once a week or once every couple weeks depending on the weather trying to tie it into more of the ecosystem unit I think you have to have something substantial that you're doing. I mean here we're doing, I mean now we're looking at changes, and signs of spring and changes in our environment so, you know well do that for a few weeks but then we couldn't really continue without a purpose because again like I said the behaviors are trying at times. So I think they need a function of why they're there. And then I think they would be better you know if they were really doing something they felt was productive. There's an activity in the old science book that's you know, you stake out this square piece of... and then you watch it. Its not, a fifth grader needs something a little more involved now there were bugs today and that was really interesting to me. They were like "it's a termite" and they were screaming. One was on a stump and one was on one of the benches down there (there's benches down) they like to name animals and insects and then I was thinking should we collect it and then we just left it there but there were large black bugs.

What are some of the other things you have done in the past outside with your students.

Jen: Other than recess and going on the trails.

Karen: We didn't organize it but they've had different demonstrations like the rocket demonstration they had.

Jen: They go snowshoeing in gym class. One of the other things I've done, it was kind of a weird thing. We go out in the courtyard during recess because its convenient but for two years we would go out back, you know to the big field, it was like really weird, we had we think high schoolers come and hang out in the woods we know that for a fact we've been back there and there's you know they're hanging out in the wood which is a little frightening so um there was this thing where they were there were all these pieces of wood and what not and my kids for recess started building structures. You know so they were building like a fort on the edge of the woods. And every day at recess they would go out and work really hard and maneuvering these pieces of wood it was like the most bizarre thing and I would say that they loved that they loved sort of being together and working together on a fort because I don't think kids get to play in the woods anymore not like when I was younger and your parents allowed you to go play and we didn't really have woods near our ouse but I had friends that did and we'd go down near a lake and or down in the woods and you would investigate and explore. They don't get that. Really they don't get to venture far from home. So I think that's why their behaviors today they're like so crazy because they like never. Very few of them hike with their families, go in the woods, so I mean some do, but the majority don't. So I definitely think that was a really interesting thing. Oh, I've done a scavenger, its like around the autumn, like an autumn scavenger hunt at Halloween time. That's a fun thing, they like that.

Q: What do you think would be the main things that limit the amount of time you spend outside.

Karen: Our schedule. With services that kids have we have kids with disabilities that require speech, um, and other academic areas that is on their IEP the biggest thing for us is they need those minutes with the service provider. Sometime yes, definitely the service providers could

come out with us and provide it in that way whether its writing or things like that but that's one of the limitations that we have this year.

Jen: Right, because our classes and another fifth grade teacher we have the special ed[ucation] students who get services so you know, you're really bound to this schedule it doesn't give you a lot of flexibility. For the unit this year, we've agreed upon a time when we have an hour a week to go on the trail or to do a lengthy time. We're actually doing and devoting an hour to science during this unit time. And the special ed[ucation] teacher is modifying her current lessons to be thirty minutes instead of 40 and then she's pushing in during our block of science time. So we're trying to accommodate that. Because we recognize that what we had been doing for science all along was not enough to do something like this. So we sort of adapted it and worked around that sort of thing. Because we don't want to go, like today when I went it was technically some math time for some kids and we can't just cancel special ed[ucation] minutes so I had to kind of make a deal to take [---] with me.

Karen: We just need the flexibility which is not an easy thing when you're working with... If it was just Jen and I it would be very different but there are other players involved and other people are not as flexible.

Jen: Right, so not having your own class by yourself. I don't think Karen ever had them all by herself, her whole class.

Karen: So that's a draw back.

Jen: So we've tried to make sure there will be some changes for this unit and then for next year pushing to say you know we know understand services are necessary but to never have you own class to take them outside and to do something like that is hard.

Karen: It's hard. It's hard for us as the teacher. And it's hard for the teachers that are always gone.

Jen: The thing is, you can go without them, or you can go and they miss service. That happens. I think Jean just goes. Don't record that. Cuz all of a sudden people are like, did you see Ms. Hoins? Uh I think she went that way. So you have to really be collaborative and then plan for it. The impromptu sort of is a rarity unless you don't have a lot of kids with services.

Karen: Right like even today, even if you were planning on going outside, and say "Oh it's a great day lets go outside for science." You wouldn't have been able to without prearranging a different schedule for the day.

Q: What do you see as the benefits of taking your students outside?

Karen: The discussions that you can have afterwards. Because you know it's a different environment for them and the conversations you can have outside are much more meaningful, you know, to them to bring back into the classroom than to just read it in the textbook. My class will have conversation about anything but we would not have as much conversation from the book as we would have experienced outside.

Jen: I think just that they kids don't spend as much time outside to begin with and to be able to go outside and see a tree versus look at a picture in a book is completely different.

Karen; And they'll retain it more because they have that hands-on first hand experience rather than reading the textbook I used in fifth grade. This is the same one just in a different school district.

Challenges to going outside?

Jen: Keeping them focused and on task. You know, again, I think if you have more support, if all four of us were out with my class today it would be completely different because we would each have a group and you could talk to the group and meet with the group and um, I think the safety issue. There are hazards out there that people just have to be aware of. Andy McGrath, he used to go out on the trail every day. I mean I don't think he really did anything, he liked to hike, they would go out on the trail, and well they lifted a log. A hornets next or a bees next stung like ten kids, so that kind of thing you just can't even predict what you may encounter kind of thing. So there's definitely a challenge to the safety factor, you know kids slipping.

Karen: They have to be prepared to come with the right shoes and obviously you had kids that didn't.

Jen: But it was the terrain is not the easiest like right now at this time of year so if you go... You know Jean goes all year round and I've done it all year round and I think that that's a great experience too to see how that ecosystem changes and adapts to the seasons but its definitely... and then I telling them that the trail markers some of them are down. So if you've never been there and you don't really know the lay of the land and the lands really odd like you start off up here and then you go down and then you go up and then you down and you can get disoriented if you're not used to that.

Karen; and that's a major concern for myself because the last time I was out on the nature trails I was actually Jean's student teacher. So that was the last time I went and I only went once so for me to go and take my class out into the nature trail is a really big concern because I get lost very easily... and I'm just concerned I'm going to get lost.

Jen: We have had classes get lost. But then they've tried to do a better job of the trails are marked but like the red trail looks rust now because its all the paint has come off the trail markers, so...

Karen: My mentor meeting is professional development on the nature trails.
...conversation about who is teaching her professional development course...

Jen: So I think the more you go, the more comfortable you are, so I think just getting people to relax and I mean even today I think as a teacher you always have to be aware of what could happen. Like when we first walked in you know there's that little butterfly garden and then it

looked like “they were like is that a den” because it was like the root of a tree was up and it looked like an animal had created it and I said “probably.... Stay away.”

Q: What would help you become more comfortable

Karen: Someone to physically take me out and tell me everything I should be aware of including the trails, the safety concerns, you know obviously there may be some things that I don't think about. But really just more information overall.

Jen: Right I don't think anyone should go with a class if they have not gone by themselves; that's not a good idea. And like I said to Karen I wouldn't mind if she came with me but then we have 40 kids with just two of us and when you double that that's fine but I've learned a lot.. I've gone with another teacher and she knew a lot. So to watch somebody else or to go with a guide who really knows... I think that would be very helpful to get classes out there. So if you had a situation where you had people who were guides and they could take the class and then the teacher was there for the discipline and helping with kids but then have that person who's really knowledgeable like a Jean. You know she's very unique she loves the woods she knows all this stuff. You know if we just took turns going with her and listening to her you would learn so much and then be able to share it with your kids. I mean even though you did that do you remember that?

Karen; Not from four years ago.

Jen: so you know from that standpoint, having guides or that practice... I don't know if you'd get some teachers to go out there. Have you heard back from everybody?

Us: Know you're the only two we've heard back from so we're going to have send another probing email.

Karen; I'm not surprised.

Jen: No.

Hannah: So if you want to put a good word out that would be very helpful.

Jen: I bet you their afraid that if they do then they will have to go out on a hike on the trail.

Hannah: We can assure them that's not the case.

Karen: I would write that in the email. Just that you sign up for an interview does not mean you have to go for a hike.

Jen: But I think that what is important if that if you're looking at ... Is part of your survey or interview, are you going to talk to administrators

Hannah: ...

Jen: Cuz I really think that you know if the administrators want this to be happening with .. especially with this unit.. and making this unit a bigger thing and involving the trails and involving the local ecosystems than they have to provide some level of support to get those kids out there, because that teacher isn't comfortable, and that teacher's not comfortable. So how do you get the kids to not be stuck inside I mean there's a situation where like Karen and I take our kids out everyday and I don't know if this is pertinent to the interview but there are teachers we work with in 5th grade where like when you have a class picnic and everyone gets their stuff and goes outside and you sit and eat, their kids get their food and go and sit at their desks and eat. So if that's how they feel about even eating outside for a picnic, the comfort level to go on a hike it just doesn't exist. So then how would you bridge that gap and then how would an administrator say OK how do I, I can't force this teacher, but could I provide someone else that would take them and then give those kids that experience. You know sometimes we do that as like a fieldtrip and you can go to ... Five Rivers... or the third grade goes up to Chingacook and they do things like that so I think we've done that where 4-H offers some environmental day. So I think the teachers are willing to let someone else do it.

Hannah: So that's all we have, do you have anything else?

Karen: No just reword the email and say that... I think you'll get.

Jen: and one of the things I guess that has come up a few times. I've asked Jean I've asked Diane Irwin about .. I think that the ecosystem kit is great, but it does not apply to that with the Chesapeake Bay part and I honestly don't even do that part because its like yea whatever. They can't relate to it. When they're fixated on this fish named Bob in the tank and... do you know what I'm saying. They can't... they really need to get attached to something so it would be great to have the local waterways and do something of that nature. I also think I'm curious about how you thought about the idea of all the you know the .. you have the ecosystem with the live animals and then you have the ecosystems you pollute....

Conversation turns to our lesson plan ideas.

Appendix E2: Teacher Interview Transcriptions, Anna Nickson

Interview with Anna Nickson
Fifth Grade Teacher, Milton North Elementary School
April 20, 2009

H: OK, first off, how would describe your teaching style?

A: I think inquiry-based, where they're encouraged to ask a lot of questions and know that they are life long learners, so I think that they would that I'm always modeling life-long learning and that we can learn from each other.

H: If you were to write your own personal teaching philosophy, what values would you say play a dominant role in that?

A: Prior experience, also, I think continual learning, reading, can you repeat it one more time? I'm sorry.

H: What values play a dominant role in the way you teach?

A: To get to know the students so that I can help them make connections, to make the learning meaningful so that they can actually, you know, they always know what to do and why they are doing it, and how to do it, so that it's not just busy work.

H: How do you know when you've done your job well?

A: Well I think that everything that I teach is kind of a gradual release of responsibility, whereas in the beginning of teaching something I'm giving them a lot of explicit... and a lot of support and then gradually I release that responsibility and give them you know more guidance than like a lot of support and they become more independent so when I see them using the language, writing down the questions that I encourage them to keep track of, so I know that I've done well when I see them applying everything, not just doing things by rote but actually applying what they're learning.

H: How frequently do you take your students outside, and this can apply for either the fifth grade or the second grade.

A: I want them to be outside every day, so if the weather is appropriate, like today they go outside with a monitor, so we might not go outside today, but if they are not going outside with someone else than I like to take them outside every.

S: By monitor do you mean, like, another person?

A: yes, there's, we have a recess monitor twice a week, so for twenty minutes they get to go outside with the recess monitor.

H: Have you ever taught class outdoors, or is it more the recreation?

A: I have, when we had a science kit with life cycles and we had the butterfly.... Oh, well before that unit I taught a unit on the scientific method and we, the second graders, learned the scientific method by thinking about whether a tree would be ticklish, so they wrote about, you know, their hypothesis and then we went outside and tickled the tree and then they came back outside. And I did that because it was very silly but they were really learning the steps and we also went outside to release the butterflies and also to look at the plants, so I try when I can to, but...

S: What would you say limits the amount of time you spend outside in class.

A: The time I spend outside? I guess the amount that we need to cover, the amount of material that we are required to cover, because every minute is so precious, even in transition if you're spending five minutes between transitions that is too long, so I guess just all of the things we have to cover. Especially with the new reading series. There is a lot to cover and it takes up other content area time.

H: We've heard a lot about that...

S: What do you perceive as some of the benefits to teaching outside to be?

A: I feel like the students are more focused on what we're doing. I mean obviously depending on what the environment is around them, but like for instance when we were releasing the butterflies outside and talking about that, they were really focused on that content and the concepts even if I was still teaching and we were sitting they weren't thinking about the playground they were really just observing. And I guess if you were in the trail outside teaching it would be more hands-on, you know, than just pictures. You asked what the benefits would be, right? And, the other instances where I've taught outside were just for teaching writing have them write down things they wonder about, in second grade. So I think that helps them maybe to just forget about other things and focus on maybe what's in their minds.

S: What about some of the challenges of teaching outside?

A: Probably distractions, and insects like bee bites, because there are a lot of kids that have bee allergies or phobias, and I guess finding the time, but the actual being outside I don't find too challenging.

S: I guess our last question doesn't really apply that much to you, but what would make you more comfortable teaching outdoors but it sounds like you are pretty comfortable.

A: I am comfortable, but like I would love to have more knowledge of the trail because I mean, walking with Ms. Hoins out in the trail I feel like I've learned a lot just on that one walk but I wish that we could go together because she has so much knowledge of...so you know in that way I'll take them on the trail, but I can't speak to all of the things that I wish I could, and I

mean, but if they ask questions I always encourage that and say lets look that up or lets right that down and look that up, so it's not that I worry about not being able to answer anything.

S: That's all the questions we have.

(End interview).

After interview, she mentioned the need for more professional development.

Appendix E3: Teacher Interview Transcriptions, Jean Hoins

Interview with Jean Hoins
Fifth-Grade Teacher, Milton North Elementary School
4/22/09

H: How would you describe your teaching style?

J: I think when you say child-centered it's become a cliché, and I think my teaching style is responsive to the children but also more, I have using the word facilitator too because that's another one of those words that.. I'd say maybe a guide, I like to guide them but I also think it's my responsibility to create some kind of order of thought process for them like a problem solving sort of framework for them to approach things with. So I try to look at them as individuals as much as I can and that would be a little bit different for every kid. So I guess a responsive guided teacher is what I'd like to be.

H: And what values would you say play a dominant role in the way you teach, or your teaching philosophy?

J: I suppose my values would have to be that I think you need to impart a sense of responsibility in people for learning at their own rate about the things that they care about, as well as the things that maybe they don't know that they care about yet. Like a great quote I heard in college is "you never know what you're going to need to know." So you need to learn how to find out, so I would say something I really value as an individual is curiosity and the courage to have curiosity no matter what. I think valuing life on a small scale, like the person sitting next to you, is really important because I think when we teach that global awareness it has to start on a small scale too. Otherwise it's just fake. You know I think, to understand the things that you do impact other things and other people. So I say the value would probably, if you were to sum it all up, would be courageous, curiosity, and respect. Which again, all sounds cliché, because they're so overused, I just can't think of better words.

S: When you go home at night, what makes you think you did a good job that day?

J: It's different on different days. Sometimes it's because you accomplish something or got something from a particular child. Sometimes it's because a child shares something with you about an issue they have from their life that helps you understand why they do what they do or why they are struggling, sometimes it's those sort of interpersonal things that you're like... Like those are the things that you still feel in your heart. Sometimes you impact other professionals that you work with, or you have a good like collegial relationship with your peers and you accomplish something on that level. I feel really good when I look around and my students are working as a community and by that I mean a real community where not everybody is doing the same thing. People are working on different tasks at different rates with different materials but they are all able to coexist in the same spot respectfully of each other, with respect for each others efforts. So that's probably, if you were going to sum it up, all of the other things would build to that. That a community of learners is not a bunch of kids sitting at desks watching and listening to my annoying voice, it's people in a room or on a nature trail working on their own things intently, learning how to access the tools they need to do that independently and accomplishing things that are meaningful to them.

H: How often do you take your students outside for class?

J: This winter it was tough. We don't yet have snowshoes, so with the snowfall and things like that and kids not having adequate clothing, it was really hard to get them out in the winter. We did, they just kept sinking and getting stuck. But they were eager to go out, and so we tried to go every Friday even if it was just around, making trails, cutting through the ice crust to get to the woods because I wanted them to see all the animal tracks and what the animals were eating and the tons and loads of deer scat, which they all wrote about! I would say a minimum it's once a week. Now that we're done with all the standardize testing and we're doing the ecosystems unit, I'll just take them out whenever I want. Like today!

S: What do you perceive as some of the benefits of going outdoors?

J: There are a lot of them. For one, I have this sort of belief that a lot of the behavior problems that particularly identified in boys in public school are not problems; they are natural behaviors that are out of context. And so, like we when we went outside to pick up garbage, as soon as we can get across the road, they can run there, I don't care, just don't run into each other and fall down. Part of it is just that they don't get to do that enough, they don't know how to not run into each other and fall down, so over the course of the year it sounds like a silly thing to learn, but that sense of your own body and that sense of how fast you can run down the hill before you fall of your face is something you need to figure out for yourself. No one can tell you... you know everyone is saying don't run down that hill and you never do it, you'll never get that sense of what your own limits are. You know it's the same thing as balancing on a log or walking on the slippery walks, there's going to be a point when your foot is going to go in the water, but that's sort of the tipping point and kids learn that way. I also think that when you go out you give them an opportunity to notice things on their own. I can take a group of kids out in the woods and every single kid will come back having had a different experience. I can't do that in here. I also like the fact that the kids who have typically struggled academically can be successful. They don't feel like the stupid kid, Even last year I had a large group of gifted students it was a

challenge for them to go out there because they had a hard time focusing. They had a million questions and I wasn't answering them. That wasn't what our trip was about. So I like taking them out because I think they can take ownership of their experience out there but I have also found over the years that you really need to be taught how to do that because they usually don't get that opportunity anymore. So they're always asking, what is the name of this, what is the name of that, how do you do this. If you don't tell them then they start to understand that's not the important thing, the important thing is going out there, noticing things, having your own experience and then if you feel like looking up the name of that plant, go ahead. So I tell them, I have kept a lot of nature journals so I consider myself a naturalist, not a scientist. I was an English major, but I consider myself a naturalist because I notice things in nature, I have a really strong curiosity and then if I want to I can look it up and learn more. If not, I can appreciate the beauty of it, I can appreciate its relationship with the other things around it, my impact on it, and leave it at that. I don't need to know the name of it.

H: What do you see as some of the challenges to taking your students outside?

J: A lot of them are very phobic. Right now we're in the middle of the "great tick phobia" because everybody is going to have Lyme disease tomorrow. Everybody thinks that if they get a bug bite, they need to go to the nurse, if they get a scratch they are going to get some horrible infection. The kids are generally, most of them, I would have to say most, have at least a guarded fear of going into the natural world, even here. So they'll cling, they stick together, or on the other end of the spectrum you have kids who have no sense of anything and keep falling down and running into stuff, so the challenges are overcoming those fears and overcoming the fears of their parents. The first couple of times we ever go in the fall and we have a new group of students, I'll have six or seven parents come, because they're all invited to come anytime they want, every Friday morning. After the first month I don't get anybody anymore because they are like "oh everybody's fine" but that's usually because it's like 20 degrees out over the course of the winter, so I'm hoping if I send home a reminder now that I'll get them to start coming back, but you know then the other thing is if they're scared of ticks then you go "OK this is what you do, you wear white socks, you pull them up on the outside of your pants and when you get home take a shower and scrub with a washcloth, there won't be any ticks on you," and half the time they've have ticks just playing around their own yards anyway so it's one of those things like "oh gosh I'm really scared to go into the woods I might get hit by lightning," well, "maybe not!" But I think there is a fear, there's definitely a fear of getting lost, there's a fear of wildlife, I mean half the shows on TV promote that kids of fear, like "When Deer Attack," or "When Chipmunks Go Wild," so they watch a lot of that stuff and they actually think it exists out there. I had a parent, I was all excited because we found fisher tracks all over the woods out there, so I have all these photos of the fisher tracks and the kids are you know, "what's a fisher," well then a couple weeks after there was an article about a fisher attacking something and so all of a sudden they are like "OH!" and I say "Don't worry about it I know what exactly what to do if we come upon a fisher who isn't afraid of 24 kids believe me, we are not going to be in the woods for very long because there will be something wrong with it," but usually we never see any animals any way because the kids make so much noise. But they are definitely fears.

S: Do you think those fears come from them not getting enough experience outside on their own?

J: Mmhmm. And right now, “bugs! Oh my gosh! There’s bugs! I saw one!” And I said “You know what you guys, that just tells me you don’t spend enough time outside,” and I have one student who has horse and I said, “I know you’ve had bugs in your face before,” and they’re annoying but they are not going to harm you, of course a lot of people in Africa may disagree.

H: In a lot of the reading we’ve done in preparation for this project, you’re probably familiar with “Last Child in the Woods,” and nature deficit disorder. Do you think that is more of a problem now than it used to be?

J: Yes. A lot more of a problem. And citing some of the reasons in that book, people are scared for their children. Almost from the minute they’re born, we’re scared to feed them the right thing, we’re scared to talk to them the wrong way, you know every minute of an early parents life is like “what if I don’t give them fluoride, they won’t have any teeth,” and you know “if I don’t show them those flashcards they’ll be over on the dumb side of the room,” you know I think our culture is driven in many areas by fear. I think it’s worse now because of, and I’m the whole soccer mom thing, everything is structured. The kids don’t get a chance to go out and you know, what have a good wrestle fight, sort it out between them. They don’t get to go out and try to climb that tree, fall out of it and go, I’m OK, and go home. They never that sense that these things are alright, and I would have to say on some of the other stuff I’ve read, particularly boys, a lot of the things that boys used to do are not considered culturally acceptable anymore; they are aggressive, bad, and dangerous. So things like wrestling or little boys touch football games with no grown-ups there where they would throw each other on the ground and stuff like that, they don’t get to do that, they don’t get to make forts, they don’t get to just to roam around in the woods doing nothing. I think we have over structured them, and then my biggest complaint, we just watch too much television. And I also, on the other side of that, a lot of the neighborhoods are very sterile, you know you have yards where lawns and huge expanses of suburb where you might as well just go at the parking lot at Lowe’s and look in the landscape section because everything there is something that was grown in the greenhouse in some place, came from another part of the world originally, and is all manicured. You hear people talking about, “well our neighbor doesn’t take care of their lawn,” and I’m like, “you should be really glad you’re not my neighbor, how about the loads of horse manure?” But I think it’s a lot of things. I think as a culture for some reason, any I think Last Child in the Woods speaks to this, for some reason we decided to separate our kids from the natural world, for their own safety, and I don’t know where that came from, whether that was during the 50s when it was the whole “plastic is this miracle thing,” or the whole Levittown phenomena. I don’t know where that happened, but at some point there was this kind of split made, maybe it was earlier than that. Maybe it was during the Industrial Revolution that nature was bad; manmade was good. So hopefully we can kind of recover, and I think we are slowly, or at least we like to think we are.

S: I think it could even be more recent, like we both definitely played a lot in the woods when we were kids, and it’s a lot different now.

J: But also you’re both college students, and so there’s part of our culture that doesn’t go down that same road, doesn’t have those opportunities, and I wouldn’t even say that its an urban/rural/suburban phenomena, but I definitely would say if you are in an urban setting it is probably harder for you to have that kind of connection, although there are a lot of really cool

projects going on in New York City, like I know Central park Conservancy has some fantastic stuff going on, and when I lived in Philadelphia there were all kinds of really cool programs organized by Penn, so to me then it boils down to whether you're from a family who is going to expose you to that, who is going to take advantage of those opportunities. It's kind of, maybe socioeconomic, maybe a lot more than we want to admit.

H: What would you say limits the amount of time that you are able to spend outside?

J: Schedule. Although I can't really complain because I have a pretty good one, but it's mandated curriculum objectives, state test pressures, like now every has breathed a sigh of relief, it's like a different building because the state tests are over, well next week is the fourth grade science test and then they'll be over, and then it's like "yay we can be real teachers now!" but we also have a mandated math program and a mandated sequential language arts program that you have to keep pace with, so...

H: Is this mandated at the district level?

J: Yea. But you know I think that's part of it, there's also, I mean, this sounds really horrible as a classroom teacher; sometimes you have kids who's behaviors prevent you from going, and I used to take them anyway, and they would straighten it out and they usually ended up getting the most from the experience, but sometimes you're just like "forget it, I'm not going to go, it would just be a fiasco" if I have to tell those kids to stop throwing stuff at each other one more time, I'm going to have to take a week off. And then I do, and they're all really upset that we don't go because one weekend, one week, they were just wild in the woods and my whole approach is "you can't do that to the forest, you don't stomp on a rotting log, do you understand what's in there?" that whole approach is "I can't bring you in here because you guys are wrecking things, and you're killing things and destroying stuff, so we're out, and when you show me that you're ready to come back in here respectfully, we'll come back." So it's not like, "you're being bad and you're awful and you're terrible, and you know," it's just like "not now I'm not bringing you here, this is a really special place," you know most schools don't have a place like this.

H: What would you say limits the ability of other teachers to go outside?

J: I think they need someone to take them there first to learn... I think, interesting question, I've been thinking about it. Part of it I think comes from this feeling in many educational professionals now that you have to stick to this rigid schedule, that there needs to be some kind of objective assessment, objective assessment, objective assessment, that if you're not giving a worksheet or some kind of performance indicator, that you're not teaching. So they feel uncomfortable in a free exploration setting because they are like "I don't know know, they aren't learning anything, I don't know what to assess, I don't have a structure in my teaching, I'm not the teacher" basically is what it is; they are not the teacher. They have to let the kids go. And I think for many people that's very uncomfortable, it's that release which is at the heart of inquiry-learning anyway, it's just let them go, then bring them back, then let them go again. But a lot of people don't feel comfortable doing that, or they've had that beaten out of them. I think that's probably one of the biggest things. The other is just the same things with the kids, is the fear part: they're going to get a tick, they're going to break a nail, their hair is going to get messed up,

their new shoes are going to get all dirty. You know that whole nature piece is just so sloppy there. It is a challenge for a lot of people.

S: What do you think would make them more comfortable.

J: Well I'm trying this: Because I've done professional development before I get the same people every time. I've decided this spring on payday Fridays here everybody wears jeans to works so I've decided on payday Fridays I was just going to have Coffee by the Creek so everybody can bring their coffee and just go walk through the woods and just sit down and nobody's going "ok this is a this and that's that," its just like, just walk in the woods and listen to the birds and watch the water flow and just go in there, and just start to feel a little more comfortable in there, and what I'm hoping is they are just going to do the same things the kids do and be like "oh look at that what is that, there were no flowers here the last time we came," and that same kind of experience, so that's my hope, and it gives me, I think I'll have it four times and then probably do it again in the fall, it's just to make it a little bit more "hey it's just the woods kind of a thing." And then we do more work with, I don't even know that I would say that we do, I mean the teacher's that I work with go out there, some of the other teachers that I have worked with in the past still go out there but I think its because I took them, so they know sort of what to do. It's a lot, it's a lot, it's hard, like when I try to put myself in other people's shoes, people who weren't outdoor educators ever, if a kids falls down in the mud they're like "oh no oh no! He's all covered with mud," and I just go "oh some people punish themselves, you know whatever, carry on" so its that whole, it's a lot of things, and its probably different for different teachers. Some want to know the answers and you never know all the answers when you're in the woods. Some are afraid of kids getting hurt, some are deeply afraid of kids getting lost, they're afraid of getting lost. So, yea. Everything in that book.

H: So looking at it from the district perspective, is it ever a reality to think that this might open up to a more open schedule that would allow for more free time and going outside, or is the general trend more towards these really structured days.

J: It has been towards a really structured setting, but we have a new Superintendent, and we have a new President, and No Child left Behind is under scrutiny right now and a lot of the data is showing that it is not the best way to teach, so something is going to change. I'm definitely a proponent of national standards; I'm definitely a proponent of consistency across states, because I feel like right now, every state is trying to do more than the state next door, like there's this whole New York/Massachusetts thing. "Well out students are more proficient then your student and blah blah blah" or they are fudging it. Like they just did, I can't remember if it was Mississippi, where according the Mississippi state tests, 80% of their students were proficient in math and language arts, and then when t hey gave them one that was more consistent with some of the others like new York State and Massachusetts, they were 13% proficient, so it's a joke. All the state tests are pretty much meaningless because there is no way to compare nationally. So just to streamline things, I would love to see us go to more national standards like math science technology standards that are in place already, I would like to see those more consistent across state lines. I think that is going to change, I think the pendulum is going to swing back to an honestly, more child-centered approach, more constructivist, more responsive, and less like "here I am and I know everything." And one of the things that's going to cause it is the internet. You

don't know everything. No one knows everything. And the kids know that, so who are we fooling. And I think education overall is more into "I don't know let's find out, let's see, what does that look like; how can we do that, I don't know, what did they do." It's more that sort of an approach than "oh here's the book and the book is right," and if what you wrote isn't the same as what's in the book, you're wrong.

H: Anything other insights into the general ability of teachers to get outside?

J: I think if I, and I'm thinking at our district that it looks like we're sort of swinging more towards a community based program, particularly in fifth, especially in fifth with community service as a priority, cooperative learning with community organizations, we're not going on a big field trip next year we are doing lots of small presenters and more of a kind of the same thing you're doing, where it is more community based. I think if I can bring in more people who can use the outside world in other different ways, than it will enable teachers to pick more from a menu of things rather than feeling like they all need to go out in waist deep snow and identify animal tracks. Which I think is what some of them feel like, that you can go out and work in the butterfly garden you can go out and just sit and read by the trees or just go observe something, that there's no pressure to perform. And I think a lot of teachers, in large part because of No Child Left Behind feel like they are under this microscope, they are under pressure to perform the same way the students are and I think if our district makes it OK to perform in a real way instead of just in an academic test sort of way, that it will encourage a lot of sort of people to go out.

Appendix E4: Teacher Interview Transcriptions, Sarah Mehan

Interview with Sarah Mehan
Fifth-Grade Teacher, Malta Avenue Elementary School
4/3/2009

H: Ok, so again, if you don't spend that much time outdoors that's fine. Just answer the questions now however you feel fit. First of all, how do you think your students would describe your teaching style?

T: Specifically related to environment?

H: No, just in general.

T: More lecture oriented. Old school I'd guess you'd say.

H: Old School, yeah. And so how would your students describe it? Would they say that as well you think?

T: Oh yeah, I'm telling you they would.

H: Ok. Ok. Great. Um, what would you say, what values play a dominant role in your own personal teaching philosophy?

T: values.. well as far as how I relate with my kids, its all about team. Its all about how good are you going to be when no one is looking, who are you, how do you help the person next to you? How do you hinder them? Straight up honesty. This is how you role. How are you going to be in this room, and what part are you going to play in this room.

H: and how do you know when you've done a good job during the day?

T: you can see it. You can see it...my class this year has some very dominant behavior students. And there are six of them. So its difficult to separate them. And I know I'm productive when my class gets through a lesson. So you're definition of success varies from year to year. I know I'm successful when I have a kid that goes oooohhh. You know the light bulb goes up and you're like YES! Then I know I've done my job. I know I'm successful when we can sit and read for 20 minutes and it's quiet. So really my definition of success varies from day to day and year to year. But those are 3 ways for sure that I know that I can measure success.

H: how frequently do you take your students outdoors for class?

T: never.

H: whats the setting around here, I guess we don't really know this area as much as we do the other schools.

T: yeah, and that's why. Um, there is a playground that is surrounding by sheet black top area it goes around, and there are wood chips, and there is a short, small grassy area for them to play. Only 2 classes at a time can be out there. They are out there for recess twice a week. Out back here used to be all grass, and you could take them out to play. And when I first started teaching here I would go out there and we would use string and mark out the area. and how many live things can you find in there. But its limited and now its fenced in, so any evidence of animals, any trace of them you might be able to find, different things you would look for, are not there. And then at times I would walk them over to the rec field, but that is often being used by other phys.ed or sports teams or ?? or things going on, so we don't go there.. it wasn't as successful as it would be if I was on a large grassy area. roped off a section and say find all the living things you can. And so were limited in that area at Malta.

H: Is, I'm just trying to orient myself with Ballston Spa is the kayad. just down over there? Do you students ever have the option to go down there for science classes or anything?

T: I don't think so because accessing it from here would be a nightmare.

H: Crossing the road?

T: Yeah, and going down that hill would be a nightmare. If we could walk down and around and go down that way over by Kelley park, but we haven't.

H: Yeah, its difficult.

T: And they have those paths over there now there's a beach over there where the park is and they put all that work in and they ?? last year. And actually to be honest with you I never really gave it a thought. My ecosystem stuff often happens in November and its getting colder, and I used to take the kids on a field trip over to Gordon Creek. I used to do that for 3 years. And one year we went over for tracking and the kids shoes and socks were soaked, and we had red feet when we got back and that was a bad thing and we sat with our shoes and socks off for the rest of day to warm up and I really haven't been back since.

S: Um, do you wish you could go outside, like if Gordon Creek was more accessible?

T: Yeah, I would and now as I sit here and talk to you I think, why don't I walk there. You know it wouldn't be that bad, but typically spring time is when you really want that to take place. In the fall it tends to be too busy. The 5th grade has a NY state social studies test in the fall, and my science curriculum takes a back seat to that social studies, until we have that state test done and that's sad but that's how it is. In the spring time, is when they benefit the most from that because the social studies test is over by then so we tend not to incorporate that in. But this year we did an ecology section in addition to the ecosystem unit and we talked more about pollution and the environment outside of an ecosystem and they really really got it. We talked about waste, recycling and things like that and we did a Chesapeake Bay presentation and my brother is an environmental engineer so he came in to hear there presentations to hear what they said and offer some feedback. And it was really neat. It was very neat, but no, um, adding in the Kayad. Down there would be very beneficial.

S: Um, what do you perceive as some of the benefits of going outside, I know you don't but...

T: The kids who get it, really get it. Its concrete. Its not concepts it's a reality and that's the biggest difference. That's true in anything you do, anything you teach in the classroom. You go to a living museum and you sit inside a TP or a Wigwam, that's far more beneficial than for me to tell you about it. And that is the difference between my teaching style being 'old school'. I will tell you about it versus lets go out and do it. Its one of the drawbacks.

S: And how about some of the challenges of going outside?

T: Its all management. Its all management. And again I'm thinking of this class I have this year. But giving those kids, the ones who don't get it in the classroom often don't get it while you're out there and when you know that there are students you can't trust to go with you to the library, its really frustrating you can take them out there. And at times you're wrong and they amaze you. They get into it or they find something they are so into. We did that over in Wood Road, we took a trip over there and then we also found some beer bottles. So, you know those kids that misbehave in the classroom often thrive during an outdoor education program. And the kids, there are other kids that don't pay attention in class, and don't pay attention anywhere you take them. So management, I would say, is probably the most difficult. And there are many problems I don't know the answers. I used to try to arrange my field trips so that I went with Jean, so that she could answer all of the questions. And I learned a lot from her, and that was really really helpful, but I didn't bring a lot to the table. I walked in like I was one of them. So your lack of knowledge in certain areas is a problem too. Oh boys and girls look at this. I don't know what it is, but look. That was one of the other issues.

S: What do you think would make it more manageable? I know you went with Jean, but do you have any other ideas?

T: We also bring 25 kids with us, and that's a large number to bring in. What I love about working with kids and we used to go to camp **Wikitokus**?? And I taught at ___Mountain and we brought our things outside there too, but um, we have much more groups. We would sit in smaller groups, and the kids loved nothing better than being outside. What's this tree and why is that going over there and how come there's no grass under the pipes but there's a bunch under the maple tree? **Background noise...can't tell what she's saying...explaining questions kids ask??** Things like that. And they love it. But with 25 of them, we spend our time frustrated with management issues instead of instruction. I think I would need outdoor training, definitely, and it would have to be more than once, cause you forget.

H: So do that classes over here teach the ecosystem in November or in the fall. Jean mentioned you guys have all taught them already?

T: Yes.

H: Is that dictated by the school or is that a choice that you all made together. How does that work out?

T: They order a kit for us. It comes when they decide its going to come. Could it be moved to the spring? Absolutely. In fact, they often stagger it so that some teachers get it in the fall and some teachers get it in the spring. Lately, I've been on the fall rotation. And it just works that way. Um, which again, I put it off, because I do arts and social studies until that state test is over, and so I often don't start it until November. And then we do it through the winter which is actually good because the sun is a little better for the [bottles]. They turn the heat on so they don't die. I don't know if Jean mentioned too, when you talked to her, but often times these kids think these animals come from ??? and they die...its unproductive. The snails are often dead when they get here um the fish tend to die, they don't eat the water plants the way the should. That's frustrating. Come on, there's Elodea right there, eat it, and they don't. and I end up sneaking in fish food. Which then makes them not dependent on their ecosystem at all, and they are waiting for the fish food to come every day. So, there's a lot of, what I would say, logistical concerns with that kit. We've lost all of our ecosystems this year because we had a cold smash and the heat wasn't on yet, over the weekend, so they had 2 days of cold, and they were gone. Just dead. So I flushed them all Monday morning. I felt bad, but I didn't want them all to come into dead fish. The kids are so funny when dies in the ecosystem. They're like, my fish is dead, can you get it out of there. I say, if fish die in a pond do you dig it out? No. but the other ones are eating it. I know, they're hungry! But that's nature. For some one to tell them death is a part of life, they are like OH! So um, there are some logistical issues related to the kit that are seasonal issues as far as weather goes, and also the shipping of those kinds of animals. They get diseases along the way. It happens. One dies and it affects the others on the way, So, there are some tricky items, some things I'd like to change about it.

Appendix F1: Administrator Interview Transcription, Joe Lopez

Interview with Joe Lopez
Principal, Milton Terrace South Elementary School
4/8/2009

H: Basically when I refer to outdoor place based education I'm really referring to those lesson plans at Gordon Creek. I guess my first question is what do you think about outdoor education based specifically in Gordon Creek. Is it a worthwhile investment of teacher's time?

J: I think it is, getting out there on the nature trail, I've gone with classes who've been exploring. It's a nice little ecosystem because it really is kept in fairly good shape. I think it's an appropriate activity with challenges. The average teacher I wouldn't expect that the average teacher would be able to go out there without either having someone that's like a mentor or a guide first, either walk them through it or take them out there and do it with them because it's a different approach to teaching. It's a different subject area etc. and they don't know what to look for and it gets back to they don't know about what they don't know about being out there. I don't think there would be a single teacher who would be opposed to taking a kid on a little nature hike if they knew what they would be doing with the kids out there. **So that's the first challenge that you'd have to face is addressing the fact that most staff members don't know what to do out there.** And one way that could be resolved or addressed is to have them look at the ecosystem around the school, and explore around the school and the flower beds and the different parts of the school before they go hiking on down and the other thing is, is it too far for different grade levels. Can kindergarten go down there. When do really start kicking into it. I've had first grade classes go there and visit and our location puts it as the farthest part away from where we are but it is something I think with the proper training, and preset that teachers could do it and this could occur at a faculty meeting for one thing. You go to a faculty meeting and let people know in advance, ok we're going to be going off down on the nature trail and go down and visit Gordon Creek, so you know make sure you have clothing appropriate for that after school and just make those kind of preparations so another thing your' going to need is good administrator support. Sell it to the building's administration so they will carve out the time needed to have their staff learn about it. And time itself, **our staffs days are very full and to carve out time for an activity like this would take some planning and you know having the answer or if I'm going to do this, what aren't I going to do, because our days are very very full right now.** But I think, so, just as you would with kids, there's preparation and planning that needs to happen when you're getting ready for an activity you have to teach them which would be the staff, teach them what they need to know and what are the expectations when they go out there, what are the rules and stuff. Do you stay on the path or are they allowed to go off the path. Things of that nature.

H: So a lot of the reading we've done in preparation for this project has mentioned this idea of nature deficit disorder and we were curious if that is something you guys have necessarily witnessed and really what a define that as is student addiction, not addiction, students are really focused on the indoor technological video games and what not, and that's where student's these days are really focused, and the outdoor becomes much less prevalent than it used to be 10 years ago or so.

J: I would say that's true, I mean I would. **The only time I see kids going outside is to play organized sports now.** And I talk to them, at the end of the day when the days and nights, I'm outside at dismissal telling them, go out and play go out and play and its not happening and it may just be around their neighborhoods they might go, **but I don't think you see kids exploring or parents taking them up the parks as much as perhaps it used to be,** which is a shame. I think the kids would be interested in it, and we do stuff here with our science units on life cycles, fish, butterflies, and ladybugs, and ecosystems, so they are exposed to it, but its in a sanitized, bringing it into them kind of stuff. But I would agree that the opportunities for the kids are much fewer and its not only, and a lot of it is it doesn't happen naturally and a lot of it is the parents aren't doing it too.

H: what do you perceive as the benefits to having students study outdoors during the day?

J: I think they get a greater appreciation of the planet and the ecology. It goes hand in hand with recycling, it would be great if people recycled because it was the right thing to do as opposed to I have to do it, I can't throw stuff away, I'm spending 5 cents on it bringing it home especially with the needing to conserve and stuff, these kids now are the ones that if things get tough with fuel in the future, they are really the ones that will pay the price in many different ways and need to have a value on the environment. Our school system, we used to take the kids to Camp Chingacook for one day or two day trips and stuff and then it came back down to a 1 day trip and now I don't think anyone goes anymore to Camp Chingacook or I used to take a 3rd grade class overnight and you would do all the stuff that you can do at that facility. But I think they lose out a lot. They lose a lot of the appreciation just to be outside and enjoying the outdoors, but part of that is I camp and hike. Its something that's important to me, I think it gets back to your point earlier about the technological aspect of things. People say don't, that they let it go with, they don't do it. You don't see it that much anymore. And maybe with things getting more expensive, maybe they will abide. I don't see kids as enthusiastic about it. They like it, they're interested in the outdoors, they're interested in visiting places but I don't see it happening a lot. They learn about it in school and they do things in ecology and we do things with conservation but its far too often just a purely I don't know, its concrete, it doesn't have any foot in reality.

H: makes sense. How do parents typically respond to the idea of having their children go outside for class during the day?

J: Oh they like it. Parents want our kids outside. If anything we reduce when we went from the primer school to this current arrangement, because of our day and how the schedule is. Now the kids don't go out as much for formal recess as much as they used to. **Parents believe the kids should be outside. Recess as a concept is very positive and popular with parents they strongly believe that their children should go out for recess.** Be active, so they are very much a proponent of it. Tying that into outdoor education, I don't think it would occur to most parents. They just want their kids outside running around playing games and stuff like that.

H: Would you ever feel comfortable requiring some sort of outdoor curriculum or is that really the teacher's choice?

J: I think it could be a school's choice. School building wide approach. It would go back to the training and as an administrator having to make sure you make your cases to the why? Why are you doing this? Why is it important? And it also goes back to, you're going to tell me I'm doing this, but what am I not going to do? I don't have to do this part anymore. Which is a real honest question on their part. The days are pretty packed. Kindergarten through fifth, they do a lot.

H: What sort of services do you think would make your teachers become more comfortable taking their students outside? You touched on it a little bit in the beginning, but...

J: Yeah, training. **People would be willing to come in and work with the staff.** People who could go down and expand upon the map of the nature trail and Gordon creek so you know, this is what you can do. **One activity you can do down there; this is what you can see; go look for this; important key points.** Making sure the path is well blazed. Make sure the path is maintained. I have no idea what condition it is now, after this past winter and it has to be a commitment on the part of the district that the nature trail is going to maintain as a viable, instructional tool, it has to be maintained. In the spring you have to send the crew down there. In the past we've depended a lot on volunteers. We would have a spring clean up day on the nature trail. And looking out in late spring and early summer, looking for poison ivy and doing cut backs of poison ivy and making sure the path itself there are no brush or tree limbs down to cause problems. Maybe someday it would be really good to really get wood chips from the town and really go in with wheel barrels full of wood chips and make the trail more permanent. Prep work is important because what you try to do is you try to facilitate the efforts of teachers. You want them to be able to use it with the minimum amount of fuss. And you are answering the question, what's in it for their kids? I think everybody agrees we'll give local support to outdoor education is important, there isn't anybody that would argue, no its not, but is it more important than what else they're doing in the room?

H: I think that's all the questions I have. Is there anything else you have that really gets at the challenges of implementing this or the feasibility of doing stuff?

J: No, not really beyond what I've suggested. I would be interested at some point to hearing what would be suggestions for what could say Skidmore or say some student from Skidmore offer to the school to help us utilize this. I mean how many school systems have a nature trail on their property. I know our middle school does come down sometimes and they take field trips here and they do hikes and so, you know I think as principals we need to open about a partnership with Skidmore if there is much of an interest to say what can we do together to make this a viable resource for our kids and something that the Skidmore students could make useful.

Appendix F2: Administrator Interview Transcription, Michael Selkis

Interview with Michael Selkis
Principal, Wood Road Elementary School
4/8/2009

H: So I guess our first question, well when we refer to outdoor place-based education, we are really referring to Gordon Creek outdoor lesson plans that we are suggesting for the ecosystem curriculum there. And so in a lot of the pre-research we've done for our project people are, we here this phrase, Nature deficit disorder a lot, that children are really influenced by the technological age and spend most of their time indoors. I guess our first question is, is that prevalent, do you notice that in your school?

M: Absolutely. I think you see it in attention spans, I think you see it in the lack of when they go home, what they are being exposed to in terms of the TV and computers. I think its infiltrating every level of our educational system. Not in a good way, but yeah absolutely. This generation.

H: What would you say motivates a teacher to take her students outside?

M: What I find generally, is that teachers that have it as a passion tend to do it more than those that don't. Also, those that have it as an interest or whatever, I would say that a lot of times you have teachers that for whatever reason, just are maybe kind of stuck in their ways a little bit, you get these veteran teachers that somewhat institutionalize their practices and they don't like, or its harder for them to move outside of themselves so sometimes that will work against a teacher. I think there is always concern about managing kids, so that might creep into it. That's my experience thus far why some take advantage of it more than others. Mostly I would say it's the institutionalization of ideas that older, sorry, more experienced teachers have. That's probably one of the biggest detriments.

H: What do you think about outdoor place-based education?

M: I'm a huge proponent of it. One is, I'm not sure you're aware of this, but you know how they build seven intelligences, Gardner came up with an eighth which is Nature, like with the ways kids relate to nature. And I, with my own kids, and my own belief, I think its absolutely inherent for kids to understand how nature works, to be in touch with it, to understand the cycles and everything that's part of it. When I used to work in San Francisco the principal of the school, we actually started an outdoor education program where all of our kids once a week went out to do something with outdoor education and the character building, the exposure, the bonding, the community, and they were just learning real like learning, and science should be hands on and we would rather have them outside on our nature trail than with a kit. So I think there are so many elements to it that are amazing that should be incorporated, if I had my way.

H: So what do you see as the benefits to having students go outside?

M: I think 1- the activity, so the physical movement, particularly with older kids, with boys and girls, to get girls interested in science but boys tend to need a little more movement from time to

time. So I think you have the movement. I think obviously it's a more dynamic learning environment than a classroom can be. I think inherent in nature itself are remarkable lessons that every body can learn from, whether it be just the relationship between living organisms to the delicacy particularly now when environment is such a prevalent thing in our society just understanding how all that works. Going back to what I said I think when kids are out on trips or working together you can have more project based and that builds internal confidence, community, friendships, creates a much more dynamic environment for kids to find their path and its also great for kids that are maybe non-traditional learners particularly for kids that have been labeled with special needs or other kids that may have trouble in our traditional style of testing this gives them another avenue to express their learning and express themselves. I think the benefits are wide and varied

S: Do you get parent reactions to, if a teacher takes their kid outdoors, like do you ever hear my kid came home with muddy sneakers?

M: Uh, I have never heard anything but positives, and usually parents are right on board. The only times I hear negatives from parents is how come my teacher doesn't do this when I know other teachers do this. So I think, so never anything, because I think teachers do a really good job preparing their kids and particularly with having a nature trail at our school, I think its kind of expected. Never had any negative complaints.

S: What sort of services do you think would help teachers feel more comfortable going outside?

M: Well, I think with like with anything, and I kind of equate outdoor education to technology where if teachers understand what to do with their resources, so its technology, they understand what to use on the computer, or how to use the software, they can see how they will engage their kids and make it easier they will use it, so the same logic would go with outdoor education that if you can train them professionally development them if you will, they'll understand how to use the materials to give them lessons they can interact with and you can build their capacity then they will be more apt to do it. So really it comes down to just removing the fear factor and getting them familiar with it and that all comes down with training and professionally developing our teachers so they can access that resource.

S: Have you ever thought about providing those resources?

M: You know, some of the other obstacles that you could talk about that exist are the pressures that we have as public schools these days to balance what is an enormous amount of accountability on standard based learning with these tests our kids are required to take every year which in my opinion, even though this is taped, I think are ridiculous. So in terms of when we are trying, and we also as a school that I work at, Title 1 School, we have lots of kids that are impoverished and in my opinion these are the exact kids that have to be out. But when we are looking at our resources and funds and how to allocate them its hard to justify sometimes in a community or by the boards intended that I want to build this program when I have so many needs with just ELA and math, I wish, its kind of a balance. What I think you need to do is you need to find outside resources whether it be through grants or other means so you can allocate that funding to the outdoor source to it and build it that way, otherwise until we stabilize our own

academic pieces still there meaning becomes a little more balance in the way we hold our kids accountable. Its just going to be, what you're asking people to do is take this leap of faith and in my opinion, if you build these great programs and you have kids engaged and kids are happy and are doing all these different things, their test scores will rise, they'll be more engaged, but what's unfortunately happening right now in education is that people scared to take that leap of faith, what they are doing instead is that they are narrowing the curriculum, putting all their resources on ELA and math, and they are thinking that's what's going to cause it now, I know and research says that's not what happens but I think we need to find a way to cultivate an atmosphere where we are looking holistically at children and understanding the relationship between social and emotional as well as academics of this test because a happy kid, a kid with confidence, a kid feeling good about themselves is going to do better than a kid who is pressured into doing it, so I kind of forgot the question, but I think I answered it.

S: Where would say coming up with those outside resources would fall on the priority list for a principal?

M: I wish it would fall, so we do a lot of grant writing, and I've done grant writing this year, and brought in a bunch for my school and it hasn't been around outdoor education, because quite honestly unless you have a Jean Hoins at your school, it isn't a lightning rod and you usually need that one person who is really involved. The grant we won this year for 10,000 dollars was doing this constructivist activity k-5 so we bought all these age appropriate blocks to this grant and we are going to do a whole month of constructivist learning which is also important as well. If I had, and this is driven by a teacher and her interest, if I had a Jean Hoins I'm sure we would have written a grant about outdoor ed so I wish it was inherent in our rotation of humanities where you have, and our PE teachers do a great job, we do snow shoeing and we do other things outside, but unfortunately it should be a priority, but it right now, in my opinion, its hard to make it a priority just with everything else we are being asked to do, and all the other things you can look at money for. So, I know that's not a good answer, but its hard when you know you don't have a critical mass striving towards it and you have other issues such as free reduced lunch kids and stuff like that. And that's a hard question. It should be higher, but I understand why its not.

H: What would you say are some of the challenges to getting teachers outside?

M: I think, so you have a very limited amount of time in the day, basically you have, a teacher has about 300 minutes to fit in about 400 minutes of what they are required to teach so they are already in a time crunch, so then you juxtapose that with the fact that they have these kids that range from 5-10 that they are trying to create this child friendly holistic classroom. Then you have accountability measures and all of these other pressures. I think for teachers to be able to, its very hard for them to let go of what they know they are going to be held accountable for and take big chunks of time to go outside, because if you go outside you have to commit to it, you can't do it for 10 minutes, you have to do it. So you need to really get, from the district level on down, you need to get the culture that says this is something we value, because then principals will say ok , I'm not going to be held accountable. It trickles from the top, so its really about addressing the board, about looking at the microcosm as well as the macro piece where you're getting it not just in the school, but you're getting it as part of the culture of the district. And that's probably one of the biggest challenges. If you don't have that, you're going to have

pockets, and a Jean Hoins, and some of those people that see it flare up but it won't become inherently part of the whole curriculum and that's taking something like that to scale you need it to start from the top. And I think right now in today's age and culture and the way resources are, I think its valued no doubt and I also know that last year we did with our A11 kids or kids that suffer from emotional disturbances we took them to the nature course for a weekly thing and that really helped, but its just not valued right now. Good or bad, its just not, so that's kind of the biggest challenge is trying to see where it fits in. If you could find a great research article that equated outdoor education with literacy scores, they would be all over it. Unfortunately, and you could probably find that, but that's part of the issue.

S: Would you feel comfortable requiring teachers to go outside?

M: I would feel comfortable with it if I knew that I did the work beforehand to prepare them for it and I also did the work with their schedule and their time so they understood how it fit in. I would certainly do that, and we may be a couple years away from that once we start stabilizing some other parts of our district, but yeah. I would never take a teacher who has never had any training and say you have to go outside, that would be irresponsible on my part, their part, but if we were able to build a program then I would say, this is part of our program, this is what you're doing, go do it. Just like I do with library and computers, so, but I think we would have get some work done before that.

M: I think it's a great endeavor and I think the big piece and I don't know where you're going with this, but I think if you're interested in trying to get some critical mass in on it, I think the important thing would be is to talk to principals, get a teacher or two recommended, meet with them and start it small and then as it gets some momentum you can start looking at getting in front of a board or what not, and getting successes and stuff. But it's a great thing, I wish we had more time for it.

Appendix F3: Administrator Interview Transcription, Kathleen Chaucer

Interview with Kathleen Chaucer
Principal, Milton Terrace North Elementary School
4/8/2009

S: What do you think of this idea of “nature deficit disorder,” that students are spending more time indoors not really going outside; a lot of video games and stuff like that. Do you think that’s a real problem?

KC: I do, you know I’m a little biased with this interview because of my husband and his work, but he has been talking about that lately and we talk a lot about it at home as a family, so we do see that and we have a young son of our own too so we really. Because of my husband’s great interest and because of mine, we really do a lot of work as a family for that, but in school I think we see it as well. We work hard to get kids outside on days that we’re able and to give them experiences. But I would agree; we all know our culture has really shifted and kids are inside a lot more than they should be.

S: What do you think motivates a teacher to take their kids outdoors?

KC: I guess I would say their own comfort level. I would think it would have to be a personal thing, because there isn’t really anything in our rules or curriculum that makes them take them outside so I guess would be kind of their internal drive and their love of doing that themselves.

S: What’s your opinion about outdoor place-based education? Do you think it’s a worthwhile investment for teachers?

KC: I absolutely do, sure. I think as we were saying before, how great for the kids to experience what they are learning right in their backyard literally, versus learning something hundreds of miles away.

S: What do you see as some of the benefits?

KC: Well I think that it means more to kids. I think that they may take better care of what we have in our backyard, I think that you know it may go beyond just that lesson but they may be more interested and be more apt to you know take care of the places that are here. I also think it may spark an interest in them so that they may start doing other environmental things. I know my husband and I talk a lot about how we want our son to really appreciate the outdoors and to respect it and I think that may start that appreciation and respect that hadn’t been started in their home. Maybe an experience may spark that interest.

S: What about some of the challenges?

KC: Well I think a lot of what we do is based on curriculum and based on the state standards and I think for teachers who are not necessarily comfortable with the outdoors themselves, if we have

a way to show them how it directly aligns with the standards and to really kind of hold their hand as we show them how to do this, maybe modeling or, I think that would be the most beneficial.

S: So you might have heard parent's responses to going outdoors, I guess we've heard through some teachers that you know, "oh my kid came home all muddy today" do you see that as a problem at all?

KC: I guess I've heard both because I have heard that, that there are kids that come home dirty, and you know and so we work hard to say you know "make sure kids have an extra change of clothes" and we have extra changes of clothes in the nurses office, but then also I've heard parents saying "get our kids outside!" So I guess as an administrator we really hear all parent complaints. But I guess I would say I've heard equally both

S: What sort of services do you think would be helpful for teachers to become more comfortable going outside and would you be willing to provide these services for them?

KC: As I said, yes I would be, I think the most important thing would be showing them ways that what you're doing fits directly into their curriculum, into the curriculum that they've been asked to teach and showing them how it's covered, um and then also you know you have lessons prepared or if you could model for them and they could go out with you or with Jean and they could go out and watch this happen at their grade level. I just know that when they can pick it up and do it the next day versus something that they have to do a ton of work on and then do it, they're not comfortable maybe unless they've got experience. But yea I'd say show them that and then absolutely... And Alex and I have spoken a lot about ways we can get that into our school. Clearly because we're the school with the nature trails out back so we really are proud of that and want to do something with it more than we do. I mean we do have teachers out there pretty often but we'd like to see more.

S: An outdoor component of the ecosystem curriculum; would you ever feel comfortable requiring that of teachers?

KC: Yes I would be, but I would want to make sure that with that requirement and with the expectations there was some modeling and professional development so that, um, I think teacher's are really resistant to things that they don't feel comfortable with. So my experience has been that really making it a gentler, you know, you're going to get to go out with Jean and watch her model this lesson all you need to do is show up and bring your kids and then Jean will show you the materials that she had. You know, even maybe making like exemplar lessons in each grade level and having someone model them in each grade level. I would be comfortable requiring but I would want to pair it with the needed professional development and resources for that.

S: How important do you think it is for students to have that hands-on outdoor experience? Where as a principal or assistant principal does that fall into your priority list?

KC: I think it's very important and I think it's very high on my priority list. We this year we're at the new school and Chuck and I, the principal and I have asked teachers if they have each

classroom, and each classroom has to complete one community service project and it can be anything but most of them have been environmental. So we have our kindergarteners recycling crayons. Our grade five has set up an entire recycling system for our whole school. And the kids every day come and get the bins and sort the stuff and the paper and the plastic and its just really comprehensive. Our grade three is doing stuff with the animal shelter and so our goal in that is to really have kids have a greater appreciation and respect for their environment and for their place in our society and so I think that is a main goal of ours and we even put it into our building improvement plan we had to write for our superintended and so it absolutely is.

S: I'm just curious I talked to the principal at Malta and she talked a lot about budget issues. Do you experience any of that stuff? Especially this year, she was saying with the bad economy...

KC: Yea, I mean we're having some real financial difficulties as every one is. Um, but I think that these are things that we I mean this community service projects that we've asked kids to do they haven't cost any money and if they paid a period amount to our kids in terms of experience and appreciation and so I think there are things that we can do that are smart that don't cost money. You know, I'm really interested in partnerships with Skidmore because they don't cost money and we both benefit. And the kids benefit, so absolutely there are financial issues, but you know, I don't think... From what I'm hearing I don't hear you asking us to put a lot of money into this, its more time and commitment, that's great I think and in these times you need to be resourceful.

S: Well great, thank you!

Appendix F4: Administrator Interview Transcription, Sharon D'Agustino

Interview with Sharon D'Agustino
Principal, Malta Avenue Elementary School
4/7/2009

Sharon D'Agustino: OK, so you know that we're not in a location like, um, the complex and all.

S: Right, right you don't have Gordon Creek in the back of your school like Ballston Ave does.

SA: No, we don't have any nature trails or anything like that like over at Wood Road. We're strictly right in the city.

S: I guess my first question is, what your opinion is about the idea of nature deficit disorder where students are spending too much time living in the technological indoor world these days, and do you think this is a problem.

SA: I think this depends actually on a particular teacher. I mean I'm not so sure that it is a problem, I think that even since when I went back and taught many years ago it's the comfort level of the classroom teacher and how she decides to do nature within her classroom, I think that can be said for pretty much every subject level at this grade level and if someone is stronger in one subject or another than students typically get more from, for example, if someone is very proficient at math and that's something they find a passion in, than that's where they that peaceful league genius to be here at Malta Ave. Even if there are limited surroundings here, she would make trips over to the complex so I'm not so sure its her program per say, I think it's more towards individuals somehow and their comfort level is with introducing it to their classrooms.

S: What would motivate a teacher to go outside beside their comfort and...?

SA: Ability is huge. I mean that's a huge, a very big piece of it. If you have a facility that is right there where you don't need to bus students and it's rights out your door, you are more apt to bring in nature that way. I think sometimes you are forced because of the actual physical location of the school that limits you sometimes to what you can or can't do to some extent. I mean I think you can always provide some type of nature within a class room I mean again there's always, depending on, I can speak to my school for example. When we had different science kits for example that have to do with erosion or so forth and they have to do it using water tables and so we create that inside the classroom however the limitations are such things as you know, ... getting rid of the materials afterwards ... it is very difficult because you are talking to folks that are you know maybe on the third floor and may have to go down the fire escape to dump the soil or whatever. So I think again, it has a lot to do with where the location is, and the availability to nature itself. If you have a park right next to you and you have a nature trail or whatever I think teachers tend to utilize it more than if you have a classroom and you don't have those things in your proximity. Especially with the budgets being cut it makes it very difficult to travel so that's a huge hindrance to our staff so its not necessarily that they don't want to do it, I think sometimes it's more of the logistical pieces of it.

S: What do you think about outdoor place-based education, do you think it's a worthwhile investment of a teacher's time if they do have the appropriate...

SA: Sure, I mean I was a teacher for 20 years myself and I took kids to Nature's Classroom. I've plugged into where my surroundings were, in my classroom I could open the door and we'd be out into fields and wherever else we wanted to so it was very natural and very easy for me to do that so I mean I think it's a wonderful opportunity for kids, I think they benefit greatly from it, and I think it is a definite plus.

S: And you mentioned some of the challenges that come with it. What do you think are some of the biggest challenges to an outdoor place-based learning curriculum?

SA: I think I've already said that. I think the environment and where it is and I think the funds inhibit teachers from doing what they need to do, and they can certainly do it through United Streaming. But again that's not the same thing as hands-on and so the biggest obstacle if I had to say right now as both a teacher and as an administrator in this particular building, there is no places very close by that lend themselves to any in the doable time to get to and perform like outside in nature. I think that teachers here have done very well as well as adapting and bringing things into the classroom and using the things available to them but I really feel that the location is a huge deterrent from that and just because of the budgetary restraint that they can't take a bus and hop on it and go visit and do what they would like to do. And I think as a teacher and as an administrator with a view from both aspects that those seem to be the biggest stumbling blocks currently.

S: What sort of services do you think would help teachers become more comfortable teaching outside and would the school be willing to provide these services.

SA: Well again, we have frozen budgets for professional development right now so that's not an option, and as far as what they would do to be more comfortable, I think they really need to be involved in it themselves and need to have a workable knowledge with it themselves. It's just like anything, you can go to teach somebody something you're not familiar with, you're not really comfortable with it. Obviously I think it would be beneficial for them to be able to take part in some outdoor activities but at this particular juncture it's not really a possibility it's not really a reality with the budget constraints. You know we just don't have the availability. Again, this is a very different year that we are currently in and to project forward for next year we still don't really know what that's going to look like yet. We are still weighing budgets to find out what that's going to look like, so its extremely difficult to predict to that point, I mean do I think teachers you know they have the opportunities I think its wonderful, but you know...

S: Would you ever feel comfortable requiring an outdoor component of the curriculum?

SA: That's not really me. I think that has to be a district decision. That's not a personal decision of mine. Our curriculum is really generated by the entire district in other words the curriculum that happens here happens in the other three schools for the most part for example our reading program and math program and so forth. And even in the current science with the way it stands

all of the classrooms do receive some type of science education. So I mean that's not a personal, you know that's not something for me to make a decision on or call. That really is up to the district as a whole.

S: And my last question is, I guess I don't know if this is answerable, but when you're figuring out your budgets and everything, where does the outdoor field trip hands-on experience fall into the budget. Is that one of the top things that gets put in there or is that pretty low on the list?

SA: Well uh as I said you're asking in a very different year, I mean we're not looking out towards any type of... I mean not just science. There are none at the moment. So I think that at this type I really can't be honest with you and answer you as far as planning for next year because we're in a very different situation until we hear from our superintendent where our budgets are going to be and then you know then we can go out and look at what the teachers would like to partake in and so forth if we have professional development and for field trips and so on. And I mean, we have trips that are nature related where teachers will go to a number of places at least we have in the past. You know where there was a nature center and we used to do an outdoor program here for many years. We had an overnight as well; we used to have also The name of the place escapes me; it's outside of Delmar; Fiver Rivers; we had a number of outdoor ed programs in the past but you know, right now its too difficult to call that. We just don't know where we're going to be for next year. In other words, there are no plans right for field trips for next year. I'm not saying that there won't be any; it's just that at this particular time we're not projecting out that far. You know, we're just trying to go forward and get our budget passed and for the districts needs for next year. So the field trips aren't in that piece yet and as far of our science program, we do have a k-12 science coordinator, she's probably someone you should be in touch with as well. And she does the coordination with the elementary buildings as well as the middle and high school as far as the science needs right now. They're all classroom science. But as far to say to you it would be great if they could go out on some of the field trips, sure it would I just don't know where we fall in that at the moment.

S: Right, I mean, students, could they walk to Kelly Park do you think? Is that feasible?

SA: I would imagine it probably is, you know depending on the age level and the teachers if that was something they wanted to include in their program, with the current science experiences that they have if it relates to it, if it relates to it and they felt that that would be a help, you know I certainly think that that would be up to them. You know, I mean that's certainly an option to them.

S: Well thank you very much for your time and you answered a lot of my questions so that was very helpful.

Appendix G1: Lesson Plans

Lesson One: Geography of the Saratoga Lake Watershed

Overview and Objectives:

Students will consider where the water in Gordon Creek comes from, and where it goes through an outdoor thought exercise by the creek, and an indoor aerial survey of the watershed using Google Earth. These exercises will give students a conceptual perspective of a watershed.

- Students will understand what a watershed is
- Students will understand where Gordon Creek water comes from and where it goes.
- Students will understand that watersheds contain various types of land use.

Students will understand that water downstream comes from many location upstream.

STC Kit Connections:

Lesson 1 in the STC Kit focuses on preparing the ecosystem bottles to hold terrestrial creatures. Much like the indoor STC Kit lesson serves to familiarize students with their ecosystem, having an outdoor lesson that introduces students to the geography of their watershed will serve as a base for future outdoor ecosystem studies.

Materials:

Nature journal or blank paper on a clipboard
Pencil

Procedure:

Outdoor Component: Gordon Creek

1. Bring students out to Gordon Creek.
2. Have students spread out and sit facing the stream within a designated area.
3. Prompt students to draw the following things on their paper
 - a. Draw yourself
 - b. Draw the stream in front of you
 - c. Where is this water coming from; how is it getting here? Draw it.
 - i. If you were to follow the stream upstream for 1 hour, what would you see?
How big is the stream upstream? What do the riverbanks and the land around the river look like?
 - d. Where does the water go when it leaves here? Draw it.
 - i. If you were to follow the stream downstream for 1 hour, what would you see?
What do the riverbanks and the land around the river look like?
 - e. What happens when it rains? How does the rainwater get into the stream? Draw and label.
4. Prompt students to consider the following questions:
 - a. How does the type of land use around the edge of river impact what goes into the river?

Indoor Component: Google Earth

Type the following location into the Google Earth search bar:
200 Wood Road, Ballston Spa, NY 12020

Follow Gordon Creek eastward

Tell me to stop every time I *intersect another body of water*.

- Kayaderosseras Creek
- Saratoga Lake

Sketch in your journal as we move along the creek. Be sure to include some indication of the following:

What is the name of the water body?

How large (width and length) is the body of water?

What direction is the body of water flowing?

What do the stream banks look like?

What kind of land use is happening on either side of the stream?

What type of activities might people use these bodies of water for?

Navigate back to 200 Wood Road, Ballston Spa, NY 12020

Follow Gordon Creek westward.

Questions to consider:

How does the size of the water bodies differ upstream versus downstream?

How does land use differ upstream versus downstream?

Appendix G2: Lesson Plans

Lesson Two: Riparian Rain Check

Adapted from "To Protect Your Streams, Protect Your Mountains" Lesson Plan
by Barbara Morton, Wildlands Conservancy, Emmaus, PA

Overview and Objectives: Students will discuss the functions of a riparian zone, and then play a game that emphasizes the importance of vegetated buffers.

- Students will be able to identify a health and an unhealthy riparian zones
- Students will understand the components of a riparian zone
- Students will understand how different vegetative structures impact the effectiveness of a riparian zone

STC Kit Connections:

In lesson two in the STC Kit, students create the terrarium in the bottle. Investigating the terrestrial environment that is immediately next to a water source will allow them to draw parallels between their terrarium environment and the real environment outside their school. Additionally, a riparian zone is beneficial in helping to draw the connections between the terrestrial and aquatic environments, and is neither solely terrestrial nor solely aquatic in scope.

Materials

- Four orange cones, or objects to proxy for cones

Background:

The riparian zone is the land adjacent to a stream or river. A healthy, functioning riparian zone is characterized by a diversity of plants, including trees, understory, and herbaceous species. The presence of a wide riparian zone ensures a healthy stream ecosystem in a number of ways and is the best method known for reducing the threat of nonpoint source pollution.

- The widespread roots of the trees, warm-weather grasses and other herbaceous plants help to hold the soil in place, especially along the banks of the stream.
- Leaves and branches of the plants (of all sizes) break the force of falling raindrops, reducing the energy of the moving water. Slower-moving water is less likely to dislodge and carry soil particles into the stream.
- Trees in the riparian zone absorb excessive nutrients, such as nitrates and phosphates, which may have been carried with rainwater from farmers' fields or residential lawns. These nutrients become bound in the growth of the tree and are held "in storage" until such time as leaves and branches fall to the ground or into the stream. There, with the help of decomposers, the nutrients are slowly released and recycled into the system through the food chain.

- The survival needs for many wildlife species (food, water, shelter and space) are provided in a diverse, well-vegetated riparian zone.

Procedure

1. Discuss with the students the above-listed functions of a riparian buffer zone. Bring the group to the edge of Gordon Creek to show them concrete examples as you direct the discussion. Compare this with an area without a buffer.
2. Set up for the "Riparian Rain Check" game. Place two orange traffic cones approximately 15 feet apart on a playing field (these represent the edge of the stream). Place another two cones about 25 feet apart, located approximately 30 feet down the field from the first set (these represent a construction site with loose topsoil and no erosion control devices).
3. Tell the students that they are going to become a newly planted riparian buffer zone on a rainy day. Select two students to be tree seedlings. They will station themselves somewhere near the stream bank, between the two cones. Their job will be to stop the raindrops before they can carry nonpoint source pollution into the stream. The remaining students will be raindrops carrying sediment toward the stream. Give each of these students a brown flag to tuck into their clothing and mark them as raindrops/soil particles.
4. The raindrops/soil particles should line up at the construction site. When the leader yells, "Go!" the raindrops should run toward the stream bank and attempt to cross the line (they must run between the cones). The trees should attempt to tag as many raindrops as possible keeping one foot "planted" in the ground at all times. When they capture a raindrop, the trees should take their brown flags. Time this "rainstorm" for 10 seconds (adjust time according to the group's age and ability). Yell, "Stop!" when the time is up.
5. Count and record the number of raindrops that were intercepted by the trees during the 5-second time period. Explain that the nutrients carried by the raindrops have been captured by the root systems of the trees, and now it has been used to help the trees to grow and reproduce. The students who were tagged will now become trees (as the riparian zone grows wider and more vegetated).
6. Repeat the exercise with the additional trees guarding the stream. Count the captured raindrops again. Were there more captures? (Just as more nonpoint source pollutants can be filtered out by wider and more vegetated riparian buffer zones.)
7. Variation: have the trees link arms and stand directly in front of the stream bank to protect it. This simulates the intertwining of roots in the stream bank. The trees may decide to test whether it is more effective to be planted next to the stream or further away. Discuss the results.
8. At the conclusion of the game, explain that the riparian buffer zone acts to filter out nonpoint source pollutants such as sediment. The wider and more vegetated the buffer, the more effective it is.
9. Ask the students to describe ways that human activity can change the condition of the stream. Be sure that positive (plant riparian buffer zones) as well as detrimental (over fertilizing lawns, disturbing soil, and leaving unprotected) activities are mentioned.

Assessment Activity

10. Walk alongside a stream that has a well-vegetated, wide riparian buffer zone.
11. Have the students point out examples of healthy riparian zone components: habitat for animals; roots on trees that are holding together stream banks; native grasses with deep

root systems to absorb runoff, capture erosion, and absorb excessive nutrients and other pollutants; trees that are cooling the water by leaning over the stream; trees and other plants that have fallen into the water to provide food for the water creatures, etc.

12. Ask the students to imagine the area during a heavy thunderstorm. Then ask the following questions to test and reinforce their knowledge:

- From which direction would the water come? (uphill)
- What is the word that describes the land that drains into this stream? (watershed).
- When water dislodges loose soil and sweeps it into the stream it is called " ____." (erosion)
- After the soil enters the stream, that soil is called " ____." (sediment)
- Why would sediment be a problem? (Clog fish gills, block sunlight, smother eggs and other aquatic life).
- Would we consider that to be a pollutant? (yes) Why? (It is too much of a good thing, located in the wrong place to be useful.) * What classification of pollutant would the sediment be? (nonpoint source)

Appendix G3: Lesson Plans

Lesson Three: Runoff, Erosion, and Riparian Zones

Derived from:

Ranger Rick's NatureScope. "Shaping the Landscape," Geology, The Active Earth. 1987

Overview and Objectives:

Riparian zones help filter out pollutants that would otherwise flow directly into the stream. By sampling locations above and below a riparian zone, students will gain an understanding of the role that riparian zones play in filtering out pollutants. Additionally, students will also sample a location where there is lots of erosion to determine what impact erosion may have on stream communities.

- Students will understand that different size sediments can travel farther in the water.
- Students will design an experiment to assess runoff from different locations around the school
- Students will make predictions about what types of sediments each runoff location will contain.
- Students will synthesize and discuss the results of their experiment.

STC Kit Connections:

Lesson Two and Lesson Three in the STC Kit focus on creating the terrarium and the aquarium. Conducting a lesson on a riparian zone will help them understand that although built independently, the two are interrelated. This lesson will highlight how terrestrial environment impact aquatic environments.

Materials:

Clear glass or plastic bottles, of approximately half-liter capacity

Soil

Sand

Pebbles

Water

Procedure:

Demonstration: Soil and Pebble Shakers

1. Fill a jar with soil, sand, pebbles, and water; shake well.
2. While shaking the jar, predict which particles will settle to the bottom fastest and which will settle last. Why?
3. Set the jar on a flat surface and allow the particles to settle over-night.
4. Observe the order of the deposition of layers. Draw and label the layers.
5. Use a hand lens to compare the sizes of the particles in the different layers.

Questions:

- Is the water completely clear?
- If not, why not?
- If these particles were eroding from a stream or riverbank, which would cloud the water the most?
- Which would travel farthest? Why?
- Which size particle would naturally erode faster? Why?

Experiment:

1. Students identify five-sites on the school grounds where they might collect runoff after a rain shower.
2. Students identify five-sites on Gordon Creek where water may be flowing into the creek after a rain shower.
3. Students predict the relative amounts of sediment that will be suspended in the runoff from each site by ranking the sites.
4. Label jars of similar dimensions with the site names and keep them ready for a rainy day.
5. When it rains, fill the jars with runoff from each site.
6. Students observe and rank the jars according to the clarity of the water, after shaking them.
7. Students compare the results with their predictions and discuss:

Questions:

- Does any sediment settle out?
- Are all the samples the same?
- Is it possible to determine the source of this sediment?
- What are some ways to control the erosion or keep the sediment out of the nearest waterway?

Follow-Up:

1. Students do an erosion inspection around their homes. Discuss options for improving problem areas.

Appendix G4: Lesson Plans

Lesson Four:

Role of Plants in Water Filtration

Derived from the Environmental Protection Agency

Overview and Objectives:

This experiment is to help you understand the role of plants in filtering the water moving through a watershed. Experiments can be done to show how a plume of dissolved materials can move through soil and enter a groundwater aquifer. Depending on whether materials are dissolved or suspended in the water, soils and plant roots can remove some or all of this material as the water moves down through soil. Most suspended materials will adhere to the soil. These may then be broken down and used as food by the plants. Dissolved nutrients, such as nitrogen or phosphorus, chemically bond with some types of soil particles. They are taken up by plants, thus removing them from the soil before they can enter an aquifer. For the plants, these elements are food, for an aquifer, they are pollution.

Not all materials are absorbed by plants and not all water pollutants are food for plants. However, sediments from eroding soil, nutrients in human and animal wastes, and some components of household wastewater (“graywater”) are excellent plant nutrients. Plants also use different nutrients at different rates, so that the amount of material they take up will depend on how much is dissolved in the water and how fast the water moves through. This experiment is a very simplified way to show whether plants will take up certain kinds of materials from water moving relatively quickly through their root systems.

- Students will make predictions about how plants will filter our different pollutants.
- Students will execute an experiment to determine which pollutants are filtered out.
- Students will identify the impact rainwater has on the pollutants that may be held in plant-root systems.

STC Kit Connections:

Lessons Two and Three in the Ecosystem Curriculum are focused on the construction of the terrarium and the aquarium indoor ecosystems. Studying riparian zones in the outdoors is a valuable way to show that both of these biomes are connected to one another. This experiment will illustrate for students how riparian plants can remove pollutants that would otherwise enter the stream directly.

Materials:

- Six potted plants, with pots roughly six to eight inches in diameter, and holes in the bottom. These plants need to be moderately dry, as if they had not been watered for a couple days. Plants with saturated soil will not absorb water, and very dry plants will absorb it all.
- Six clear containers, such as cups, which will support the plants and allow drainage to be viewed. You will need separate plants and cups for each of the materials in the water.
- Soil from outside (anywhere). The best soil is loamy, with smaller particles than sand.
- Unsweetened powdered drink mix, preferably grape or cherry for color.

- Vegetable oil.
- One or two different household cleaners (such as Comet/Ajax and Dish or Laundry soap). One should be liquid and the other powder.

Preparation:

- Set up the potted plants, each in its own cup.
- Slowly pour six to eight ounces of clean water through the pot, and check the percolation rate through the pot.
- Loosen or tighten the soil so that water percolates at about one ounce per minute. The rate should be fast enough to prevent long waiting periods, but slow enough not to carry very much soil through the pot.

Procedure:

1. Place the potted plants into the top of their cups. Pour clean water slowly through one of the pots and watch it percolate through the bottom of the pot. The water should look as clean as what was poured.
2. Add a gram or so of soil to 6-8 ounces of water and stir so that the soil is well suspended and distributed in the water. Pour slowly into another flowerpot. The water percolating through should look much cleaner than the dirty water poured.
3. Add about one ounce of vegetable oil to 6-8 ounces of water, stir (they won't mix completely) and pour into a third pot. See if the vegetable oil percolates through or is caught up by the plant roots.
4. Add some powdered drink mix to 6-8 oz. of water and pour through a fourth pot. See if the water percolating through retains the color.
5. Add some powdered cleanser to 6-8 oz. of water and pour through a fifth pot.
6. Add some liquid soap to the water (an ounce or so in 6-8 oz. water).
7. Using the "contaminated" plants, pour some clean water at the same rate through each one (simulating a rain shower). Is more of the "pollutant" rinsed away from the soil by the clean water?

Appendix G5: Lesson Plans

Lesson Five: Stream Populations, Communities, and Ecosystems

Adapted from: "Organisms and Their Environments" Lesson Plan by: Rosemary Grove, Cathedral Center

Overview and Objectives

- The biosphere is the part of earth where all life is found, and it consists of biotic (living) factors as well as abiotic (nonliving) factors such as air, soil, water, and sunlight.
- Populations are made up of all the members of a species living in the same place at the same time. A community includes all the populations of the area. The community and the abiotic factors make up the ecosystem.
- An organism lives in its habitat within a community. The role or job of an organism within a community is its niche.

- Students will be able to identify the biotic and abiotic factors in the stream ecosystem
- Students will be able to describe the characteristics of populations.
- Students will be able to compare a species' habitat and its niche within a community.

STC Kit Connections

Although Lesson Three in the STC Kit focuses primarily on plants, this lesson provides a coarse survey of both plant and animal populations in the stream that will help students prepare for more fine-tuned examinations later in the unit.

Materials

Dissecting and compound light microscope

Protoslo

Plankton net

Vial to contain sample in

Microscope Slides

Cover slips

Procedure

1. Explain that in the biosphere living things depend upon and interact with each other and with the nonliving things in their environment.
2. Ask students to brainstorm the living and nonliving factors of Gordon Creek and list them on the board.
3. Classify each as biotic or abiotic.
4. Discuss that each species in the stream makes up a population; all the populations make up the community; the community and abiotic factors may up the ecosystem.

5. Tell students that each person lives in a population as part of a community. Have each student describe his/her population, community, habitat, and niche. (Students may describe themselves as humans, living in towns, inside houses and as students, brothers, sisters, etc.) Discuss answers.
6. Divide students into groups of four and assign each group a different section of Gordon Creek.
7. Have each group tow the plankton net through the water in the stream, and then rinse the content of the net into a sampling vial.
8. Bring the water sample indoors, and prepare microscope slides by placing a drop of the stream contents on the slide. Add a drop of protoslo if the sample organisms are moving too quickly.
9. Have them make a list of all the populations present and infer the niche of each species. Each group will then draw their ecosystem and share it with the class.
10. Explain the relationship between population, community and ecosystem. Point out that populations interact to make a community. Stress that communities and nonliving things make up the ecosystem.

Appendix G6: Lesson Plans

Lesson Six: Freshwater Macroinvertebrates

Objectives

1. Students will work together to collect macroinvertebrates.
2. Students will understand that the presence of specific organisms in a freshwater habitat determines the quality of that habitat.
3. Students will understand that an organism's behavior and adaptations relate to its habitat.
4. Students will understand that freshwater habitats have different characteristics depending on whether water is still or moving.

STC Kit Connections:

This lesson plan matches up well with the STC Kit Lesson 4: Adding Animals to the Aquarium, because it introduces students to some of the animals that live in the aquatic environment behind their school. Although the focus of the lesson is on macroinvertebrates, students can brainstorm other aquatic animals that may use the stream.

Materials

The class will need the following:

- Various field guides of pond life or freshwater life
- Collecting nets such as small fish nets, long-handled dip nets, kick seine nets
- Collecting buckets, preferably white, so that it is easier to see collected organisms
- pH paper
- Thermometers, preferably those that do not contain mercury
- Meter sticks or tape measures
- Fish floats or any object that will float on water (even a leaf)
- Stop watches or watches with a second hand
- Magnifying glasses or bug boxes to help identification
- Old shoes or boots
- Copies of the Identification Sheet: Identifying Macroinvertebrates
- Copies of the Classroom Activity Sheet: Freshwater Habitat Data
- Copies of the Take-Home Activity Sheet: Freshwater Habitat Data

Procedures

1. Discuss with students the characteristics of freshwater habitats. Explain that scientists consider water to be a freshwater source if it has a salinity (saltwater content) of less than .005%. Freshwater habitats can be ponds, lakes, bogs, rivers, streams, creeks, marshes,

- and swamps. Even a puddle or a drainage ditch can be a source of freshwater. A reservoir is an example of an artificial freshwater resource.
2. Brainstorm with students a list of possible freshwater habitats closest to your school. After you have determined which freshwater habitat is closest, ask students to describe the plant and animal life that they would expect to find there. Is there anything around the freshwater habitat that could influence the life found there, such as farms, manicured lawns (which may contain chemicals), asphalt, trees, or other bodies of freshwater? Ask students to hypothesize about the health of the habitat and its diversity of life. Would they consider it healthy or unhealthy? Why?
 3. Explain to students that they can learn about the health of a freshwater habitat by studying the organisms living within it. Scientists have determined that certain organisms can tolerate a polluted freshwater environment, while others can only live in a healthy freshwater environment. In this activity, students will visit a freshwater habitat and determine its health based on the presence of specific organisms.
 4. If the closest freshwater habitat to your school is a puddle or a drainage ditch, adjust the data collection in this lesson as necessary. For instance, if the habitat does not have flowing water, as in a pond, lake, or puddle, students cannot test the water velocity. However, a number of organisms can be found living in puddles and ditches.
 5. Introduce the word macroinvertebrate to the class. Explain that a macroinvertebrate is an animal without a backbone living in one stage of its life cycle, usually the nymph or larval stage. Macroinvertebrates can spend a few years living in this stage in a freshwater habitat and can be seen without a microscope. Many macroinvertebrates are benthic organisms, or bottom dwellers.
 6. Explain that scientists look at the number and type of organisms present in a freshwater habitat to determine its health. The water quality of a freshwater habitat is good when it is rich in oxygen and capable of supporting a variety of organisms. Water quality is fair when it contains less oxygen and low concentrations of pollutants, and poor water quality habitats suffer from high levels of pollutants. Some organisms can only be found in healthy freshwater habitats with good water quality, while others can tolerate fair water quality, but are unable to survive in a poor water quality habitat. And some organisms are able to live just about anywhere.
 7. Clarify for students that a pollutant is something introduced to an environment that is not native to it: for example, warm water introduced to a stream is called a thermal pollutant and can harm the organisms adapted to live in the cool water, environmental pollutants taint freshwater habitats, and human and animal waste products contain bacteria such as fecal coliform that pollute freshwater.
 8. Share with students the list of organisms below and the quality of water their presence indicates. The larvae of a stonefly, for example, is a macroinvertebrate that is very sensitive to chemical and physical changes in water, and its presence indicates good water quality. Clams and crayfish are able to survive in fair water quality areas, but not in poor water quality areas. Blackfly larvae and leeches can be found in any type of water, and their presence alone suggests a poorer quality of water.
 9. Divide students into teams of three or four. Provide each student with a copy of the Identification Sheet: Identifying Macroinvertebrates and the Classroom Activity Sheet: Freshwater Habitat Data. Review these sheets with the class. The identification sheet will be used to distinguish and classify organisms found during the field study. The activity

sheet will be used to record their findings. Explain to students that they will study two specific parts of the freshwater habitat—shallow and deep areas. For example, in a stream the shallow water should reach no higher than a student’s ankle, and the deep water should reach no higher than the knee. In a pond or puddle (depending on its size), the shallow areas exist along the edges, and the deeper areas are in the center.

10. Review the safety precautions to follow during fieldwork:

- * Wear old boots that will keep feet dry.
- * Remember wet surfaces, such as rocks with algae, are slippery.
- * Be sure of the depth before stepping further into the water.
- * Handle organisms gently and return them to the habitat alive.
- * Be aware that some organisms can bite or pinch.
- * Never drink the water.

11. Have each team gather collecting equipment and choose a place to work in the habitat. First have each student quietly stand or sit and observe the habitat. What can they hear? What can they see? Have them observe the water’s edge and surface, and look through the water to the bottom of the habitat. Encourage students to use these observations as they choose an area to complete their habitat study. Have the students record their initial observations on their data sheet.

12. Have students first measure the water temperature with a thermometer. Using a meter stick, they will record the depth. Next, students should determine the velocity of the flowing water by measuring the distance a float travels downstream in a 10-second time period. Students can measure the pH of the water with a pH kit, pH paper, or pH probe. Test for phosphates, nitrogen, and other chemicals using kits obtained from science supply catalogs if there is time and interest. Students should record all data on their data sheets.

13. If students choose a stream, have them find an area that has riffles in which to collect macroinvertebrates. A riffle area is where water passes quickly over a barrier or structure in the stream, creating a slight disturbance in the water’s surface. This disturbance increases the oxygen content in the water.

14. Students should place a kick seine net or a large net with a small mesh downstream. Hold the net so its bottom rests on the bottom of the stream to prevent organisms from being washed downstream underneath the net.

15. Students should disturb the bottom of the stream; they should pick up rocks and rub the surface of the rocks to dislodge organisms, which will be captured in the net. After a few minutes, students will carefully raise the net without releasing any organisms. They will gently put them into a collecting bucket. Students should identify and count the organisms, record their information on the data sheet, and release them.

16. In still water, students will use various nets to capture organisms. They must carefully sift through mud or sand in the net when looking for macroinvertebrates. Collect all organisms in buckets and identify and count those captured. Record the data on the data sheet.

17. For homework pass out copies of the Take-Home Activity Sheet: Analyze Your Data and review the questions with students. Explain that to determine the quality of the freshwater habitat (good, fair, or poor), students must calculate how many organisms they find in

each category. The presence of good water quality organisms indicates a healthy freshwater environment. If students find an equal number of poor and fair water quality organisms, have them hypothesize how the habitat can be improved to sustain good water quality organisms.

Follow-Up Discussion

1. Compare and contrast the areas in the freshwater habitat. Which area had the greatest diversity of life? Which had the highest population? Why were some areas more diverse than others?
2. Locate the source of the freshwater habitat studied. Use a map to trace the area that brings freshwater to the habitat or the area that carries the freshwater away. Hypothesize the path a water molecule could take from the freshwater study site to the nearest ocean.
3. Saltwater and freshwater mix in bays and estuaries. Organisms such as shrimp, crab, and oysters have adapted to live successfully in these habitats. What special adaptations must they have that allow them to live in such a habitat?
4. Discuss whether the freshwater habitat studied would be considered healthy or unhealthy. What organisms indicated this? Are there any threats to the water quality there? Are measures being taken to maintain the quality of the habitat? What could be done to improve the health of the habitat?
5. The amount of freshwater on Earth is limited. Discuss how you use freshwater daily. Could you measure the exact amount? Make a number of suggestions to conserve freshwater effectively.
6. Explain at least one predator-prey relationship in the freshwater habitat studied. Hypothesize what would happen if one of the organisms disappeared from the habitat.

Appendix G7: Lesson Plans

Lesson Seven: How Do Pollutants Travel through the Water Cycle?

Derived from: the Environmental Protection Agency

Overview and Objectives:

Everyone must familiar with the water cycle (technically known as the hydrological cycle), do you know what can it do to help us from its continuous movement of water over, above, and beneath the Earth's surface. As water moves around in the hydrosphere, it changes state among liquid, vapour, and ice. During the process through which a liquid becomes a vapor, it is defined as Evaporation. Minerals like salt and other substances dissolved in water are left behind. As a result, when the water vapor condenses to become water again, it is relatively pure. The evaporation and condensation are the key terms that help water purifying. While these process occurs during the water cycle, it can also be used to purify water for drinking or industry use.

- Students will be able to trace water through the system
- Students will be able to trace pollutants through the system
- Students will make connection to what happens to water from the lakes and stream in their community.

STC Kit Connections:

Lesson Eight in the STC Kit is entitled, “Upsetting the Stability.” It focuses on the different ways that pollutants can impact a system. Because our outdoor curriculum focuses on water ecosystems, it is important to understand how water (and pollutants they contain!) can travel through the water cycle.

Materials:

- 4 cups of dirt or sand a dozen stones,
- 2 quarts of water a large glass bowl with tall sides (mixing bowl),
- A short glass,
- Clear plastic wrap
- A sunny day

Procedure:

1. Mix the dirt (or sand) and water in a large bowl.
2. Stand a clean and empty short glass in the center of the bowl.
3. Place the bowl outside in the sun.
4. Cover the bowl with the plastic wrap and weigh down the edges with the remaining rocks.
5. Place one rock on the plastic wrap directly over the cup.

6. Allow the bowl to remain in the sun for several hours.
7. Look in the cup (it should contain some relatively clean water free of mud).
8. Look in the bowl (it should contain the dried dirt).

Variations:

Add food coloring to water to demonstrate that this process does not remove all pollutants. This may be done simultaneously with the procedure above.

Appendix G8: Lesson Plans

Lesson Eight

Steam Study: Water Pollution in Gordon Creek

Grade Level: 5th

Subject Areas: pollution, presenting, group collaboration skills

Duration: 1 hour

STC Kit Connections: Lesson 9 (Reporting on Pollutants). Students learn how human-made pollutants can damage the environment by presenting and researching different types of pollution. Going outdoors and finding pollutants (trash, water pollution, etc.) will be a way for students to learn about pollutants through their own experiences taking measurements and making observations.

Summary: There are a wide variety of pollutants that can affect water and the plants and animals that live in the water. This pollution can be divided into three groups: chemical pollution, thermal pollution, and ecological pollution. Since not all pollution is human produced students need to understand that there are sometimes "natural" reasons for some pollution.

Objective: Students will be able to identify 2 or more pollutants in or around Gordon Creek and will understand that some pollutants cannot be seen. This will be done with observation and water quality testing. These activities will help students' understanding of water pollution and its potential effects on human and wildlife habitats.

Materials:

- 1) pH meter
- 2) Dissolved oxygen monitor
- 3) Waders
- 4) Turbidity meter
- 5) Nitrogen and Phosphorous Testing
- 6) Notebook and pencil
- 7) Rubber gloves
- 8) Plastic garbage bags

Procedure:

Taking students to Gordon Creek will help them become more aware of the watershed and water quality around them.

- 1) Take with you paper, pencils, clipboards, rubber gloves, plastic garbage bags and extra adults.
- 2) Divide students into groups of 3 or 4. Each group is to look around the wetland area and find as many sources/types of pollution as possible.
- 3) A designated recorder for each group will record the different types of pollution found.
- 4) After 10 minutes, come together as a whole group and discuss the pollution that is seen.

Since the visible pollution is often in the form of litter, discuss with your students the pollution that may be present, but not seen.

- 5) When the group discussion is over, pass out gloves and bags. Divide students into groups and assign an adult to each group.
- 6) Have the students pick up the litter pollution and take back to school and put in dumpsters. Repeat throughout the year.
- 7) To further students' understanding of non-point pollution, and less visible pollutants that exist in the water, have students take water samples and wade into the stream to collect water quality measurements. Students should collect pH data, dissolved oxygen levels, and stream turbidity.

Discussion:

- Make sure students are aware of the difference between non-point source pollution and point source pollution.
- Possible indoor activity to supplement what has been outdoors is to look at cups filled with sugar water, white vinegar, salt water, water mixed with citric acid, and tap water. Have students taste these samples and discuss sources of 'pollution' in the water. This should illustrate that not all types of pollution can necessarily be seen.

Assessment:

Providing students with a background of information and an opportunity to actively use that information, they will begin to develop a feeling of stewardship for their world. Using activities that develop environmental stewardship in students will hopefully become a basis for action in their future lives. Have students discuss the pollution sources they observed outdoors and put together a presentation of these sources. In the presentation, students should prepare possible experiments that could be used in the future to monitor stream quality and pollution in Gordon Creek. Students should demonstrate an understanding of pollutants, and should be able to portray this information to their classmates in a clear and precise manner.

*This lesson plan was adapted from David A. Gillam, Susitna Elementary, Anchorage, AK. <
<http://www.col-ed.org/cur/sci/sci26.txt>>

Appendix G9: Lesson Plans

Lesson Nine

Designing a Pollution Experiment

Grade Level: 5th

Subject Areas: pollution, designing an experiment, scientific method

Duration: 1 hour

STC Kit Connections: Lesson 10 (Planning Pollution Experiments). Now that students have studied different types of pollution and observed it in the schoolyard, they will design an experiment to test for pollutants outside, paralleling their ecocolumn alterations, in which they will be adding various pollutants to the aquariums and terrariums.

Summary: It's not difficult for students to follow a procedure and perform an experiment and make observations. However, when asked to come up with their own experiment, they must understand the scientific method, have a good understanding of the material, and appreciate what is required of working outdoors.

Objective: Using information obtained from lesson 9, students should be able to design an experiment using the scientific method, to test various locations around the school for pollutants. Students will come up with a control for their experiment, the materials needed, the pollutant they want to test for, and the location of the experiment.

Materials:

- Pencil, paper

Procedure:

- 1) Students will spend time developing their experiment by coming up with a control, procedure, and location for their experiment
- 2) Groups of 3 or 4 people
- 3) The experiment must not cause harm to the environment, the ecocolumns will be used with this outdoor activity so that detrimental alterations can be made to the artificially created environments, controlled within the confines of the classroom

Discussion:

- Make sure students can explain the causes of pollution, the effects of these kinds of pollutants, and why people continue to use fossil fuels, road salt, fertilizers...?
- What question is each team trying to answer?
- What is their hypothesis?
- Understand the concept of an experimental control.

Assessment:

- Students will write their procedures in a notebook, separating their methods and a short summary of why their experiment is important
- Make sure experiments are feasible, detailed, and well thought out
- Ensure experiments have a control group and logical hypothesis

Example of an experiment:

Objective: Test for acid rain in the courtyard of the school.

Hypothesis: We hypothesize that the water collected in the bucket will turn the litmus paper red, suggesting it is somewhat acidic.

Procedure:

- 1) Set up buckets in the yard
- 2) Leave buckets there until first rain storm
- 3) Collect buckets and bring samples of water from these buckets into the classroom
- 4) Test water using litmus paper
- 5) Record results

Control: *Tap water* will be compared to the buckets of rainwater collected outside

Additional Experiment ideas:

- 1) Erosion and pollution runoff
- 2) Water pollution (test for phosphorus, nitrogen...use skills from lesson 9)
- 3) Observe pollution in the stream's substrate
- 4) Test a location upstream for pollution and see if it has been carried down stream from there
- 5) Compare soil health in 2 locations (e.g. by the stream and by the school building)

Appendix G10: Lesson Plans

Lesson 10 Setting up the Pollution Experiment

Grade Level: 5th

Subject Areas: pollution, designing an experiment, scientific method

Duration: 1 hour

STC Kit Connections: Lesson 11 (Setting up our pollution experiments). As they set up their indoor experiments and add pollutants to their ecocolumns, they will set up their outdoor pollution experiments based on the procedures they developed in lesson 10.

Summary: Students have now studied pollution in lesson 9, developed experiments in lesson 10, and now will begin to set up their experiments in lesson 11. As they go through these activities they are required to take on more responsibility, understand how pollutants enter and exit a system, and come up with their own experiment using the scientific method.

Objective: Students will set up their experiments such that they have included a control mechanism, have followed the scientific method and have developed a hypothesis.

Materials:

- Will most likely involved water testing equipment
- Notebook, paper, pencil
- Other equipment necessary for experiments, which will vary on an individual basis

Procedure:

1. Students will set up their experiments outdoors using the procedure they developed in lesson 10
2. Ensure students experiments are in a location where they will not be ruined by other students, and are protected from inclement weather (if possible)

Discussion:

- What pollutants do you think you will find?
- Do expect the stream and local schoolyard will be clean or polluted?
- Come together as a class and talk about what your experiments are and which ones will find pollution

Assessment:

- Make predictions in nature journals, similar to the hypothesis, illustrating an understanding of the types of pollution found in nature

Appendix G11: Lesson Plans

Lesson Eleven **Observing Pollution in the Natural Environment**

Grade Level: 5th

Subject Areas: pollution, observing effects of pollution, data collection

Duration: 1 hour

STC Kit Connections: Lesson 12 (observing early effects of pollution). Observing pollution that exists in the outdoors is valuable for students to understand how their actions affect the environment. Thus, in addition to adding pollutants to their ecocolumns, they are able to see the effects of pollution in their natural environment. Students will see the impact they can have on their environment and the effects littering, urban runoff, development, and fossil fuels have on the local area.

Summary: By observing their pollution experiments, students can appreciate the impact they have on their natural world. They can see how their experiments have led them to observe things about the environment and make conclusions about the health of the stream and schoolyard around them.

Objective: Students will observe the experiments they have set up and collect data. Students should compare what they see outdoors to what they see happening in the ecocolumns, especially if students are observing salt content that comes from urban runoff, soil and plant health or acid rain.

Materials:

- Notebook, paper, pencil for recording data and making observations

Procedure:

1. Students will observe the experiments they set up
2. They should sit next to their experiment and write down what they see
3. After they have made qualitative observations, have students take the appropriate measurements to determine their experimental results
4. Have students

Discussion:

- How do we analyze results?
- How do pollutants affect our natural world

- What implications does this have for the stream's health
- Is the area you observed polluted?
- How does pollution affect the animals living in the environment you tested?
- Compare what you see in your experiment with what you observe in the ecocolumn
- How could the pollutants you tested for affect plants?

Assessment:

- Students should understand the importance of data collection
- Students will document their observations and record their data in nature journals

Appendix G12: Lesson Plans

Lesson Twelve Pollution Experiment Conclusions

Grade Level: 5th

Subject Areas: pollution, analyzing data, making conclusions

Duration: 1 hour

STC Kit Connections: Lesson 13 (where do the pollutants go?). In lesson 13 of the ecosystem unit, students observe the changes they have caused to their aquariums and terrariums. They notice more change in the terrariums, where most plants have not survived the experimental strains put on them. In the outdoor experiments, they have observed their experiments and collected data, and now they will analyze what they have collected and draw conclusions. Students who have chosen to do land experiments will compare their data with those who have done stream experiments and will see if they observe similar patterns to what they see with their ecocolumns.

Summary: Students in lessons 9-12 have now observed what is required to test water, created their own experiments, and made observations and collected data from their experiments. However, while they have been very invested in their own projects, they are missing out on their peer's experiments, which may be showing other valuable information about the health of the watershed.

Objective: The goal of this lesson is to have students make conclusions about their own experiments, but also to understand how pollution affects stream and terrestrial ecosystems. Thus, students will share their experiments with their peers so that they compare water and land experiments and the implications this has for the overall health of an ecosystem.

Materials:

- Notebook, paper, pencil or writing down observations about other experiments

Procedure:

1. Students will go around to other students' experiments and learn what they did and why they chose to run their tests
2. Students will make observations of other students' experiments and write it down in their nature journals

Discussion:

- How are streams and lakes affected by pollution in comparison to terrestrial environments?
- What are the similarities and differences of the experiments done by the class?
- What are the effects of pollutants on the overall ecosystem?

Assessment:

- Students will learn about their peer's experiments and will record this in their nature journals

Appendix G13: Lesson Plans

Lesson Thirteen Setting up the Pollution Experiment

Grade Level: 5th

Subject Areas: pollution, designing an experiment, scientific method

Duration: 1 hour

STC Kit Connections: Lesson 14 (drawing conclusions about our experiment) In lesson 14 of the ecosystem unit, students are supposed to relate their own ecocolumn experiments to problems that exist in the land and water systems on earth, specifically observing the Chesapeake Bay watershed. However, the outdoor components given in lessons 9-13 have all involved setting up experiments in the Saratoga Lake Watershed, specifically focusing on Gordon Creek. Thus, students have already observed pollution in the natural world and in their local environment. In lesson 14, students will come up with solutions to the problems they observed in their experiments and will do the best they can to change these problems.

Summary: Students have spent a long time coming up with experiments, setting them up, and observing pollution in their local environment. However, it seems counterintuitive to find pollutants and not come up with solutions as to how to get rid of them. Even if no pollution is found in student experiments, coming up with ideas to keep the stream ecosystem clean is a valuable experience.

Objective: As a class, students will come up with some ways they can improve the local stream environment. This may involve preventing erosion by setting up rocks along the edge of the stream, picking up trash along Gordon Creek, planting native trees and plants along the stream, etc. There are many ways to clean up a stream ecosystem, and having knowledge of the pollutants that are detrimental to the stream ecosystem will help students understand what needs to be done to improve the health of the environment.

Materials:

- Camera
- Plastic garbage bags to collect trash
- Gardening gloves
- Shovel
- Materials are dependent upon the project the class decides to choose

Procedure:

3. Students will come up with ways that they can reduce the amount of pollution they have

observed in previous experiments

4. If not pollution was observed in any of the experiments, students will come up with ways to protect the health of the environment and stream ecosystem
5. Students will go out and do a clean up exercise that involves picking up trash, restoring the stream ecosystem from erosion or sedimentation, planting trees where there has been environmental degradation, etc.
6. One of these projects should be chosen, not all. If there is more time later on, students could go back out and do a different restoration project.

Discussion:

- What is required to restore a stream ecosystem?
- How can we avoid pollution occurring in the first place?
- Where does pollution come from?
- What is the overall health of Gordon Creek and the surrounding area, and how can we maintain/improve this health?

Assessment:

- Students should reflect on their experiences cleaning up the watershed, what this means to them, and what they would do in the future to maintain and improve the creek's health
- Additionally, students should draw pictures of the creek and illustrate their interpretation of it after they have studied it in great detail and taken the time to clean up various pieces of it. This will be a follow up activity to the mapping activity they did earlier in the year.

Appendix G14: Lesson Plans

Lesson Fourteen Examining Real Environmental Problems

Grade Level: 5th

Subject Areas: Erosion, pollution, green plants, sedimentation, macroinvertebrates

Duration: 1 hour

STC Kit Connections: Lesson 15 (examining a real environmental problem). Students have spent several lessons observing real environmental problems in their local watershed and around Gordon Creek. They will now apply the knowledge they have gained through their experiences to go on a scavenger hunt, looking for erosion, pollution, certain green plants, macroinvertebrates and sedimentation.

Summary: After spending several months observing their natural ecosystem and altering an artificial terrarium and aquarium, students should have a deep understanding of how food webs, populations, and aquatic and terrestrial systems function. They should understand the impacts pollution and environmental degradation have on these systems and what they can do to change these problems.

Objective: Students will go on a scavenger hunt to find various elements of the stream and watershed that they have studied in the ecosystem unit. They should understand where to find erosion, green plants, sedimentation, macroinvertebrates, and pollution, since they have spent several months studying these major concepts.

Materials:

- Camera
- Paper, pencil, clipboard
- Plant identification book

Procedure:

1. Students will walk around the school yard in groups of 3 looking for a list of items that they have studied throughout the semester
2. Each group will carry a camera, so they can create a photo journal of their local ecosystem
3. Once back in the classroom, students will download their pictures on the computer and create journals to show the importance of each element they have photographed
4. From previous observations and written documentation of these elements, developed in

previous lesson plans, they will put together their pictures and written descriptions of watershed issues

Discussion:

- What have you learned about ecosystems?
- How can we protect our ecosystem and Gordon Creek?
- What are the major threats to our watershed?

Assessment:

- Students will make photo journals from the scavenger hunt, demonstrating an understanding of where they can find various aspects of the ecosystem in their own backyard
- Students will combine their photographs with excerpts and descriptions they have written throughout the ecosystem unit, describing the major concepts they observed

Scavenger Hunt: Items to Find

1. Find an example of erosion (remember, erosion is defined as the carrying away of solids due to wind, water, and other environmental causes, that often occurs along the edges of streams)
2. Find the invasive species, garlic mustard
3. Find an example of non-point source pollution
4. Find a macroinvertebrate
5. Find an example of sedimentation (this is defined as an accumulation of gravel or sediment)
6. Find an example of some animal that lives in the stream ecosystem
7. Find an example of some animal that lives in the terrestrial ecosystem
8. Find an example of point-source pollution that you have studied
9. Find the native species, white ash
10. Find an example of a food web