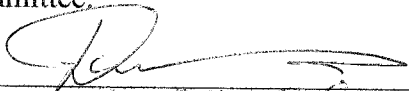
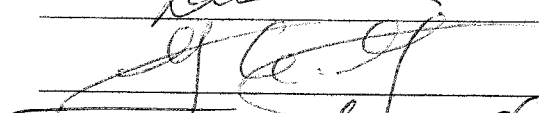
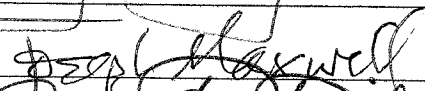
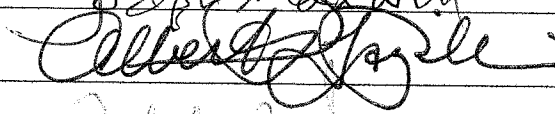
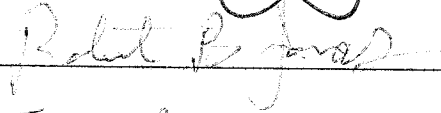
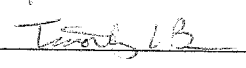
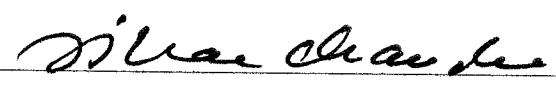


KEEPING GREEN SCHOOLYARDS GREEN: A STUDY OF CHALLENGES AND  
SUCCESS STRATEGIES FOR THE LONG-TERM SUSTAINABILITY OF  
SCHOOLYARD HABITATS

by

Margaret A. Redman  
A Thesis  
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of  
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Keeping Green Schoolyards Green: A Study of Challenges and Success Strategies for the  
Long-Term Sustainability of Schoolyard Habitats

A thesis submitted in partial fulfillment of the requirements for the degree of Master of  
Science at George Mason University

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## DEDICATION

This work is dedicated to my grandmother, Patricia Lou Shalap, who graduated from George Mason University with highest distinction in 1975. Thank you for your encouragement and for lending me your “smarts” gene.

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I would like to thank my advisor, Dr. Parsons, for guiding me through my undergraduate and graduate studies and for always being available when I needed to drop by with a long list of questions. My committee members, Drs. Maxwell and Guagnano, for sharing their wisdom of all things qualitative and quantitative research. Dr. Mark Uhen, for inviting me to teach his lab class and for sparking an interest in ancient armadillos. I never would have been able to pursue this study without the permission and support of National Wildlife Federation. I extend my thanks to all of the fantastic people I got to meet while there, some of whom provided technical assistance, background knowledge, and suggestions, and all of whom made coming to work more enjoyable. Special thanks go to my supervisors, Nicole Rousmaniere and Eliza Russell, who gave me the opportunity to work on this project. I am also indebted to all of the educators and volunteers that took the time to speak with me about their schoolyards and that responded to my survey.

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## LIST OF ABBREVIATIONS

Adequate Yearly Progress .....	AYP
California Instructional School Garden Program .....	CISGP
Common Core of Data .....	CCD
Confidence interval .....	C.I.
Degrees of freedom .....	df
Elementary and Secondary Education Act of 1965 .....	ESEA
Exponentiated beta .....	Exp(B)
Full Time Equivalent .....	FTE
Geographical Information System .....	GIS
National Center for Education Statistics .....	NCES
National Wildlife Federation .....	NWF
No Child Left Behind .....	NCLB
No Child Left Inside .....	NCLI
Private School Universe Study .....	PSS
Standard error .....	S.E.
United States Department of Education .....	USED
Water Education for Teachers .....	WET

## ABSTRACT

### KEEPING GREEN SCHOOLYARDS GREEN: A STUDY OF CHALLENGES AND SUCCESS STRATEGIES FOR THE LONG-TERM SUSTAINABILITY OF SCHOOLYARD HABITATS

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George Mason University, 2013

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Despite the well-researched benefits of nature exposure for physical and emotional well-being, children today spend less time outdoors than in years past. As a result, the green schoolyard movement, which aims to transform school campuses from grass and asphalt to diverse havens of nature, has emerged to address this issue. A wealth of information is available to educators on how and why to begin green schoolyard projects, but little empirical research exists on sustaining these projects for many years after their installation. This study used interviews and survey data to examine schools involved with the National Wildlife Federation's Schoolyard Habitats program to identify challenges associated with green schoolyards and strategies used to avoid or overcome these challenges. The mean habitat certification date of the schools selected for interviews was late 2002. Three hundred six (306) of these schools still maintained their habitats and

used them for educational purposes, while 136 schools had removed their habitats or no longer used them. Challenges to habitat sustainability cited by interviewees were separated into three categories: challenges arising from 1) habitat design and location, including safety and usability issues, wildlife conflicts, damage, and weather and seasonality; 2) the school environment, including constrictive curriculum, lack of teacher involvement, lack of time, unsupportive administration, and lack of funding; and 3) lack of community involvement, including lack of understanding, maintenance, and difficulties with the habitat workforce. One of the most readily apparent causes of habitat abandonment was turnover of habitat leaders, which was mentioned by numerous interviewees. Additionally, schools that experienced low turnover of habitat leaders were 28% more likely to still use their habitats than schools with complete turnover of habitat leaders. Elevating habitats to school priorities by involving more teachers and community members, gaining upfront administrative support, and incorporating the habitat projects into school culture was seen as important to avoid the challenges posed by turnover. Suppliers of green schoolyard grants should also consider needs-based applications in their decisions, because schools in areas with high and low rates of poverty experienced different levels of funding-based challenges. Since green schoolyards have the potential to provide wildlife habitat in urbanized landscapes and to boost mindfulness of the environment in young people, increasing the long-term success rates of green schoolyard projects could have major implications for conservation.

## CHAPTER 1: THE GREEN SCHOOLYARD MOVEMENT

It is well accepted that children spend far less time outdoors today than in years past (Juster et al. 2004; Louv 2008; Clements 2004). Rivkin (1997) suggested that the reason today's children are stuck indoors goes back to urbanization and industrialization. These events have had far reaching effects on children that limit opportunities for outdoor exposure. More children live in apartments or cramped city neighborhoods with few open spaces. Pollution and crime make outdoor play riskier than in the past. In many families, both parents work during the day and there are fewer adults to supervise children at play outside. And of course, television, video games, and the internet provide endless sources of indoor entertainment. Richard Louv (2008) described the result of the replacement of outdoor play with indoor media and strict school schedules as "nature-deficit disorder."

There is a broad body of literature on children's need for nature for physical and emotional wellbeing, as well as to improve behavior and learning. Considering that schoolyards may be one of the few places where children receive routine outdoor exposure, many researchers and educators have pushed using natural elements on school campuses to increase children's time spent in nature (Rivkin 1997; Dymont & Bell 2007; Danks 2010; Cronin-Jones 2006). The renovated grounds go by many names: green schoolyards, ecological schoolyards, sustainable schoolyards, schoolyard habitats,

naturalized schoolyards, schoolyard restoration, and school gardens (Houghton 2003, cited in Dymont & Bell 2008). Regardless of the name, this movement is an ongoing, international shift toward creating schoolyards with diverse natural features that support wildlife and increase ecosystem services (Danks 2010). Green schoolyards create opportunities for play, exploration, and learning, and evidence abounds for their potential to create happier, healthier, and higher achieving students.

However, the promotion of outdoor play and learning is often cited as competing with the strict, standards-based testing process mandated by the No Child Left Behind Act of 2001 (NCLB). Schools have been forced to remove programs like physical education and recess to focus more time on reading and math lessons (Henley et al. 2007). This could come at a major cost, since studies indicate that outdoor recreation may actually improve classroom behavior (Rasberry et al. 2011; Barros et al. 2009). Research has suggested that green schoolyards, school gardens, and environmental education programs are actually associated with higher rates of academic achievement (Lopez et al. 2008; Glenn 2000; Danforth 2005; Blair 2009), even though the standards-based testing process is frequently credited as the major deterrent for using green schoolyards more often (Henley et al. 2007). Several studies have found that even just having access to views of green yards from windows may possibly improve academic performance and reduce stress (Matsuoka 2008; Wells & Evans 2003).

Cronin-Jones (2006) conducted an even more comprehensive study seeking to understand whether schoolyard learning could sufficiently meet the science standards required by NCLB, while also fulfilling the K-12 guidelines of the North American

Association for Environmental Education. The study was conducted with elementary school students, measuring their standards-based science knowledge, environmental attitudes, environmental behavioral intentions, and perceptions of the schoolyard. Science knowledge was measured with a ten item quiz; environmental attitudes and environmental behavioral intentions were measured with 10 item Likert-type instruments that ranged from agree to disagree; and student drawings of the schoolyard were used to measure schoolyard perception based on a seven item rubric. Students completed each of the four instruments before and after a series of six lessons taught in the schoolyard over six weeks. After the six outdoor lessons, students' scores improved significantly in all four areas (100 percent increase in science knowledge and attitudes, 25 percent increase in positive schoolyard perception, and 11 percent increase in behavioral intentions), with especially high impacts on younger students.

There is also evidence that green schoolyards have health benefits, particularly in relation to obesity and obesity-induced diseases (McCurdy et al. 2010). Blacktops and lawns that characterize the typical schoolyard offer few recreational opportunities other than structured sports. Schoolyards with green elements like gardens, trees, and nature trails provide a diverse array of activities to engage more students in outdoor play (Dyment et al. 2009). Plus, green schoolyards are often described by students as places of peace and calm (Keena 2011), so it makes sense that the yards may dull symptoms of attention deficit/hyperactivity disorder (Kuo & Taylor 2004; Taylor & Kuo 2011). Green schoolyards can also engage cognitively disabled children when elements such as sensory gardens are employed (Hussein 2012). McCurdy et al. (2010) concluded an extensive



review of health and nature studies by recommending more outdoor exposure for children to decrease rates of obesity and related conditions and to increase psychological wellbeing in the process.

Green schoolyards may provide health benefits in more ways than increasing exercise and catering to special needs students. School gardens have been shown to increase students' knowledge of vegetables and their preferences for and willingness to taste vegetables (Ratcliffe et al. 2009; Morgan et al. 2010; Parmer et al. 2009). According to the World Health Organization (2004), inadequate fruit and vegetable consumption is linked to host of non-communicable diseases, including cardiovascular diseases and cancer. School gardens, therefore, could help to curb the rates of these ailments by developing healthier habits in children that do not currently incorporate enough fruits and vegetables into their diets.

An important goal of environmental education is to develop students that will demonstrate pro-environmental behavior later in life (Tanner 1980). Hungerford and Volk (1990) cite environmental sensitivity as being one of the most important precursors to pro-environmental behavior, and it appears that environmentally sensitive people have a history of rich outdoor experiences in pristine environments over a long period of time. Although Chawla (1998) reveals that the significant life experiences theory popularized by Tanner (1980) may be more complicated than originally proposed, there is overwhelming evidence for outdoor learning experiences playing at least a partial role in the development of pro-environmental behavior, behavioral intentions, and environmental

beliefs (Ewert et al. 2005; Wells & Lekies 2006; James et al. 2010; Kellert 1998; Cheng & Monroe 2010).

In addition to the host of benefits offered by green schoolyards, it is often the case that green schoolyards are simply preferred over grass and asphalt. In a study of educators working at child care centers in Canada, Herrington (2008) found that schoolyards with an abundance of natural features received more favorable reviews than facilities that lacked plants. Additionally, educators in the study sample wanted more plants, water, and space for the schoolyard and less concrete. Studies on student views resulted in similar findings: children that were unsatisfied with the current state of their schoolyards desired more greenery (Odzdemir & Yilmaz 2008). Even the surrounding community may find reasons to appreciate a green schoolyard, because in urban environments, schoolyards can function as “pocket parks,” green areas that are much more accessible to the community than larger tracts of distant parkland (Schulman & Peters 2007; Assadourian 2003).

The advantages of green schoolyards extend beyond the benefits they provide to educators, students, and communities. The dual purpose of green schoolyards means that they should cater to wildlife as well as children, and schools that implement native plants in their green schoolyard designs may be making the best use of their spaces. Many researchers, organizations, and government agencies promote the values of gardening with natives, citing the facts that they best support wildlife and that they are easier to maintain without fertilizers and pesticides (Lady Bird Johnson Wildflower Center 2013; National Wildlife Federation 2013; U.S. Forest Service 2011; U.S. Environmental

Protection Agency 2012). Entomologist Douglas Tallamy contends that gardening with native plants in suburban landscapes is imperative for increasing biodiversity and preventing local extinctions of native wildlife (Tallamy 2007, 2009). His research indicates that native plants are more capable of supporting lepidopterans in the mid-Atlantic than invasive and nonnative ornamental plants (Tallamy & Shropshire 2009), and that yards with exclusively native landscaping have higher species richness and abundance of birds and caterpillars than lawns with a mixture of native and nonnative plants (Burghardt et al. 2009).

An additional scientific study conducted by Steffenie Widows in 2010 sought to uncover whether or not yards that were certified as wildlife habitats by National Wildlife Federation (NWF) actually delivered more habitat to wildlife as opposed to nearby noncertified lawns (cited in Cubie 2012). Her sample included 50 homes in Orlando, FL, as well as the noncertified yards directly to the right of the certified yards, and 50 randomly selected, noncertified yards in the same neighborhoods. The certified backyard habitats, which are comparable in design to schoolyard wildlife habitats, were more likely to provide food, water, cover, and places to raise young for wildlife, and certified yards had higher species richness than noncertified yards. These results indicate that even small chunks of land in suburban and urban locales can benefit wildlife if they are designed with native plants and other green elements.

Despite the extensive research into the effectiveness of and preference for green schoolyards, many urban school grounds still consist primarily of lawn and asphalt, according to a GIS analysis of urban schoolyards in Baltimore, MD, Detroit, MI, and

Boston, MA (Schulman & Peters 2007). The majority of the schoolyards in the study sample lacked green space other than lawn, which Schulman and Peters (2007) estimated provides fewer behavioral and ecological benefits than tree cover. Clearly, the green schoolyard movement still has many more schools to reach. There are a number of programs run by government agencies and non-profits to assist and encourage schools in converting their grounds from barren asphalt and uniform lawn to diverse ecological communities (Rivkin 1997; Danks 2011).

However, for over a decade, environmental education has been hindered by the passage of the No Child Left Behind Act of 2001, which reauthorized the Elementary and Secondary Education Act of 1965 (ESEA). Under NCLB, schools and school districts are required to make adequate yearly progress (AYP) toward achieving a 100 percent rate of students reaching academic performance goals (U.S. Department of Education [USED] 2004). Schools and districts not making AYP are subject to corrective actions. One of the flaws with this system, according to advocates of environmental education and schoolyard learning, is that AYP is measured solely in terms of proficiency on language arts and math standardized tests and graduation or attendance rates (Griffith 2008; Marx & Harris 2006). Although states are required to develop science standards and test science skills, this does not factor into the all-important AYP measures, and so teachers are obligated to spend more time on reading and math and less time on science. Additionally, the standardized assessments encourage “teaching to the test” via fact memorization rather than building a deep understanding of science knowledge, especially in low performing schools (Marx & Harris 2006).

Some changes have taken place under the Obama administration. President Obama released his blueprint for educational reform in 2010, stating his intentions of giving more flexibility to states under NCLB (USED 2010). At its conception, NCLB mandated that all schools reach 100 percent student proficiency by the end of the 2013-14 school year. However, President Obama has offered states waivers for meeting this goal and has given states more discretion to determine appropriate actions for strengthening underperforming schools (Obama 2012). In exchange for waivers, states must set higher standards that prepare students for college and careers. It is yet to be seen exactly how these changes will affect environmental education, but another action at the federal level that has validated the green school movement was the 2011 establishment of the Green Ribbon Schools award program (USED 2013). Schools can be nominated for the award to the U.S. Department of Education by their state departments of education, provided they exemplify the three pillars of the program: reducing environmental impact and costs, improving health and wellness, and teaching environmental and sustainability education. Green schoolyards have the potential to meet all three of these criteria, at least in part. Since this award holds the same level of prestige as the Blue Ribbon Schools Award, which recognizes schools for outstanding academic performance, the Green Ribbon Schools award gives motivation and incentive to schools to green their grounds.

Furthermore, a coalition of businesses and organizations are calling for more change at the federal level in support of environmental education by backing the aptly named No Child Left Inside Act (NCLI). If passed, this legislation would further amend the ESEA to provide incentives for states to create environmental literacy plans and to

allocate funding for teacher training in environmental education (NCLI Coalition 2013). Since the outdoors is such a critical component of environmental education, the passage of such a bill could have a massive impact on the green schoolyard movement.

The institutions involved with the green schoolyard movement are countless. National and international nonprofits provide resources and a forum for collaboration among educators (e.g. Green Schoolyard Network, International School Grounds Alliance, Children and Nature Network, North American Association for Environmental Education). Popular environmental education curriculum and professional development opportunities for teachers are available through organizations like the Project WET Foundation, the Council for Environmental Education's Project WILD, and the American Forest Foundation's Project Learning Tree. Educators can seek technical assistance and guidance through U.S. Fish and Wildlife Service's Schoolyard Habitats program and the U.S. Green Building Council's Center for Green Schools. The National Gardening Foundation and National Gardening Association both support children gardening in schools, and some botanic gardens like the Chicago Botanic Garden provide teacher training and outreach to schools. International efforts like the Eco-Schools program push school greening on a number of levels, including school grounds. Many areas also have green schoolyard programs at the state or local level, such as the Boston Schoolyard Initiative and the California School Garden Network. Plus, some universities get involved with environmental education outreach in their communities (e.g. North Carolina State University's Natural Learning Initiative). For-profit companies have joined the green schoolyard movement by providing grants, such as Lowes with their Charitable and

Educational Foundation. Finally, certification programs, including the National Wildlife Federation's Schoolyard Habitats program, provide recognition to schools that provide habitat to wildlife by greening their schoolyards.

## CHAPTER 2: SCHOOLYARD HABITATS PROGRAM AND GREEN SCHOOLYARD CONTINUITY AND ABANDONMENT

The program that is the topic of this thesis is the Schoolyard Habitats program, a green schoolyard certification program offered by National Wildlife Federation (NWF 2012). In addition to the goal of educating students about the natural world and creating environmental stewards, the Schoolyard Habitats program aims to conserve the environment by providing suitable habitat to wildlife. The program offers a certificate and press release to schools that provide food, water, cover, and places to raise young for wildlife on their school campus and that then use the resultant habitat area for education. The wildlife habitats that result include butterfly gardens, nature trails, ponds, outdoor classrooms, and ecosystem restoration projects. These habitats serve as easily accessible areas in which educators can provide students with learning opportunities in a functioning ecosystem.

Nearly 5000 schools and other education-based institutions have certified habitats with National Wildlife Federation as of 2012. However, it was revealed during an extensive phone survey as part of this study that some of these schools no longer maintain their habitats or participate in outdoor education. Unfortunately, relatively little information exists in the literature about the reasons underlying green schoolyard continuity or abandonment. However, if green schoolyards are considered to be an



innovative program of which educators can choose to take part in, then there is a wealth of material which may help to explain why some schools are so successful at sustaining green schoolyards and others only keep the projects for a short time.

One of the most comprehensive studies of why programs succeed or fail in schools is the book “Innovation Up Close: How School Improvement Works” (Huberman & Miles 1984). The authors followed 12 schools as they implemented innovative programs. While only one of these programs was related to environmental education, their results provide an in-depth look at the specific processes and factors leading to the success or failure of the programs. Program success was measured by six outcomes split into two groups: stabilization, percentage of use, and institutionalization, as well as student impact, user capacity change, and job mobility. Stabilization was defined as a “compound of practice mastery and program settled-ness.” Percentage of use referred to the proportion of educators utilizing the program. Institutionalization was the degree to which the program became “built in” and routine. The second set of outcome measures focused on how the program affected participants. Student impact, while somewhat self-explanatory, was measured by changes in student behavior and achievement. User capacity change measured the degree to which educators gained skills, knowledge, or attitudes that benefitted them professionally. Finally, job mobility referred to the movement of educators and administrators up, down, sideways, or away from their school, district, or the field of education.

Huberman and Miles (1984) defined success of an innovative program to mean “stable, built-in, widespread use of a well-designed innovation that had a positive impact

on students and teachers.” The best outcomes were associated with administrative enforcement of the innovation, along with high levels of assistance and low levels of changes to the initial innovation design. Moderate to high outcomes were achieved in “overreaching” scenarios—when users pushed themselves above and beyond their capabilities. These scenarios led to mastery of the innovation and high impacts on students, but institutionalization fell as job mobility increased. Moderate to low outcomes came about when users were allowed to change the innovation, which usually resulted in a “downsizing” of the program. The lowest outcomes occurred in schools where the program was poorly designed and inadequately prepared for the school and faced indifference from users and administrators. In these cases, use of the innovation may have already been low initially and eventually dropped off further. If the general conclusions drawn by Huberman and Miles (1984) can be extended to innovative green schoolyard programs, then their findings may shed some light on the processes leading to success or failure of green schoolyards.

However, one of the main differences between the Huberman and Miles (1984) case studies and green schoolyards is that in many cases, schoolyard greening projects are led by one interested teacher or volunteer, with little to no real administrative involvement. This model seems to fit somewhat with the “islands of innovation” phenomenon presented by Tubin et al. (2003) in reference to technological innovations in schools. An island of innovation is defined as an innovation that is practiced by less than 15 percent of teachers and/or students. In contrast, a school-wide innovation involves at least half of the teacher and/or student population (Forkosh-Baruch et al. 2005). In some

of the cases observed by Tubin et al. (2003), innovations appeared to be carried out in only a few classrooms or by a few teachers. These “islands” existed against the background of more traditional approaches.

Avidov-Ungar (2010) suggested that the islands approach may stunt comprehensive (school-wide) innovation, especially when an island of innovation is being used as a pilot program with the hope that the innovative technology will spread throughout the school. Often, islands of innovation spring up as a result of administrative pressures to compete with and conform to the higher educational standards of other schools. Because there is no change in the culture of the organization, the gap created between the vision and values of the teachers and those of the overall organization results in the failure of innovation diffusion. The islands may prevent more comprehensive change, because they give the appearance that the school is succeeding in incorporating innovations, when in fact, the majority of the school has not.

Islands of innovation may also form by a bottom up process led by enthusiastic teachers (Avidov-Ungar & Eshet-Alkakay 2011), which is often the case with green schoolyards. But islands of innovation produced by bottom-up approaches usually lack the necessary amount of administrative support and tend to be short-lived (Darling-Hammond 2000 and Hanson 2001, cited in Avidov-Ungar & Eshet-Alkakay 2011). However, when spontaneous, bottom-up islands of innovations do receive administrative support, they can also be quite successful (Kozma 2000, cited in Avidov-Ungar & Eshet-Alkakay 2011). Thus, at least in the case of technological innovations, it appears that the route of implementation—either in islands or school-wide—greatly influences the

effectiveness and success of innovations in schools. These models have not been applied to schoolyard greening, but considering the wide range of implementation strategies of green schoolyards (Vesalind & Jones 1998; Danks 2010), it is quite possible that the method of implementation could be a process that affects the continuity or abandonment of green schoolyards.

Additionally, there may be physical factors that influence the implementation and long-term success of green schoolyards. For example, the size of the schoolyard may play a role in greening projects. Since schools must have some level of impervious surface cover for parking, walkways, and ball courts, small schools may have little room left to devote to greening projects (Schulman & Peters 2007). The budget and availability of a maintenance workforce are other components of schoolyard design. Once laid down, asphalt playgrounds require virtually no care, as compared to gardens which must be tended and maintained throughout the year. When money is tight or volunteers are few, asphalt is the clear choice. Another reason schools might remove natural elements or avoid greening altogether is the fear that trees provide cover for vandals or that natural features present too many safety hazards for young children (Schulman & Peters 2007; Rickinson et al. 2004).

It is possible that the design of the greening project could affect its sustainability as well. Danks (2010) discussed a number of important design considerations including location, comfort, signage, memorable features, building materials, and seating arrangements. Although not directly suggested, it could be the case that poorly thought out designs or designs that lack certain elements could influence their eventual continuity

or abandonment. An article by Coffee and Rivkin (1998) discussed several cautionary tales about schoolyard habitat design and concluded that educators and volunteers need to collaborate with administrators and maintenance crews to ensure that their design elements are feasible and do not conflict with any building plans or safety codes kept by the school. Additionally, if the schoolyard greening project is meant to provide a wild-looking habitat as opposed to a carefully kept garden, then signage may be needed to communicate the educational and conservation purposes of the schoolyard to the community, lest they think it unkempt (Coffee & Rivkin 1998).

Socioeconomic status of the school and parent community seems to be important as well in determining the fate of schoolyard greening efforts. Dymont (2005a) sampled principals, teachers, and parents from a number of Canadian schools with green schoolyards. Schools in areas with lower socioeconomic statuses rated a number of schoolyard elements significantly lower in adequacy than did schools with higher socioeconomic statuses. Considering that schools in high-income areas had access to more funds, this makes sense. A more interesting relationship, though, was that parent involvement with green schoolyards was much higher in schools with high socioeconomic statuses. In low socioeconomic status schools, teachers were responsible for the schoolyard greening projects. This lack of parent volunteers at schools with low socioeconomic statuses could result in lower rates of green schoolyard success.

The implementation and utilization of a green schoolyard can also be influenced by teachers' perceptions and beliefs. Simmons (1998) sought to understand teachers' perceptions about the benefits and barriers of outdoor environmental education by

assessing responses to a series of photographs representing different nature areas as educational settings. The settings depicted in the photos were deep woods; rivers, ponds, and marshes; country park; and urban nature. Participants seemed generally enthusiastic about teaching in natural settings and about the importance of their students experiencing these types of areas. However, safety hazards, difficulty managing large classes, and lack of background knowledge and training were perceived as barriers. This study assumed that field trips to natural settings would be required (versus short walks to green schoolyards), so it is possible that these barriers may not apply to the schoolyard setting. Interestingly, though, educators regarded the deep woods and lakes, rivers, and marshes settings as more appropriate for environmental education than the country park setting and urban nature. Considering green schoolyards in suburban and urban areas may be more likely to resemble the latter two settings, it could be the case that some educators do not realize the full potential of the schoolyard as an educational tool.

Although information is lacking on the strategies behind green schoolyard success and the paths leading to abandonment, several studies have been conducted on the barriers to implementing and using one component of green schoolyards: the school garden. One of the first of these studies was a survey of elementary school teachers in Virginia (Dobbs et al. 1998). Teachers that responded to the survey demonstrated a high level of interest in horticulture and gardening, and reported that the most important resource to facilitate the teaching of these subjects was additional lesson plans and curriculum. Volunteers and training were also seen as important.

Later, a national survey of teachers in elementary schools with gardens was conducted to inquire about the most critical factors to school garden success (Demarco et al. 1999). Survey respondents indicated that a “person with responsibility for school gardening activities” (usually a teacher or teacher committee, occasionally a volunteer) was the most essential factor. Secondary success factors were the availability of physical resources such as space, gardening equipment, funding, and volunteers; a availability of instructional time; and the possession of gardening knowledge.

More recent studies found similar results. Interviews and surveys of key players in California schools involved with a farm-to-school nutrition program revealed that time constraints, lack of standards-based lessons, and lack of resources were major barriers to implementing gardening and nutrition curriculum in the classroom (Graham et al. 2004). A survey of the population of California school principals showed the greatest barriers to having a school garden were lack of funding, lack of time, and lack of gardening supplies (Graham et al. 2005). Principals from schools that already had gardens reported that the greatest barriers to using them for teaching were lack of time, lack of standards-based curriculum, and lack of teacher interest and experience. Graham and Zidenberg-Cherr (2005) compiled another list of barriers to using school gardens as teaching tools, this time by surveying teachers in California schools with gardens. The major barriers were lack of time, lack of teacher interest, lack of teacher experience, lack of standards-based materials, lack of gardening knowledge, and lack of gardening training.

Two other survey and interview efforts of California schools were conducted by Hazzard et al. (2011, 2012). First, interviews were conducted with teachers,

administrators, and volunteers at ten schools that had received the California Instructional School Garden Program (CISGP) grant and whose gardens had been sustained for at least two years and were considered exemplary (Hazzard et al. 2011). The interviews revealed similar findings to previous studies in that time constraints and lack of funding were the primary barriers to using the garden and that having committed administrators, volunteers, teachers, and garden coordinators were critical to success. The following year, Hazzard et al. (2012) published a study on surveys of California school principals and garden leaders to determine which factors would predict a school's decision to apply for grants to install a garden under the CISGP. The majority of the schools that did not apply for the grant simply were not aware of it. However, the non-applicant schools that did not have a garden reported that time constraints, lack of funding, and lack of teacher interest were the greatest barriers to installing one. The barriers preventing use of existing gardens in non-applicant schools were lack of time and lack of teacher interest and experience. Survey responses from applicant schools indicated that the best predictors for garden grant application were already having an existing garden, a garden coordinator, and volunteers.

Finally, O'Callaghan (2005) surveyed principals, staff, and other stakeholders in Clark County, Nevada, one of the driest parts of the country, and found that intense involvement of teachers and administrators were most important to garden success. Interestingly, funding was not seen as a major concern, especially after the initial establishment.



Recommendations that stemmed from these eight studies on school gardens included offering teacher training programs (O’Callaghan 2005; Graham & Zidenberg-Cherr 2005; Demarco et al. 1999), promoting district-level involvement (Hazzard et al. 2012), involving a number of committed people and a garden coordinator (Hazzard et al. 2011; Graham et al. 2005), and providing standards-based curriculum (Demarco et al. 1999). There were several limitations, though, to these studies. First, with the exception of Demarco et al.’s (1999) national survey, all of these sources considered schools from only Nevada, Virginia, or California. In the case of the latter, this is likely the result of the high incidence of gardens in California schools, due to the garden and nutrition initiative started by the state department of education in 1995 (California Department of Education 2002). Second, their focus was only on school gardens, and not on the larger picture of an entire green schoolyard. Third, the focus of the school garden projects in most of these studies was mainly on adolescent nutrition and garden curriculum as it relates to nutrition, rather than to a wider range of subjects which are typically taught in green schoolyards. Fourth, the studies tended to ask successful schools what they perceived the barriers to success were, rather than focusing on the challenges faced by unsuccessful schools.

Dyment (2005b) presented one of the most relevant studies on the barriers to using green school grounds for education. She compared the reported barriers of a sample of Canadian schools involved with green schoolyards to the five major barriers to outdoor learning (in any location) set forth by Rickinson et al. (2004). Three of Rickinson et al.’s barriers held true for Dyment’s sample: Lack of teacher confidence and expertise, the

requirements of school curricula, and wider changes in the education sector and beyond (e.g. workplace unrest, too many new initiatives). Additionally, competition with other extracurriculars, poor schoolyard design, lack of administrative support, and cold climate were seen as barriers not mentioned by Rickinson et al. (2004). However, like the gardening studies discussed previously, this study does not attempt to fully address the question of why green schoolyards initiatives succeed or fail.

One of the most common guidelines to sustaining a green schoolyard or garden is to develop a detailed maintenance or stewardship plan and to assign roles to various committee members (Danks 2010, NWF Schoolyard Habitats How-To-Guide). Depending on the design of the schoolyard, maintenance may include weeding, watering, planting, filling feeders, cleaning water features, composting, and removing litter (NWF 2012). However, it is unclear how many schools develop maintenance plans and whether the creation of the plan actually leads to the continuity of the green schoolyard.

With the green schoolyard movement growing, and mounting evidence of its benefits, identifying how to keep green schoolyards green in the long term becomes increasingly important. Several studies most relevant to this question have concluded that the presence of garden coordinators, availability of funding, access to gardening resources and knowledge, teacher interest, access to standards-based materials, and time might all be influential in sustaining green schoolyard projects, but these studies focus only on school gardens and not entire green schoolyards (Demarco et al. 1999; Hazzard et al. 2011, 2012; Graham & Zidenberg-Cherr 2005). Dymont (2005a) determined that Canadian schools in areas with lower socio-economic status had lower quality

schoolyards and less parent involvement, but this study did not take into account long-term sustainability of greening projects. Danks (2010) states that a good design plan is important to create a useful outdoor learning space, but this resource did not include an empirical study of green schoolyard sustainability. Thus, information on how to sustain green schoolyard projects seems to be lacking in the literature. The purpose of this thesis, therefore, will be to provide probable explanations as to why schools are able or unable to maintain and use their green schoolyard projects over the long term, based on quantitative and qualitative data pertaining to the National Wildlife Federation's Schoolyard Habitats program.

## CHAPTER 3: METHODS

The samples of schools used for this study were drawn from the population of educational sites that had certified Schoolyard Habitats with the National Wildlife Federation (NWF) as of 31 December 2010 (N=4102). The nature of schoolyard habitats varies widely across schools. The design criteria for certification require that food, water, cover, and places to raise young are present on the school campus. The resulting habitats include a number of ecosystems and features. These habitats are much more diverse than the school vegetable garden approach that was covered in the literature review; schoolyard habitats more closely fit the description of a “green schoolyard” in that they incorporate a number of natural features. However, some schools only designate a small portion of their schoolyards as the habitat, whereas others choose to green the entire campus.

Research on schoolyard habitats for this study first began in October 2011. The original intent was for this to be a project for job-related purposes; the choice to use results for a master’s thesis was not made until several months into the process. Likewise, the research question of the factors and processes leading to the long-term sustainability or abandonment of schoolyard habitats was not defined at the outset of the project, but developed after many interviews with educators. The results of this study may provide

insight into the factors behind the success of many green schoolyard projects, but the generalizability may not extend beyond the population of NWF certified schoolyard habitats.

A number of data sources were used for analysis, including interviews with key habitat leaders, an internet survey conducted in 2012, information from schoolyard habitat certification applications, and demographic data from the National Center for Education Statistics (NCES). Each of these sources is discussed in detail below. The research process started with telephone and email interviews of a fraction of the over 4000 educational sites that had certified schoolyard habitats at the time. Later, the internet survey was developed and sent to the entire population of schoolyard habitats that had valid email addresses stored with NWF. The survey invitation was sent while interviews were still being conducted, so when updating contact information of new interviewees, if they did not previously have a valid email address on record with NWF, they were sent a personalized email with a link to the survey so that they would have the option to participate. Therefore, the survey sample included some, but not all, of the interviewees, as well as schools that were never contacted for interviews. Table 1, presented later, clarifies response rates. Of the other two data sources, information from schoolyard habitat certification applications was available for almost all schools, and NCES demographic data were retrieved for responsive schools in the interview sample and for all surveyed schools. Details about the methodology used in this study were submitted to the Institutional Review Board of George Mason University, and the study was dismissed by this body as not meeting the federal definition of human subjects research.

### *Telephone Interviews and Emailed Questionnaires*

Telephone interviews and emailed questionnaires were conducted with educators and volunteers from October 2011 to June 2012 while I worked as a temporary employee for NWF. Educational sites were not selected for interviews in a completely random fashion. Rather, for convenience of using the NWF contact information database, schools were selected alphabetically by school name through the first few letters of the alphabet<sup>1</sup>. Furthermore, the interview sample was split into three parts, or subsamples. The first two subsamples resulted from a split between two categories of educational sites: those certified prior to 1 January 2009 with fewer than two person contact names associated with them, and with those not fitting both of these criteria<sup>2</sup>. The sample of older educational sites with fewer contacts was contacted first, and was called further down the alphabet than the sample of newer schools with more contacts. This means that all of the older schools with fewer contacts with school names starting from A to D were called, whereas the newer schools with more contacts were only called through the letters A to C. Therefore, a higher proportion of older schools with fewer contacts are represented, and the sample is slightly skewed toward this type of site. For these two subsamples, no sites were contacted that had a certification date after 31 December 2010, because the most newly certified schoolyard habitats would not have existed long enough to exhibit

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<sup>1</sup> There is no reason to suspect that the name of the school would have any bearing on the success of the habitat, so this was presumed to be a reasonable method for obtaining a “random” sample.

<sup>2</sup> The reason for this split was for ease of learning how to use the database that stored all the contact information. Schools with fewer individual contact names were easier to update than schools with many names. Additionally, some schools that certified after 2008 had specific errors associated with them.

long-term success. The third subsample consisted of schools that were not contacted with any semblance of randomization, but were instead selected because of their location or other reasons for purposes non-related to this thesis. For example, all schoolyard habitats in one specific city of interest to NWF were called. Schools in this third subsample will be referred to as “non-randomly contacted schools” for the remainder of this paper. Schools in the former two subsamples are referred to as “randomly” or “semi-randomly contacted schools.”

Throughout this paper, charts and statistical outputs will only include data attained from semi-randomly contacted schools unless otherwise noted. However, when discussing interview responses in the text, information from non-randomly contacted schools may be included. Any schools that had closed since their habitat certification were also dropped from all charts and statistical outputs unless otherwise noted. Additionally, any educational sites that did not qualify as schools teaching grades from pre-kindergarten to twelve (such as nature centers, universities, and museums) or that were not located in a U.S. state or territory were dropped from the study entirely. Table 1 shows response rates and the number of dropped schools in detail.

The interviewees consisted of teachers, administrators, volunteers, and other staff members. For each school, the interview process began with a phone call to the main office, at which point a request was made to the secretary to speak to the person who applied for habitat certification (whose name would be included in the NWF database as a contact) or, in the case of faculty and staff turnover, whoever was in charge of the habitat at the present time. When possible, the interviews were completed over the phone and

usually ran for approximately 15 to 20 minutes. When habitat leaders could not be reached by phone, open-ended question sheets were sent to them by email.

The first question asked during the interview was whether the habitat was still present and being used for educational purposes. Schools that still maintained their habitats and used them for educational purposes were defined as *active habitat schools*, while schools that did not still maintain a habitat or that did not use their habitats for educational purposes were classified as *dormant habitat schools*. Schools were still considered to have active habitats even if their original certified schoolyard habitat had been removed but a new habitat was constructed elsewhere on the grounds. The lines of questioning for schools with active versus dormant habitats are available in Appendix I. Very few complete interviews were obtained from dormant habitat schools, because often there was no habitat leader in charge to answer the questions. Additionally, sometimes so many years had passed since certification that the current staff was unaware of their status with NWF. In situations where this occurred, as much information as possible was gathered from the secretary about the status of the habitat at the school.

Educators from all schools were contacted at least twice by phone or email when they were not available for an interview during the first phone call. After two unsuccessful attempts to reach an interviewee, the school was categorized as nonresponsive. When possible, nonresponsive schools were further marked “active non-interviewed” if the secretary was able to confirm that the habitat was still being used by educators.



Responses to emailed question sheets and notes from phone interviews were stored in Microsoft Excel under columns by question. Responses from schools with active habitats were stored separately from those of schools with dormant habitats. After all interviews were completed, the interview notes and question sheets were imported into QSR NVivo 10, and an initial read-through of all materials was conducted. A large set of potential thematic coding categories was developed for the two datasets representing active and dormant habitat schools during the read-through. Each coding category and the hierarchical structure of the categories for active habitat schools are presented in Figure 1. Initially, coding categories were developed for all nine questions that were asked of interviewees from active habitat schools. However, many of these categories were eliminated because they were not relevant to the study (such as the types of wildlife seen in the habitat). The final categories were limited to topics dealing with challenges<sup>3</sup> and success strategies, with the result that the majority of the coded material came from questions 7a and 9a<sup>4</sup> in Appendix I. However, material was drawn from all parts of the interviews when appropriate. For dormant habitat schools, the final collapsed coding categories were created in a question-by-question format (for questions 5b and 7b in Appendix I), and these codes are presented in Figure 2.

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<sup>3</sup> Challenges mentioned by interviewees were usually either ongoing or resulted from events that had happened in the past. Occasionally, interviewees would mention potential challenges that had not happened yet (i.e. “I think that a lack of funding could be harmful to the habitat in the future.”) All three types of challenges (past, present, and future) were included in coding categories.

<sup>4</sup> Question 7a, regarding challenges, was asked for 174 of 182 active habitat interviewees. Question 9a, regarding success strategies, was developed later and so was only asked for 121 of these interviewees.

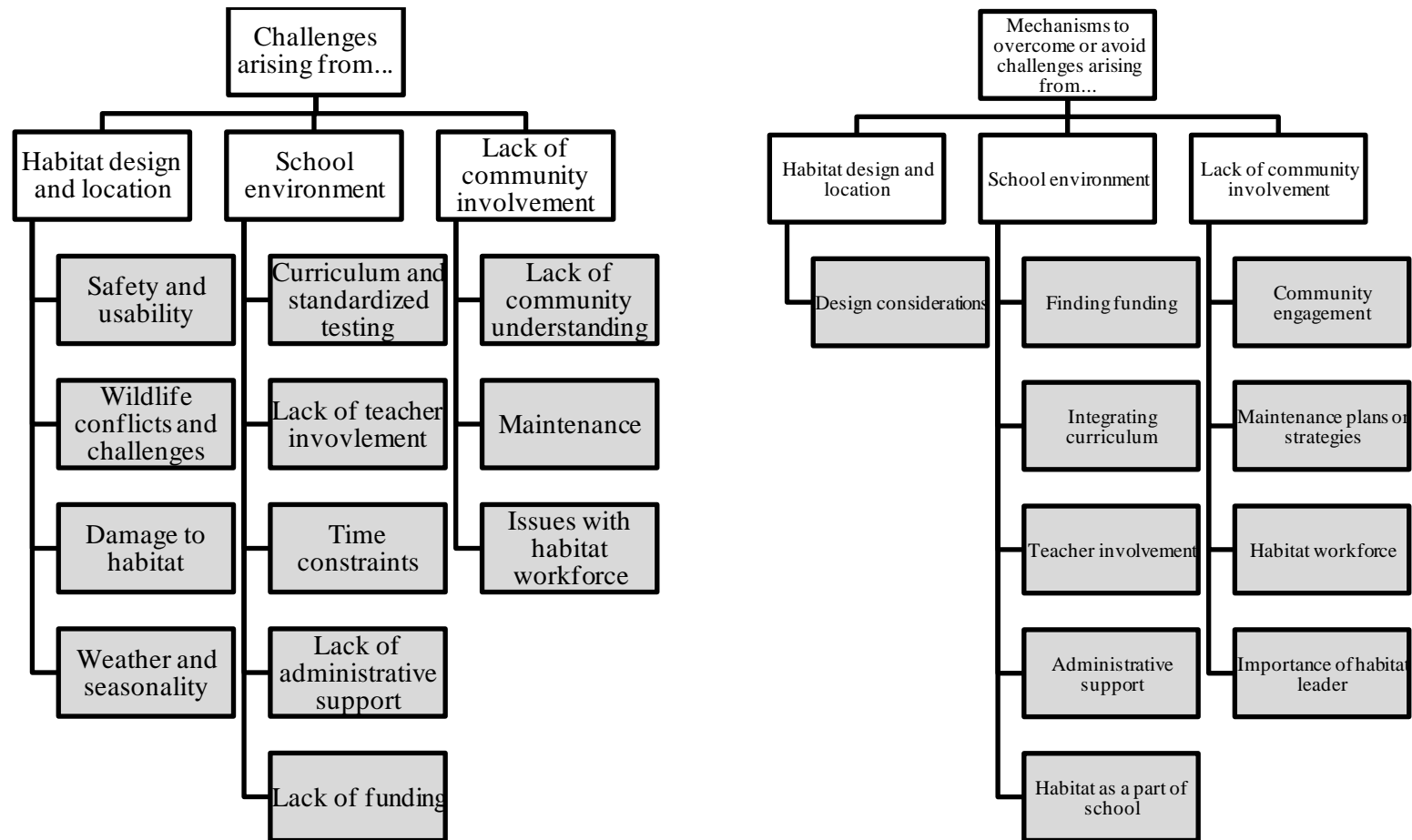


Figure 1. Hierarchy of coding categories for interview notes and emailed questionnaires from schools with active habitats. Text in gray boxes represents individual coding categories.

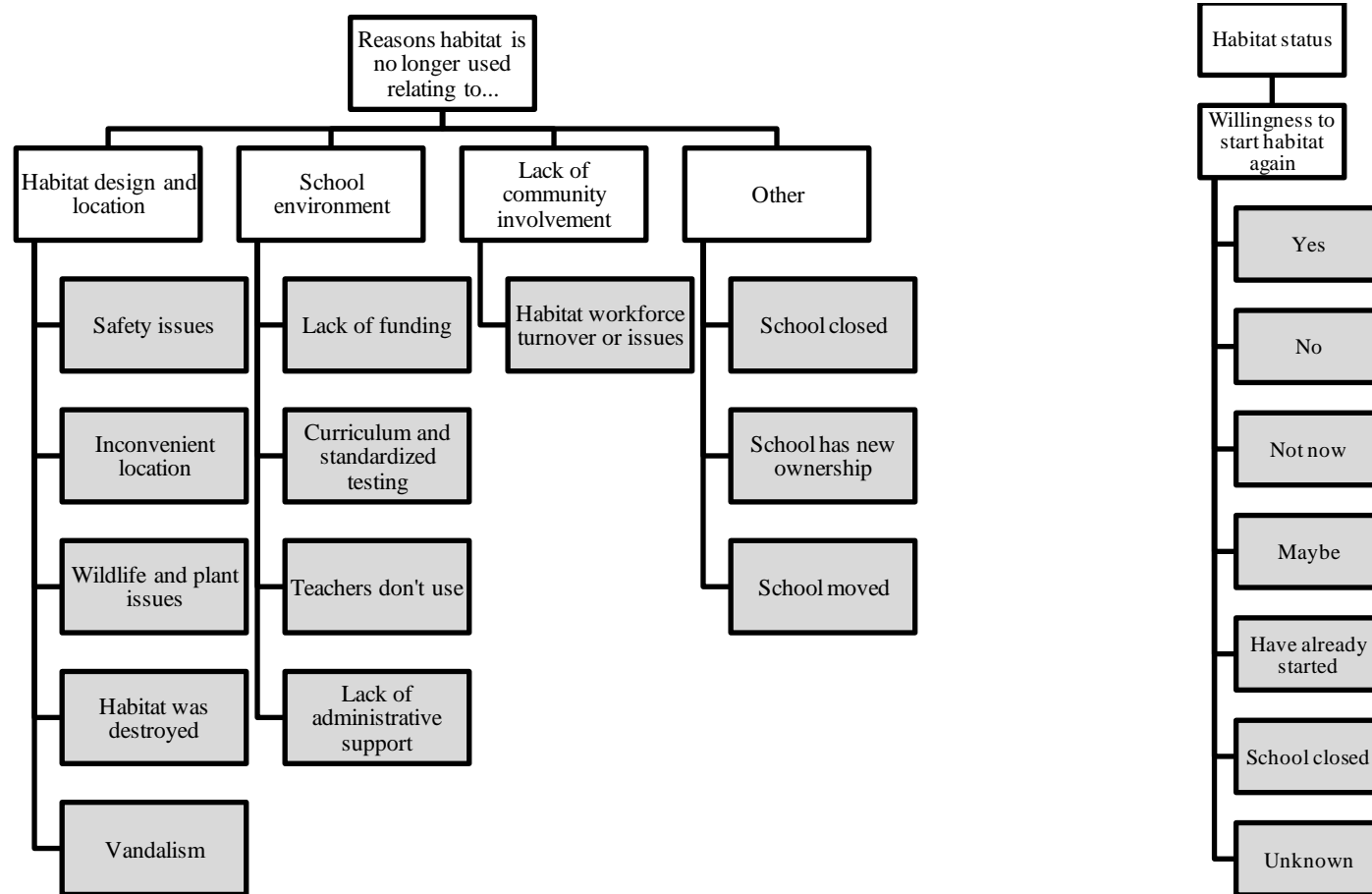


Figure 2. Hierarchy of coding categories for interview notes and emailed questionnaires from schools with dormant habitats. Text in gray boxes represents individual coding categories.

### *Internet Survey*

In addition to interviews, a survey of NWF certified schoolyard habitats was hosted on Survey Monkey, and a link to the survey was sent by email to educators on 27 April 2012. The survey link was sent to contacts from all certified educational sites with a valid email address stored in NWF's contact database<sup>5</sup>. Since much of the contact information in the database had not been updated recently, schools that certified many years ago or that had fewer person contacts would be less likely to receive the survey. Questions were designed primarily by me with input and assistance from NWF education department staff. The questions were informed by responses to the open-ended interviews conducted during the school year. The survey, which is located in Appendix II, was split into several sections. The first section collected contact information so that the survey responses could be matched to data from certification applications already stored in the NWF database. Next, questions were asked about the school, its location, enrollment, and whether or not the habitat was still present. Skip logic was used to inquire if schools without habitats planned to re-install them. Next, information about the habitat's installation and uses were asked. Most questions were closed-ended and multiple choice with chances to specify "other" choices in response boxes. The survey was not pilot tested with habitat leaders, but review by multiple NWF staff members helped to clarify some of the questions. After distribution, responses to several of the questions and comments at the end of the survey indicate that wording on a few questions may have

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<sup>5</sup> The sample for this survey overlaps with the samples for the phone interviews, but they are not the same.

been unclear, and this will be noted in analysis when information from these questions is used.

Due to several errors with the use of NWF's contact information database, some contacts received the survey in April, while others did not receive it until 23 May 2012. Multiple reminder emails were sent out to participants and they were given until 19 June 2012 to complete the survey. In an attempt to increase response rate, the email invitation offered survey respondents a free mailed copy of a curriculum booklet. It was expected that one survey response from the habitat leader would come in for each school. However, there were a few cases where multiple educators from one school took the survey, or where one educator took the survey twice. Overall, responses were retrieved from 4.4 percent<sup>6</sup> of all educational sites that were certified at the time when the first email invitation was sent. However, because of a lack of contact information for many schools, not all schools received the survey. Additionally, one of the reminder emails was sent on a listserv for educators that were not all associated with the schoolyard habitats program, making a calculation of the response rate of schools with certified habitats difficult. Unless otherwise stated, data from the survey used in this thesis is limited to U.S.-based schools with active habitats. See Table 1 for response rate details.

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<sup>6</sup> Of 4586 certified educational sites, 211 survey responses were retrieved, 7 of which were duplicates.

Table 1. Detailed response rate data for interviews and survey responses. Each line should be read as a number of respondents being subtracted from the total on the right-hand side of the previous line.

Population of NWF Schoolyard Habitats certified as of 31 December 2010, the interview cutoff date		=	4102
<hr/>			
Number contacted for interviews		=	700
-	59 Educational sites dropped because they were not schools or not located in the U.S.	=	641
-	164 Nonresponsive schools	=	477
-	37 Schools that were selected for interviews in a completely non-random fashion	=	<b>440<sup>7</sup></b>
-	120 Schools that said their habitats were still active, but were not interviewed completely	=	320
-	172 Schools with active habitats that were interviewed	=	148
-	29 Closed schools	=	119
-	8 Schools that had moved	=	111
-	4 Schools that were under new ownership	=	107
-	107 Dormant habitat schools	=	0
<hr/>			
Population of NWF Schoolyard Habitats certified as of 27 April 2012, the date of the first survey invitation		=	4586
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Number of survey responses received		=	211
-	2 Schools located outside of the U.S.	=	209
-	19 Educational sites that were not individual schools	=	190
-	19 Schools that did not respond that their habitats were active	=	171 <sup>8</sup>
-	165 Unique school respondents <sup>9</sup>	=	7
-	7 Schools that took the survey twice <sup>10</sup>	=	0
<hr/>			
Total number of U.S. schools that responded to both an interview and the survey		=	30

<sup>7</sup> These 440 schools make up the total sample size of interviewees, and data from all were used at some point in this study.

<sup>8</sup> Of these 171 schools, 123 were public, 45 were private, and 3 were unknown.

<sup>9</sup> Of these 165 unique responses, nine were from schools that could not be matched with known certified schoolyard habitats. It is possible that they never certified a schoolyard habitat but received the survey link, because they were on an educator's listserv. Nevertheless, they were kept in the sample, because they responded that they had an active green schoolyard project.

<sup>10</sup> Of the 7 schools that submitted the survey twice, in two cases it was two separate people from the same school that took the survey. In five other instances, the same person took the survey twice. All responses were included in the sample, because there were some differences in responses, even when it was the same person retaking the survey at a later date.

### *NWF Database of Certification Applications and Contact Information*

Several pieces of information used in this study were retrieved from the NWF database which houses information on the number of individual person contacts for each school and which stores details from habitat certification applications. Typically, one or several habitat leaders that went through the process of certifying their school's habitat were listed in NWF's contact information database. In the course of conducting phone and email interviews, contact information for all of the contacted schools was updated, and so the relationship between changing habitat leaders and the activity status of the habitat was calculated. Other information retrieved from this database included the certification date and size of the habitat. Certification date was available for all schools, but data on habitat size were only available for schools that certified their habitats online, which biased the sample toward more recently certified schools.

### *National Center for Education Statistics*

The final data sources used in this study were the 2009-2010 Private School Universe Study (PSS) and the 2010-2011 and 2011-2012 Common Core of Data (CCD), which are data files collected by the Department of Education's National Center for Education Statistics (NCES)<sup>11</sup>. Specifically, the number of students enrolled at the school, the number of teachers employed at the school, the grade levels taught, locale type (i.e. urban, rural, suburban), and the public or private status of the school was collected from

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<sup>11</sup> The 2009-2010 dataset was the most recent file available for the PSS. The majority of the data from the CCD, which provides information on public schools, was from the 2010-2011 dataset. The search tool for the CCD combined the 2010-2011 data with the school directory information from the 2011-2012 dataset.

both datasets. Additionally, the number of students eligible for free or reduced price lunch was collected from the CCD. This information was gathered and stored manually for each U.S.-based school in the two interview subsamples that were called in a semi-random fashion and for all surveyed schools. Several schools, most of which were preschools/daycares, were not listed in the PSS or CCD. For these schools, information on the grade levels taught and public or private status was taken from the schools' websites. The variables from the NCES datasets were then compared to variables from the interview and survey datasets to search for relationships.

#### *Quantitative Data Storage*

Quantitative data from certification applications, the NWF database, and the NCES were initially stored in Microsoft Excel 2007 before being transferred to SPSS 20. Responses to the survey were opened directly into SPSS 20 from the survey host website. Each thematic code from the phone and email interviews was also imported into SPSS as a variable with values that were equivalent to the frequency that each code appeared within the interviews from each school. For example, if the interviewee from Elementary School X mentioned wildlife conflicts twice, then that schools would have a value of "2" for the variable "wildlifeconflicts" in SPSS. Because many data sources were used for each school, school contact information was associated with each survey, interview, and database record. To protect privacy, each school was given a unique identifier. Data from the various sources were matched to the appropriate identifier using the school's name and address and the vertical lookup function in Excel. Manual checks to ensure accuracy



were run on various cells. Identifiers were used to link each dataset (excluding the survey) into one overlapping file, and then all contact information was removed. Each row in the final SPSS file represented a school. Results from the 2012 survey were stored separately to preserve cases where more than one educator from a school took the survey.

## CHAPTER 4: RESULTS AND DISCUSSION

The Schoolyard Habitats program has four design requirements for certification of a wildlife habitat—that food, water, cover, and places to raise young are provided for wildlife. This leaves plenty of options for educators to create unique outdoor spaces on school campuses where children can learn about the natural environment. Upon asking teachers, administrators, staff members, and volunteers to describe their schools' habitats, one of the most popular responses involved gardens. Butterfly and pollinator gardens were especially common, as were vegetables gardens and various theme gardens such as rainbow gardens, fraction gardens, and sensory gardens. Gardens were excellent choices for small or large spaces, but schools with especially large acreage or rural surroundings often initiated even bigger projects like prairie restorations and woodland trails. Some schools chose an aquatic focus by utilizing and maintaining wetlands, ponds, and rain gardens. Still others expressed their school's commitment to greening projects and described the entirety of the school grounds as the habitat.

According to survey responses of educators at schools that still use and maintain their habitats, the most popular subject to teach in the space was science (97.5 percent of respondents; see Figure 3), followed closely by environmental studies<sup>12</sup> (78.8 percent).

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<sup>12</sup> Environmental studies was presented as a separate answer choice from science for consistency with previously conducted NWF surveys. The answer choices overlap greatly.

This preference for science was reflected in the educator interviews, as well, where teachers were quick to mention how schoolyard habitats were useful for supplementing book-based science learning with hands-on education. Popular lessons for elementary school students included butterfly life cycles and the changing of the seasons, while young and older children alike were taught to identify native plants and animals. Teachers also discussed the integration of other subjects into science lessons. For example, math was built into lessons in the form of plant measurements and counts. In other scenarios, students would learn about health, nutrition, and the origins of their food while planting and harvesting vegetables. The two most commonly taught subjects after science and environmental studies were English (62.5 percent) and art (59.4 percent). This makes logical sense, because interviewees have described their schools' habitats as peaceful places where students can seek inspiration for creative writing and art projects.

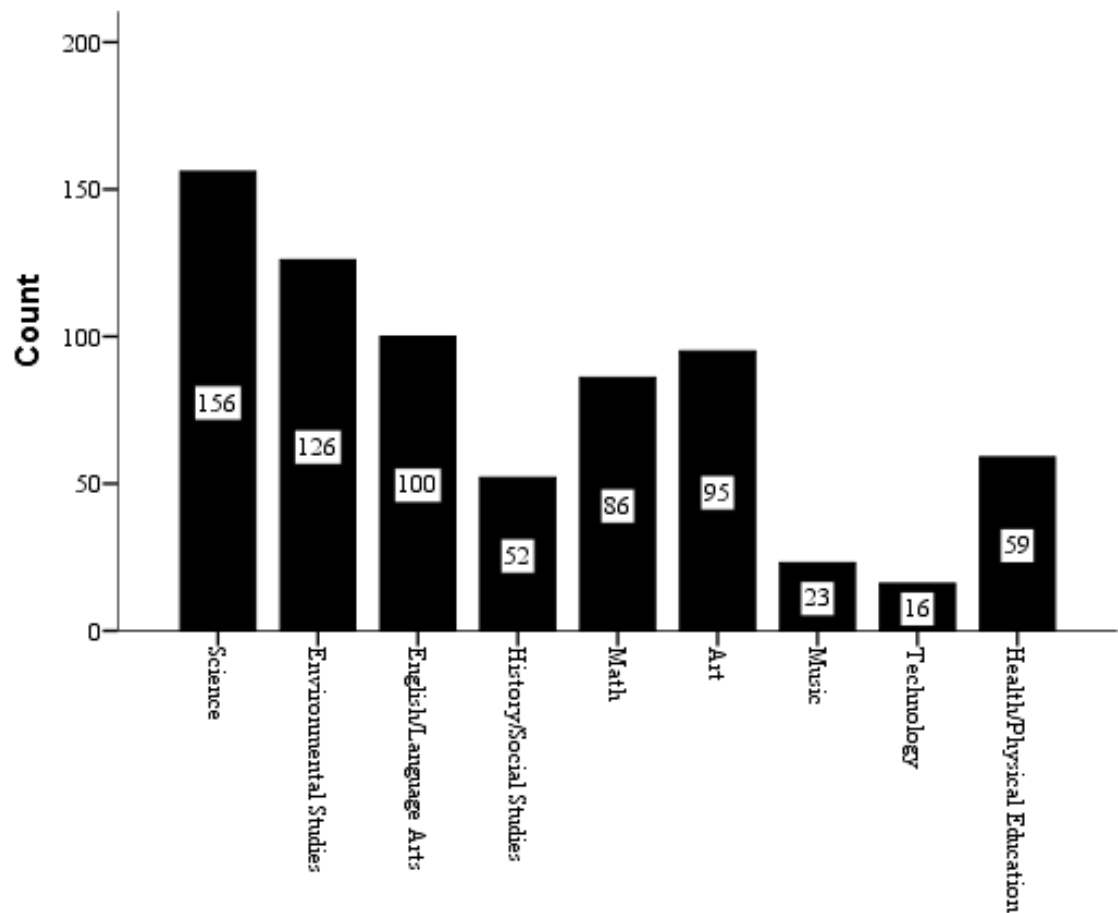


Figure 3. Number of survey respondents indicating which subjects were taught in their schoolyard habitats .  
Source: Survey data from active habitat schools.(N=160)

A total of 594 U.S.-based schools that certified habitats with NWF’s Schoolyard Habitats program were contacted for interviews in a semi-random fashion (alphabetically by organization name), and an additional 48 were contacted non-randomly (for purposes not related to this study, such as to check habitats in a specific city). These sites consisted of public and private schools ranging in grade level from pre-kindergarten to twelfth grade. Institutions were considered responsive if the existence, maintenance, and use of the schoolyard habitat could be confirmed, even if a full interview was not completed.

The total response rate (not including closed schools in the equation) was 72.9 percent. Three hundred six (306) schoolyard habitats were found to be “active,” meaning that the habitats were still being maintained and used for educational purposes. One hundred thirty six (136) schoolyard habitats were classified as “dormant,” indicating that the habitats were not being used for educational purposes, regardless of whether or not they still existed or were maintained. Finally, an additional 36 schools were closed. See Figure 4 for a further breakdown of these numbers.

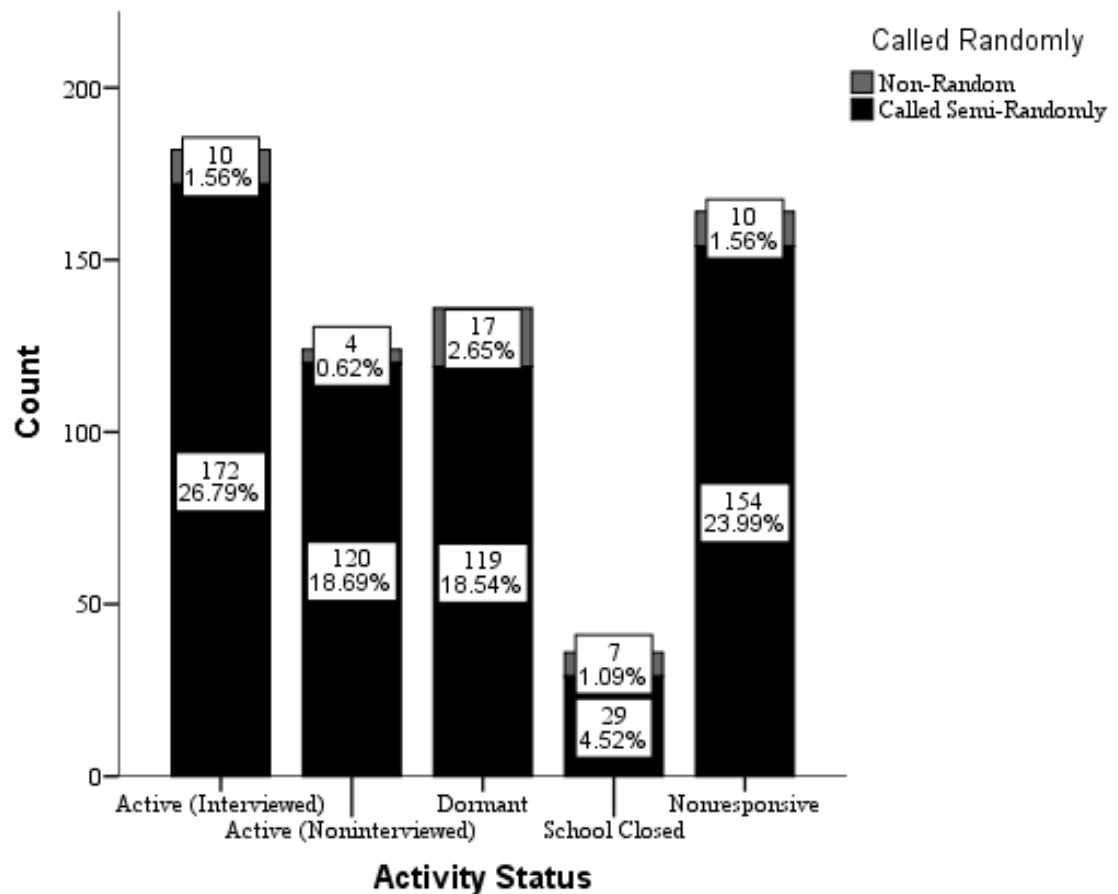


Figure 4. Counts of schools classified as active (both interviewed and non-interviewed), dormant, closed, or nonresponsive and the number of these that were contacted in a semi-random or non-random fashion. Source: All schools contacted for interviews. (N=642<sup>13</sup>)

Although the Schoolyard Habitats program of the National Wildlife Federation was created in 1996, schools and other educational institutions have been certifying wildlife habitats with NWF since 1973, when the organization's original Backyard Wildlife Habitat program was established. Figure 5 demonstrates that the median age of dormant habitats was 9.83 years, while the median age of active habitats was only 5.70

<sup>13</sup> The count is one greater than it should be according to **Table 1** because one non-randomly selected school certified after the cutoff date of 31 December 2010.

years, indicating that older habitats are more likely to be dormant than more recently certified habitats. As the years pass, there are more chances for a challenging situation to arise that would threaten the continued use of the habitat. Age is not a strict rule to determine whether or not a habitat will still be in use, though. Several schools that certified schoolyard habitats more than 20 years ago were still being used at the time of the interviews. And in some cases, schools that had certified habitats within the past few years no longer used them.

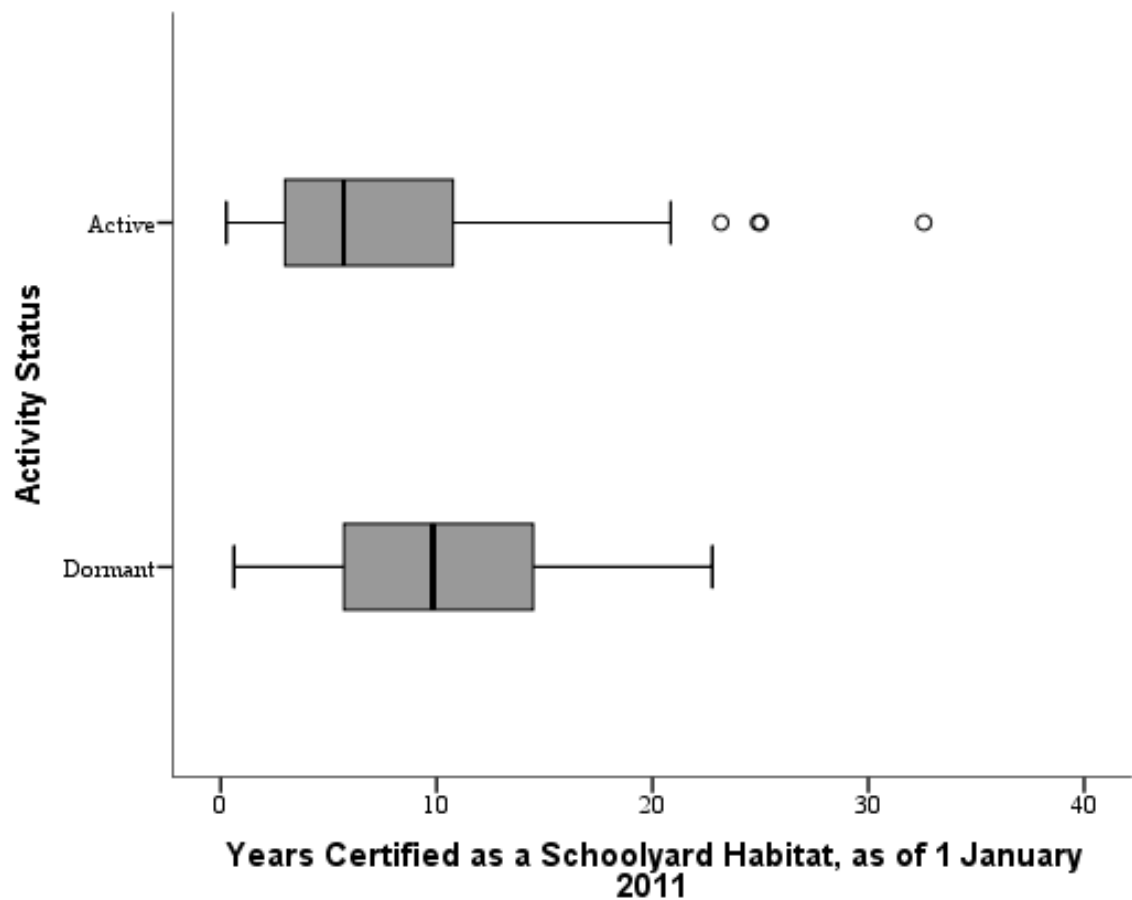


Figure 5. Status of schoolyard habitats as active or dormant plotted against the number of years that had passed since the habitat was first certified. Source: Activity status data are from schools contacted for interviews with active or dormant habitats. Years certified is from the NWF database. Does not include schools that closed or were selected non-randomly. (N=411)

The key piece of information collected from schools with dormant habitats was about the events leading up to the disuse of the habitat. Of the 136 schools deemed to have dormant habitats and that gave a reason for the discontinued use of the habitat, 51 had closed, moved, or gained new ownership, and 85 others responded with a variety of reasons as to why their schools' habitats were no longer maintained or used. Apart from schools that had closed, moved, or gained new ownership, the two responses most often



given as to why a school's habitat fell out of use were teacher or volunteer turnover and removal of the habitat (see Figure 6). However, it may be inaccurate to say that these are the greatest drivers of habitat abandonment. Rather, these seem to be pieces of information that are most memorable and most likely to be known by interviewees. This is especially true considering that many of the interviews from schools with dormant habitats had to be conducted with school secretaries or staff members that may not have been directly involved with the habitat, because often enough time had passed that the former habitat leaders had left the school and could not be contacted. While a former habitat leader might recall specific issues that led to the disuse of the habitat, such as curriculum constraints or wildlife conflicts, other staff members might not have known these details. However, they would likely recall if a major building renovation caused damage to the habitat. Additionally, school secretaries could easily confirm if the habitat leader on record with NWF had left the school, and the loss of these leaders was often the reason for a lack of maintenance or use of the habitat.

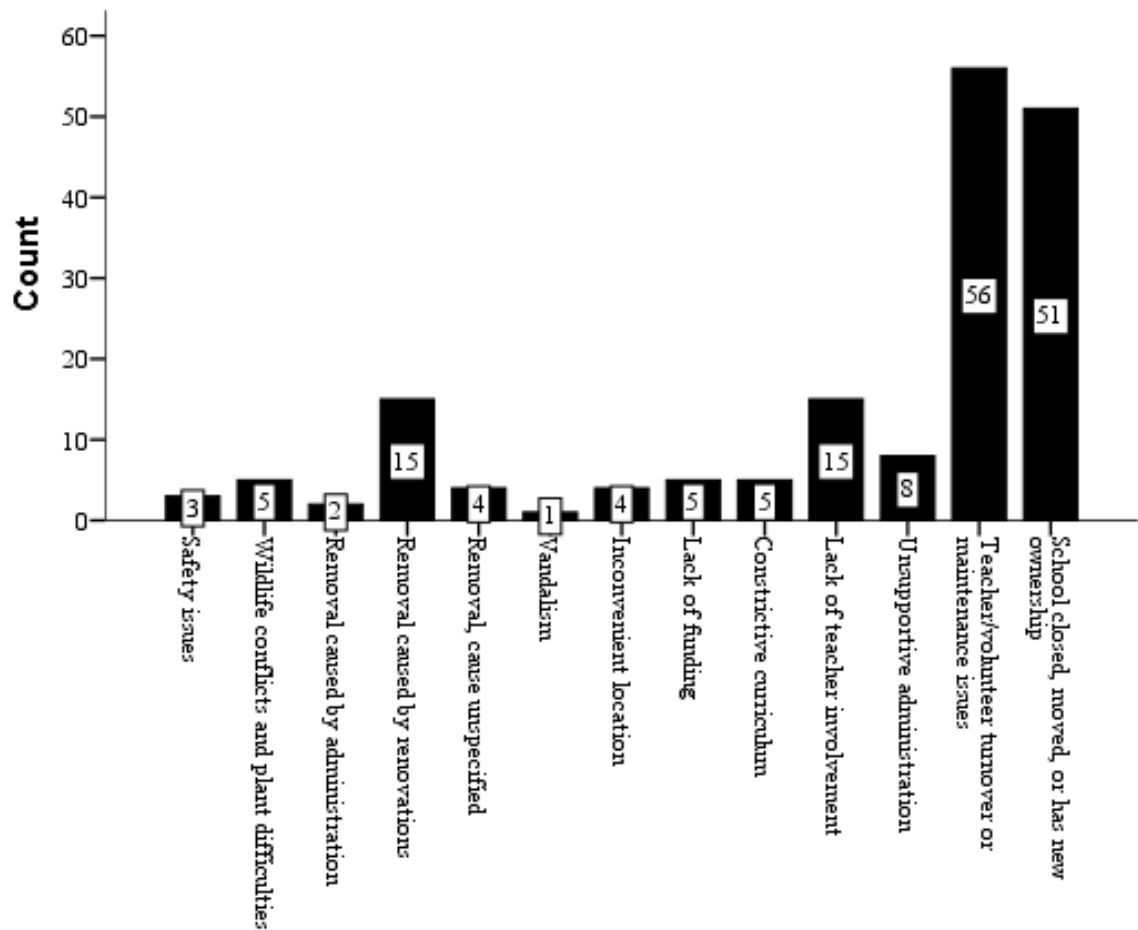


Figure 6. Reasons given by schools with dormant habitats as to why their habitats were no longer in use. Some schools gave more than one response, and 36 schools gave no response. Source: All interviewed schools with dormant habitats. Includes randomly and non-randomly selected schools. (N=172)

The responses given by schools as to why their habitats were no longer used fell into three broader categories of challenges: those at the habitat level, at the school level, and at the community level. Challenges at the habitat level were defined as those that arose in response to the design or location of the habitat, including safety issues, wildlife conflicts, major damage to the habitat, vandalism, and inconvenient location of the habitat. School level challenges were defined as difficulties associated with the school environment, such as curriculum constraints, limited funding, and lack of administrative

and teacher involvement. Turnover of habitat leaders and volunteers were considered community level challenges, because maintaining a volunteer workforce often involved engagement of the community surrounding the school. The events leading to the disuse of dormant habitats, as well as the challenges faced by schools with active habitats, will be discussed in the following sections.

## CHALLENGES ARISING FROM HABITAT DESIGN AND LOCATION

### Results

Four major categories of challenges that could be linked back to the design and location of schoolyard habitats emerged from the interviews with educators in schools with both dormant and active habitats: safety and usability difficulties, wildlife conflicts and challenges, damage to the habitat, and weather and seasonality issues. Figure 7 shows the frequency with which educators mentioned each of these challenges.

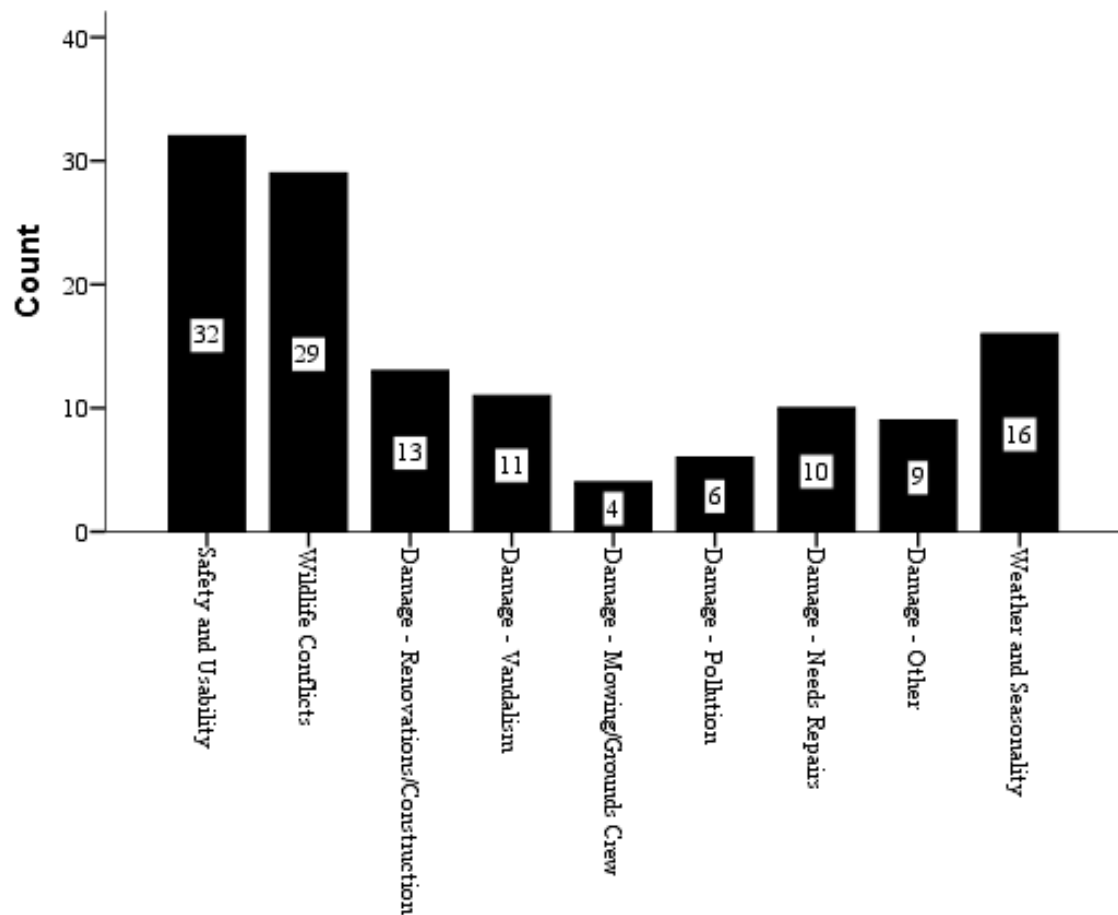


Figure 7. Number of active habitat school interviewees that mentioned specific challenges relating to habitat design and location. Eight interviewees were not asked about challenges in their habitats but may have mentioned challenges elsewhere in the interview, and those responses would be included in the chart. Source: All interviewed schools with active habitats. Includes both randomly and non-randomly selected schools. (N=182)

### *Safety and Usability*

In the course of interviewing 182 educators from schools with active habitats, 32 interviewees mentioned at least one safety or usability issue with their school's habitat. Safety issues were defined as events or circumstances surrounding the habitat that had the potential to threaten the safety of students, adults, or school infrastructure. Issues of usability, which were defined as events or circumstances that made the educational use of

the habitat difficult, were lumped together in this category, since often the two overlapped.

The source of these two challenges stems partly from the fact that outdoor classrooms are less controlled environments than traditional classrooms, and unforeseen difficulties can emerge. In several cases of schools with aquatic habitats, administrative officials stepped in and deemed the habitat a liability issue for the school because of concerns for student safety. Although no actual instances of drowning were reported, having a pond on the school grounds could pose a safety threat, especially for facilities that serve small children. In two of these cases, the habitat leaders were forced to have the areas fenced off; in another, the leader was forbidden from taking students near the pond habitat altogether.

Other safety threats were not so substantial as to require administrative involvement, but still posed challenges nonetheless. For example, some educators reported that their main difficulty was in helping students to avoid poison ivy, ticks, and insect stings. Two interviewees explained that they believed that these issues were trivial, but that parents were overly fearful that their children could be injured by ticks or snakes. At one school, worried parents exerted enough pressure to have the habitat area mowed, but a convincing argument by the habitat leader led to the regeneration of the schoolyard habitat.

A different type of safety challenge described by some interviewees was threats to the school buildings, usually from the possibility of a fire. This was particularly evident in schools with habitats that required regular burns to maintain the desired vegetation

growth, such as prairies. One habitat leader said that, understandably, there were a number of safety-related hoops to jump through when burning an area so close to the school. Another interviewee mentioned that brush piles that they kept as cover for wildlife were viewed as fire hazards and that the fire marshal wanted to remove them.

Sometimes safety issues affected the usability of the habitat, such as when fencing of ponds limited accessibility or when insect nests forced classes away from certain areas of the habitat. In other instances, no safety challenges were reported by the habitat leader, but usability of the space was still a problem. One habitat leader described the location of the habitat as the limiting factor for usability. The habitat was constructed in a courtyard surrounded by classrooms. When a teacher would take students into the courtyard habitat, the commotion would create an unwanted distraction for students in surrounding classrooms. Usability of habitats in other schools was limited by inconvenient locations or landscapes that were difficult to traverse. Even a lack of shade could render a habitat inadequate for teaching on hot, sunny days.

### *Wildlife Conflicts and Challenges*

Serving wildlife is one of the main purposes of the Schoolyard Habitats program, but sometimes this goal interfered with the use of the habitat as a teaching space, as stated by 29 of 182 interviewees from schools with active habitats. Most conflicts described were ordinary complications of gardening and spending time outdoors, although these could be exacerbated by having small children involved. For example, some teachers described the challenging situation of allowing children to interact with nature, while also

trying to avoid ticks and insect stings. Deer, rodents, and other herbivorous mammals that munched on birdseed and garden plants were seen as challenges by some interviewees. Two educators described this latter type of issue as a “regular garden challenge” or “only naturalistic” difficulty.

Some wildlife challenges faced by schools with active habitats were related to behaviors of people rather than wildlife. For example, several habitat leaders disagreed with choices of administrators and custodians on how to remove unwanted wildlife, such as when school officials used pesticides to eradicate a large mouse population in one schoolyard habitat. In another case, city officials took steps to drain a school pond habitat to minimize mosquito breeding grounds, and refilling the pond later in the school year required extra work. One interviewee described how a lack of education on the part of students and other teachers led to the disturbance of harmless wildlife, such as when students picked eggs out of native bird nests.

Additionally, when asked about what kinds of wildlife were present in the habitat, some interviewees reported difficulties attracting wildlife, but survey results indicate that this is not typically a debilitating challenge for most schools (see Figure 8). Some educators mentioned that they were able to see signs of wildlife, but young students would unknowingly scare wildlife away by being noisy. Notably, none of the interviewees from schools with active or dormant habitats brought up difficulties with large carnivores, even though several educators mentioned seeing bears, wolves, coyotes, cougars, or bobcats on their school’s property. However, feral cats and invasive species were problematic for some schools.



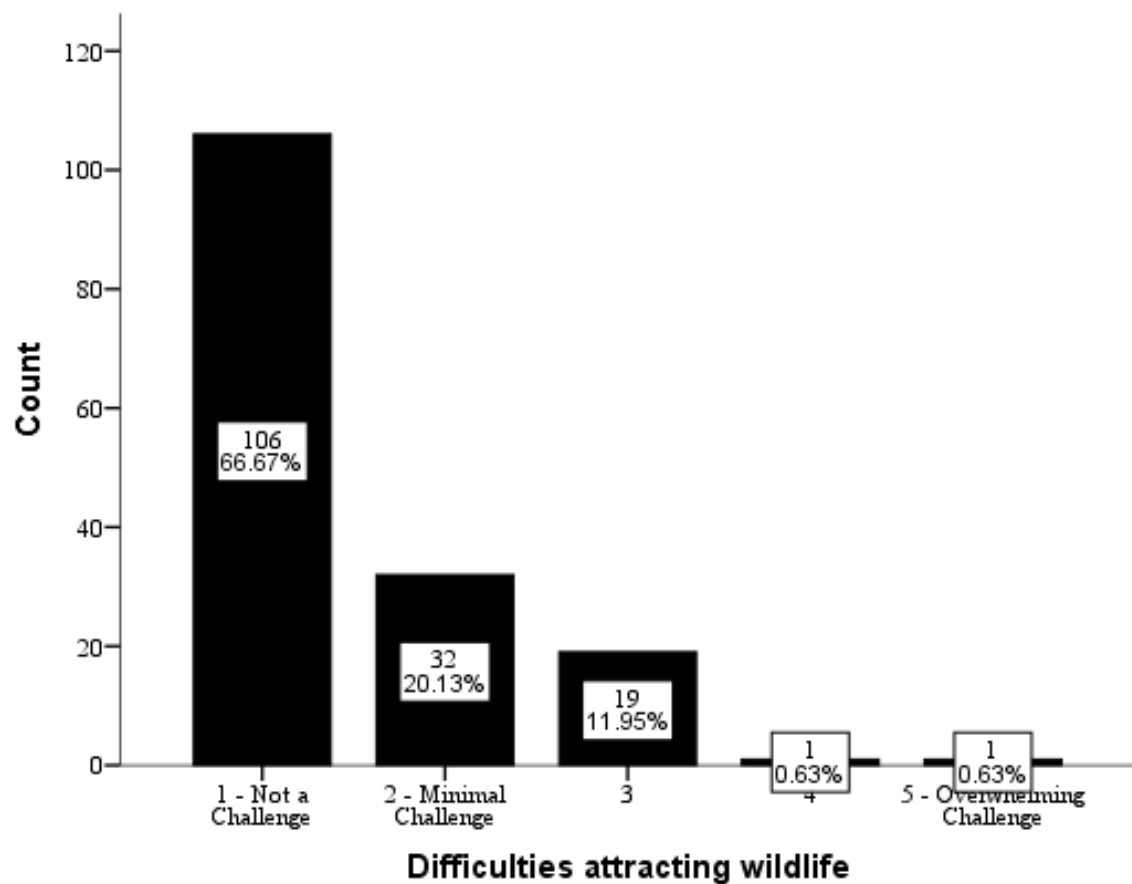


Figure 8. Survey respondents' ratings of difficulties attracting wildlife as a challenge on a scale of 1 to 5. Source: Survey data from active habitat schools. (N=159)

Three schools with dormant habitats experienced wildlife conflicts or challenges that led to the discontinued use of their habitats, at least in part. For one of these schools, wildlife was a minor issue, but wildlife issues played pivotal roles in the discontinued use of habitats in the two other schools. In one case, educators found that the butterflies that classes released into the habitat to learn about the butterfly life cycle were nonnative, and the releases were stopped. Since this was the primary educational activity that took place

in the habitat, the cessation of butterfly releases resulted in decreased use of the area. The second instance of a major wildlife challenge in a now dormant habitat was caused by Canada geese, which were aggressive toward students. Overall, though, with the exception of bug bites and pesky herbivores, wildlife challenges were not particularly common in schoolyard habitats.

### *Damage to the Habitat*

Damage to a school's habitat was described by 50 of 182 interviewees from schools with active habitats, with the damage ranging in severity from minor vandalism to full-scale destruction. Damage in active habitats was split into six categories, owing to their very different causes: harm caused by renovations or construction, vandalism, excessive mowing, pollution, broken fixtures in need of repair, and other causes. Damage was also a common theme cited by interviewees from schools with dormant habitats, with 21 of 172 schools reporting that complete removal of their habitats was the reason that the habitats stopped being used. For 15 of these 21 removed habitats, school building renovations and construction were designated as the causes of the habitats' destruction. Two more were removed at the order of administrators and several others did not specify a cause for the removal of their habitats.

Interviews with educators from schools with active habitats demonstrated that habitat damage comes in many more forms than habitat removal. A number of these schools did mention that they lost all or part of their original habitats to building renovations, sports fields, and other various projects, and sometimes they had to build a

new habitat from scratch because of it. However, schools with active habitats also highlighted problems with vandalism, a more malicious form of damage. One interviewee attributed vandalism to the problem of living in an urban community, while another noted that the location of the habitat in a less visible area behind the school could be the cause of the problem. One interviewee from a school with a dormant habitat cited the same visibility issue and proximity to a park as encouraging vandals and opined that a more protected, fenced habitat would have been better for the school. On the other hand, an interviewee of an active habitat plagued with vandalism stressed the challenge of keeping vandals out while still allowing in wildlife and the well-meaning public. Figure 9 shows that vandalism was nonexistent for about half of the survey sample, although some respondents rated it as an overwhelming challenge.

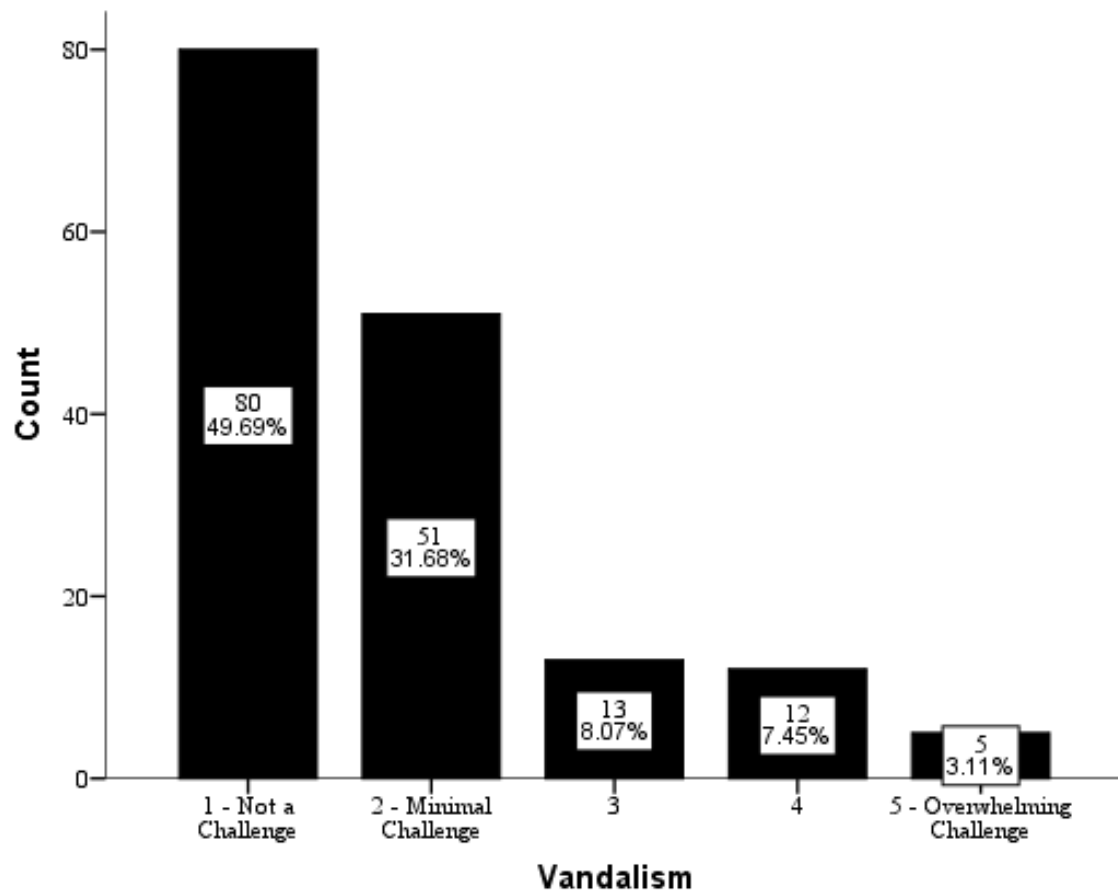


Figure 9. Survey respondents' ratings of vandalism as a challenge on a scale from 1 to 5. Source: Survey data from active habitat schools. (N=161)

Sometimes damage to the habitat caused by people was not malicious in intent but instead resulted from a lack of understanding. The best example of this was presented by three interviewees from schools with active habitats that described the challenge of working with maintenance crews that mowed through their habitats, presumably because of misunderstandings or to give the areas more landscaped looks. In all three cases, however, educators noted that the mowing had now stopped. Another example is the damage that can be caused by small children that are sometimes too eager to run through

a habitat and end up crushing valuable plants, which was mentioned by two interviewees and classified under “other” in Figure 7.

There were several instances of pollution in active habitats. In three cases, herbicides or pesticides were applied directly to the habitat by school or district officials. Pesticides were so detrimental to one of the habitats that the plant life died off and the habitat leader had to start the habitat over. Pollution played an indirect role in three other habitats. For two of them, nutrient runoff from nearby housing developments and industrial facilities polluted their streams, and the third habitat frequently had pesticides carried into it on the wind from a neighboring building.

Finally, some forms of damage to schoolyard habitats did not stem from the decisions or behaviors of people, but were simply the result of chance. Specifically, several interviewees from schools with active habitats stated broken fixtures needing repairs or weather-related damage as challenges. Along with fencing and signage, water features were the most likely structures to need repair; ponds with holes, nonfunctioning manmade streams, broken birdbaths, and faulty drip systems were all mentioned. Two schools had problems with falling trees; in one, the tree damaged a garden and in another, the tree left the habitat inaccessible for some time. Weather-related damage (see “other” in Figure 7), while mostly unavoidable was also mentioned as challenging by several schools. Storm damage left a few habitats in need of repair, and erosion was an ongoing problem for two schools.

### *Weather and Seasonality*

Weather and seasonality were described by interviewees from schools with active habitats as presenting three types of challenges: causing plant death or damage to habitat features, restricting use and maintenance of the habitat by educators and students, and limiting what could be experienced in the habitat by students due a shortened growing season or lack of overlap of the growing season and the school year calendar. Of the 16 interviewees that mentioned weather and seasonality as a challenge, six were referring to damage of habitat features, as mentioned previously, or to plant damage caused by drought. In another instance of weather-related damage, the school building itself was in need of repairs, and this indirectly led to a drop off in use of the habitat. Four interviewees spoke of wind or rain presenting challenges to getting students into the habitat or to maintenance schedules. Finally, five schools remarked that the school calendar could be a difficulty, especially in northern latitudes. For example, depending on the climate, students might miss a great deal of wildlife and blooming plants that could only be seen in summertime when children were out of the school. Other interviewees remarked that a shortened growing season meant that they could not grow as much food as they wanted or that planting and harvesting was a challenge since it had to be done in summer when school was not in session.

### *Discussion*

The challenges that schools faced relating to the design and location of their habitats—issues of safety and usability, wildlife difficulties, habitat damage, and weather

and seasonality—ranged in severity from mild to extreme. While some of these challenges arose from chance or were, for the most part, unavoidable, several interviewees from schools with active habitats recounted how they mitigated the consequences of such challenges or did manage to avoid unnecessary pitfalls altogether. For example, although having to put up fencing was considered a challenge for some schools, two educators noted that having fencing was part of the key to their success. In one school, fencing was critical for keeping small children away from potentially dangerous areas, and in another, fencing was used to keep potential vandals out.

Although not mentioned directly by interviewees of active habitat schools, choosing the right location for the habitat could be another potential strategy to discourage vandalism. Placing the habitat in front of the school or in a centralized courtyard may help to prevent vandalism more so than having it tucked away behind the school. Plus, seven interviewees stated that their habitat's location in a highly visible area was essential to their success, presumably since the increased visibility helped to keep the habitat at the forefront of people's minds and prevented it from falling to the wayside. Another interviewee stated that their school enlisted the help of their community to act as watchdogs for the habitat to prevent vandalism.

Although storm damage and extreme weather cannot be stopped, many educators were able to at least partially conquer the challenge of the lack of overlap of the school calendar with the growing season by inviting students and parents to the habitat over summer. By holding summer clean-up days, students got to experience the habitat in its

full summertime glory. At the same time, the extra maintenance kept the habitats ready for autumn.

Few interviewees mentioned experiencing a problem with safety, wildlife, habitat damage, or weather that they were able to completely eliminate. Repairs can be made when habitat fixtures are damaged and fences can be put up in an effort to increase safety, but bug bites are a necessary evil of being outside and cold, rainy weather will continue to keep classes indoors. It seems that the effort required to continually combat these types of difficulties must be backed by good attitudes and the support of a determined habitat workforce.

The value of a positive attitude was demonstrated by the educators that acknowledged that some wildlife-related challenges were just a part of having a habitat. Of course, attitude only goes so far without dedicated people to care for the habitat. For example, one teacher enlisted the help of their students and the shop teacher to make repairs after a storm. Another teacher described how their school takes environmental challenges like erosion and turns them into inquiry-based teaching moments while searching for solutions. But perhaps the best example of a determined workforce can be gleaned from the interviewees that stated that their schools' original habitats were destroyed or partially removed, and yet they were able to cope with diminished habitats or construct new ones altogether. It is certainly understandable for educators and volunteers to lose motivation when a habitat must be removed for renovations or because of opposition from administrators. But while habitat removal crippled outdoor education in 21 schools with habitats classified as dormant, many other schools were able to keep



going with new habitats. One educator even told a story of a parent volunteer coming to the school before the habitat was slated for removal and digging up hundreds of plant bulbs to prevent their destruction.

Finally, it is worth noting that design and location-related challenges are not always experienced in isolation. Rather, they are frequently made more complicated when coupled with issues within the school setting or with a lack of involvement from the community. Some of these unfortunate pairings have been touched on previously—such as when habitat leaders face opposition from administrators—and these types of challenges will be discussed in more depth in subsequent sections.

## CHALLENGES ARISING FROM THE SCHOOL ENVIRONMENT

### Results

Five types of challenges related to the school environment were identified from the interviews with active habitat schools. These included difficulties with constrictive curriculum and standards, teacher involvement, lack of time, unsupportive administrators, and lack of funding. Figure 10 depicts the frequency with which each of these challenges was mentioned.

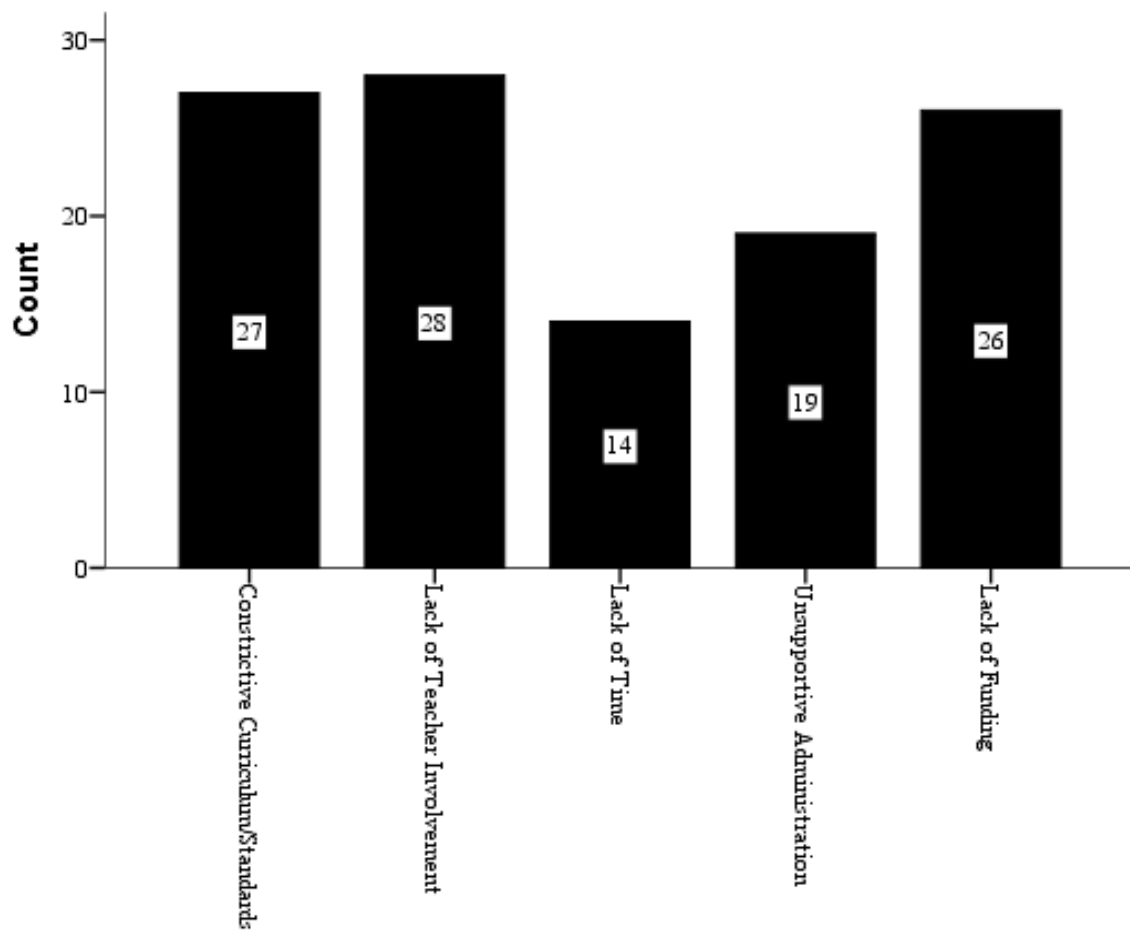


Figure 10. Number of interviewees from schools with active habitats that mentioned each of five challenges related to the school environment. Eight interviewees were not asked about challenges in their habitats but may have mentioned challenges elsewhere in the interview, and those responses would be included in the chart. Source: All interviewed schools with active habitats. Includes randomly and non-randomly selected schools. (N=182)

### *Constrictive or Changing Curriculum and Standardized Tests*

Constrictive or changing curriculum and pressure to focus on units linked to standardized tests were seen as challenging by 27 of 182 interviewees from schools with active habitats. Additionally, five of 172 interviewees from dormant habitat schools attributed problems with curriculum to the disuse of their schools' habitats, at least in part. Challenges related to curriculum tended to stem from two main issues. First, five

interviewees from active habitat schools noted that changing science curriculum or the abolishment of certain science classes led to decreased use of the habitat. One educator stated that their habitat garden was designed to go with the school's original science curriculum, but although the curriculum eventually changed, the garden did not. In that particular school, the garden was not what was needed for science anymore, but teachers found other uses for the habitat to keep it alive. Of the four other interviewees, three stated that the habitat was used less often now, and one pointed out that maintenance was much more difficult, since previously they had had science-oriented classes that provided most of the care for the habitat. One educator from a dormant habitat school cited new, incompatible science curriculum and a push to spend more time on reading as explanations for the discontinuance of their schoolyard habitat.

The second, more prevalent type of challenge tied to curriculum was the pressure to cover academic standards and materials that would appear on standardized assessments. Part of this problem was an increasing focus on language arts and mathematics, as mentioned above. Another interviewee from a dormant habitat school said that in elementary schools, science and social studies are seen as the “ugly stepsisters” compared to language arts. This type of view was echoed by four other educators from schools with active habitats that found that the time spent on reading and/or math prohibited use of the habitat. Nearly 20 other educators noted that the “curriculum crunch” caused by set curriculum, academic standards, and testing made use of the habitat difficult. Compounding issues were administrators focused on standards and not pushing the use of the habitat, and also teacher evaluations, which were based on

students' test scores in some schools. One interviewee pointed out that what can be seen in the habitat does not always match up with the order of academic units, and this could add to the difficulty of using the habitat.

Figure 11 demonstrates that curriculum challenges are not just common challenges, but can be severe ones as well. Survey-takers were asked to rate the challenge of facing pressure to spend more time on subjects where there will be standardized tests. About a quarter of the sample said that this was not problematic for them, but the rest of the respondents said that it was challenging on some level. On a scale of one to five, with five scoring as an "overwhelming challenge," 17.39 percent of respondents rated this challenge as a five, and an additional 26.71 percent rated it as a four.

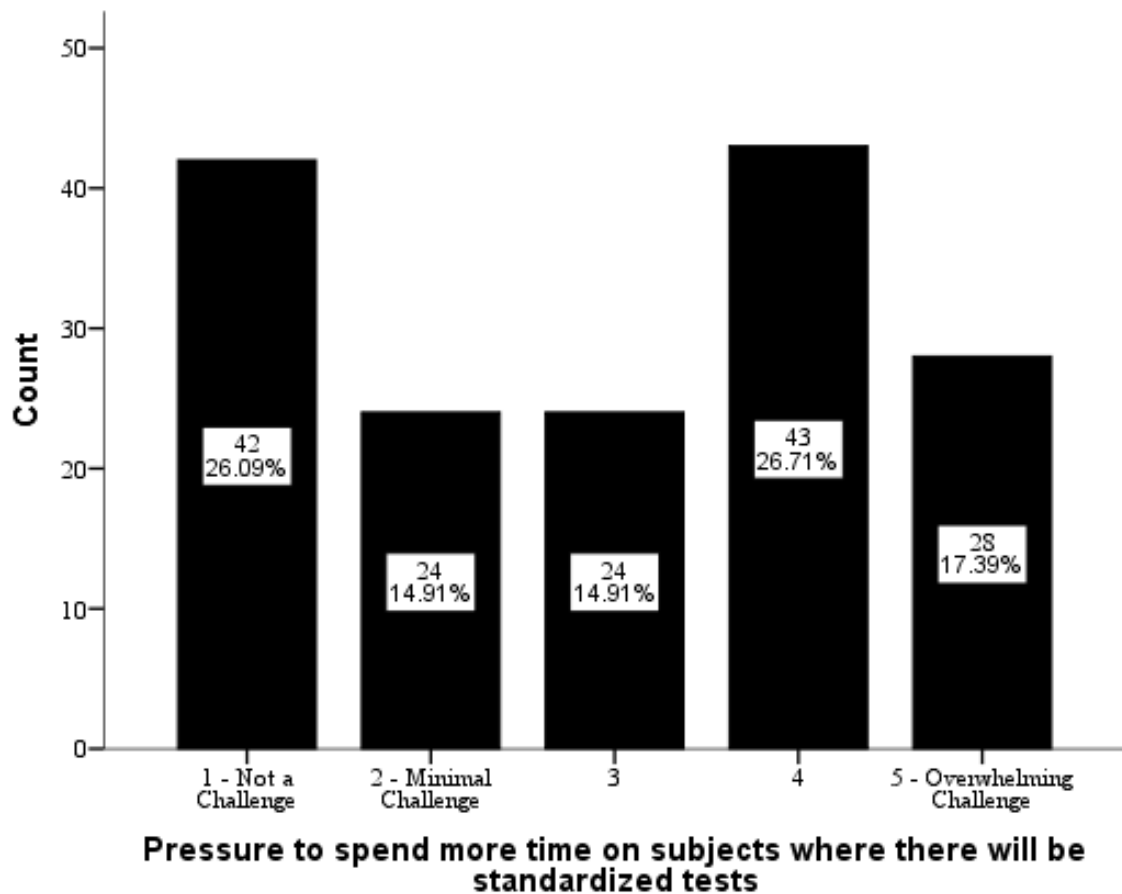


Figure 11. Survey respondents' ratings of standardized test pressures as a challenge on a scale of 1 to 5.  
Source: Survey data from active habitat schools.(N=161)

Survey-takers were presented with two additional questions about the schoolyard habitat's role in curriculum. First, educators were asked about the importance of the habitat in the curriculum (see Figure 12). Of 170 respondents, 39.41 percent indicated that the habitat was critical for conducting certain lessons; 58.82 percent said the habitat was helpful, but not necessarily essential; and just 1.76 percent said that the habitat was not particularly helpful and lessons could be taught just as well indoors. Since the sample of educators answering the survey were all expected to be heavily involved with the

habitat, it makes sense that the majority of the respondents viewed the habitat as, at least, helpful for teaching items on the school curriculum. In the next question (see Figure 13), survey-takers were asked to assess to what level the habitat was “built-in” to the curriculum. The number one answer, representing 42.11 percent of the sample, was that the use of the habitat was mostly spontaneous, and sometimes planned.

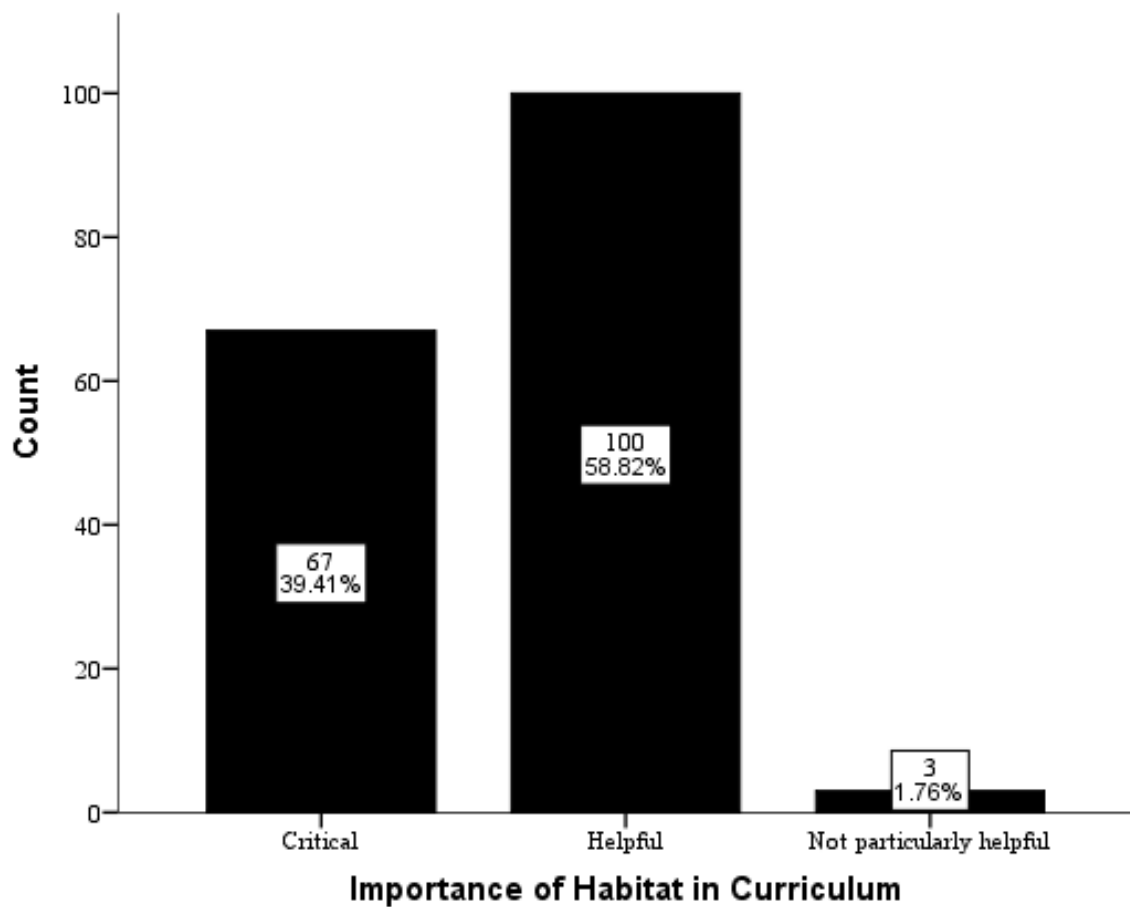


Figure 12. Responses of survey-takers to question asking them to rate the importance of the schoolyard habitat in their school’s curriculum as “critical for conducting certain lessons in the school’s curriculum,” “helpful for conducting certain lessons in the school’s curriculum,” or “not particularly helpful; the lessons could be taught just as well inside.” Source: Survey data from active habitat schools. (N=170)

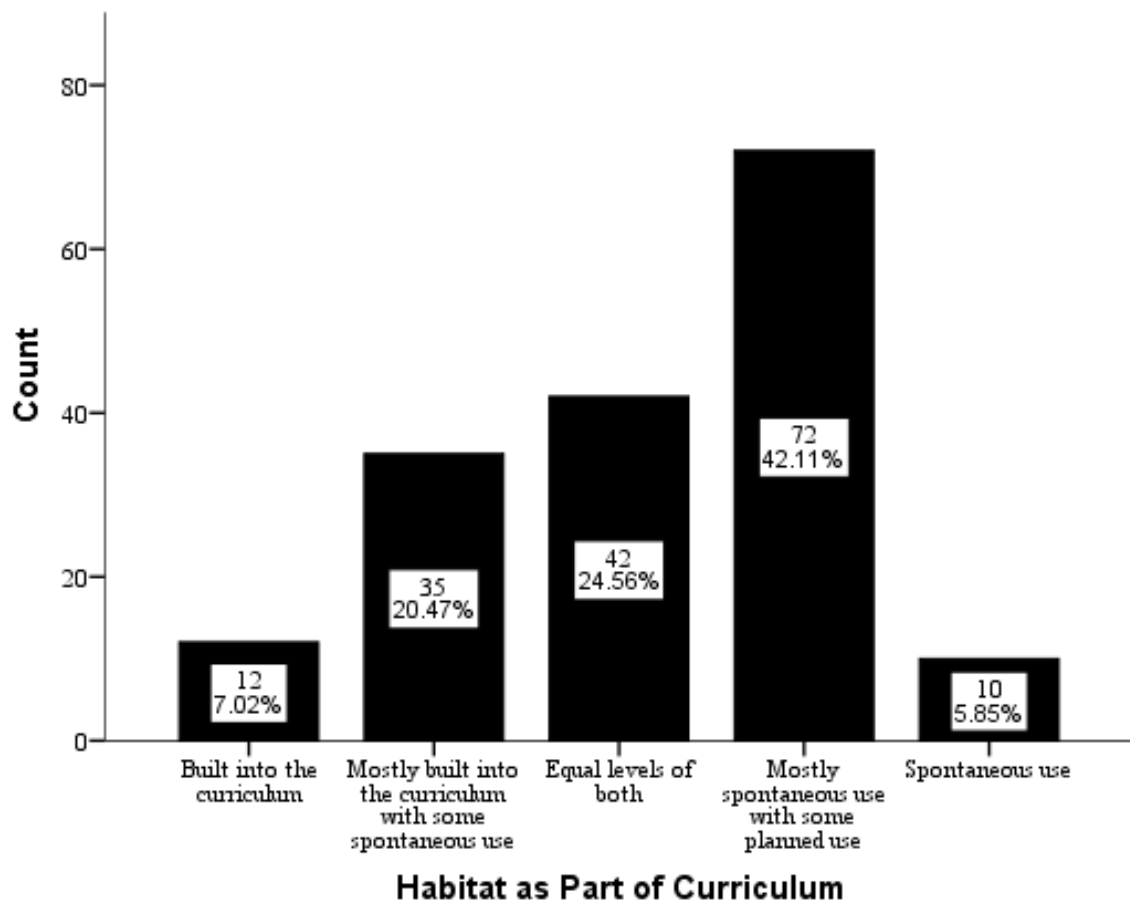


Figure 13. Responses of survey-takers to question asking them to rate the level to which the habitat was “built in” to the curriculum. Source: Survey data from active habitat schools. (N=171)

Although the samples of interviewees and survey-takers did not overlap completely, it could be that those survey respondents that managed to build their habitats into the curriculum, making them critical components of education, were less likely to experience challenges with constrictive curriculum and standardized testing. This does seem to be the case when comparing these two survey questions regarding the habitat’s presence in curriculum to the survey question about challenges of standardized tests. Respondents that said that the use of their habitat was mainly spontaneous reported a



median level of 4 out of 5 in regards to the level of difficulty posed by standardized test pressures. Their counterparts that stated that the use of the habitat was completely built into the curriculum only scored a median level of 2.5 out of 5 on the same question (see Figure 14). Figure 15 shows an even more dramatic difference. In schools where the habitat was considered critical for conducting lessons, the median level of difficulty posed by standardized test pressures was only a 2, or a minimal challenge. In schools where the habitat was seen as helpful, but not essential, the challenge rating median was 3, and in schools where the habitat was not seen as particularly helpful, the median rating was a 4.5.

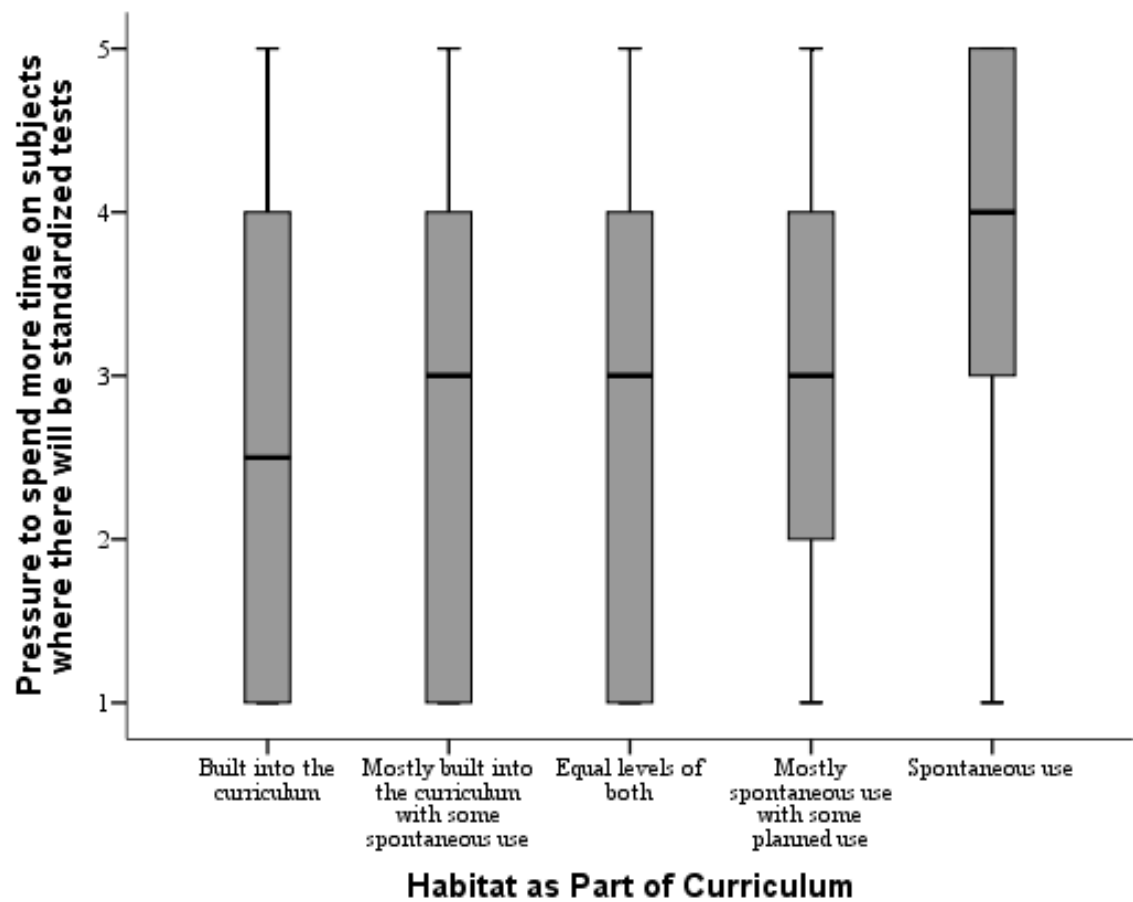


Figure 14. Comparison of survey respondents' ratings of the challenges of standardized testing to their responses about the level to which the habitat was built into curriculum. Source: Survey data from active habitat schools. (N=161)

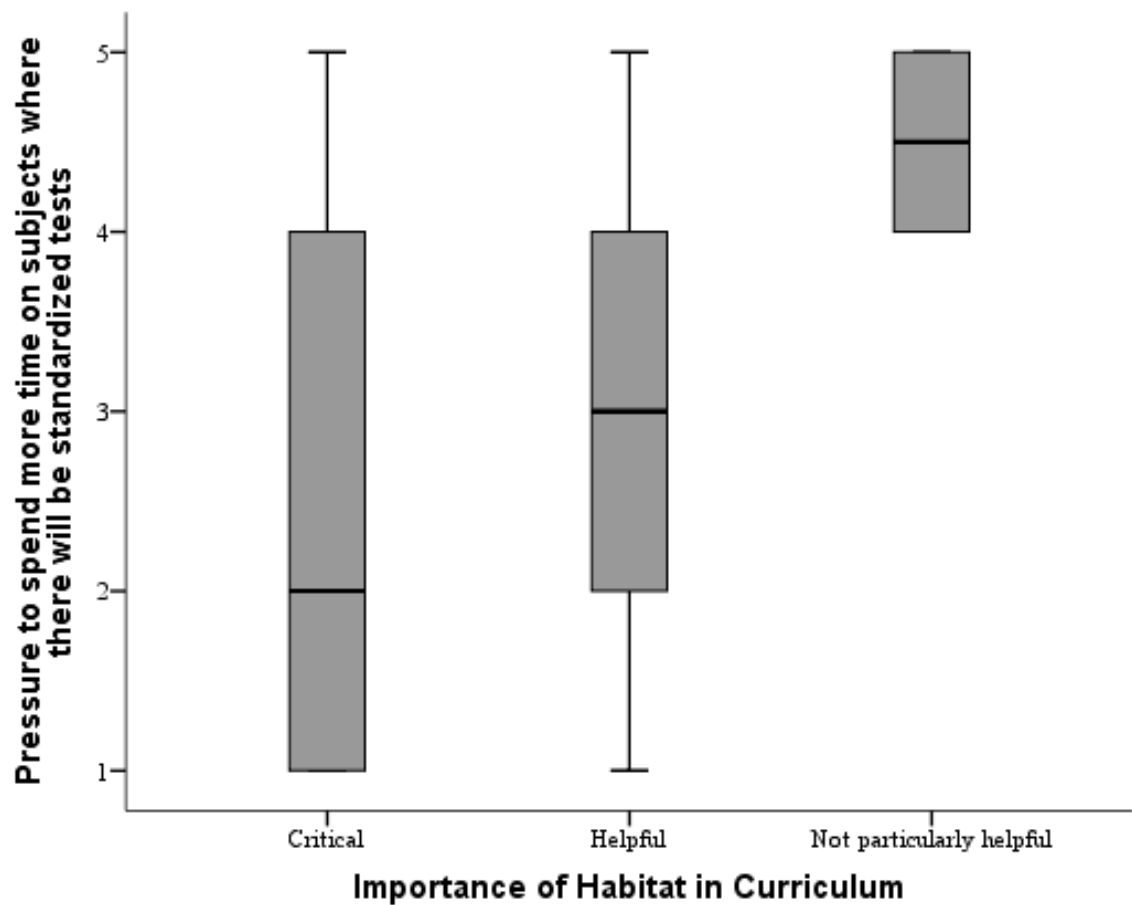


Figure 15. Comparison of survey respondents' ratings of the challenges of standardized testing to their responses about the importance of the habitat for teaching lessons. Source: Survey data from active habitat schools. (N=161)

Also of interest when examining challenges posed by constrictive curriculum was whether the respondent schools were public or private and what grades were taught. Unlike public schools, private schools do not have to meet the demands of making adequate yearly progress under No Child Left Behind, and thus, they do not face the same kind of standardized test pressures as public schools. Indeed, private schools were 11 percent more likely to retain active habitats than public schools in the interview sample

( $X^2=3.759$ ,  $df=1$ ,  $p<0.10$ <sup>14</sup>; see Figure 16). Challenges caused by constrictive curriculum may be partly at fault for this difference, because whereas the median challenge rating of standardized test pressures was only 1 out of 5 for private schools, the median ranking for public schools was 4 out of 5 (Mann-Whitney  $U=4112$ ,  $N=159$ ,  $p<0.001$ ; see Figure 17). Results remained statistically significant after removing all of the preschools and daycares (most of which were private) from the sample (Mann-Whitney  $U=2102.5$ ,  $N=135$ ,  $p<0.001$ ).

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<sup>14</sup> The p value does not represent the probability that the null hypothesis is true (that there is no relationship between a school being public or private and a habitat's activity status as active or dormant). Rather, it represents the probability of attaining the data seen in Figure 16 if the null hypothesis were true. See Cohen (1994) for a discussion of the misinterpretation of p values.

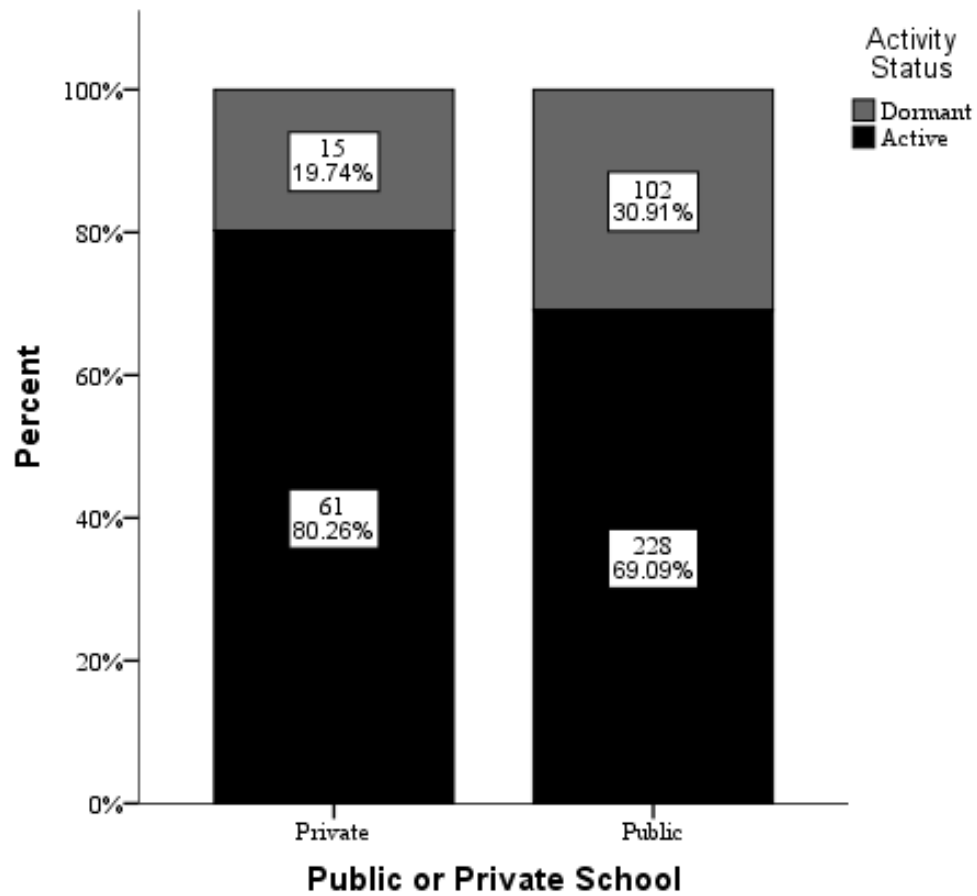


Figure 16. Comparison of the percent of private schools versus public schools with active habitats. Source: Activity status is from schools contacted for interviews with active or dormant habitats. Public/private data are from NCES. Does not include schools that closed or were selected non-randomly. (N=406)

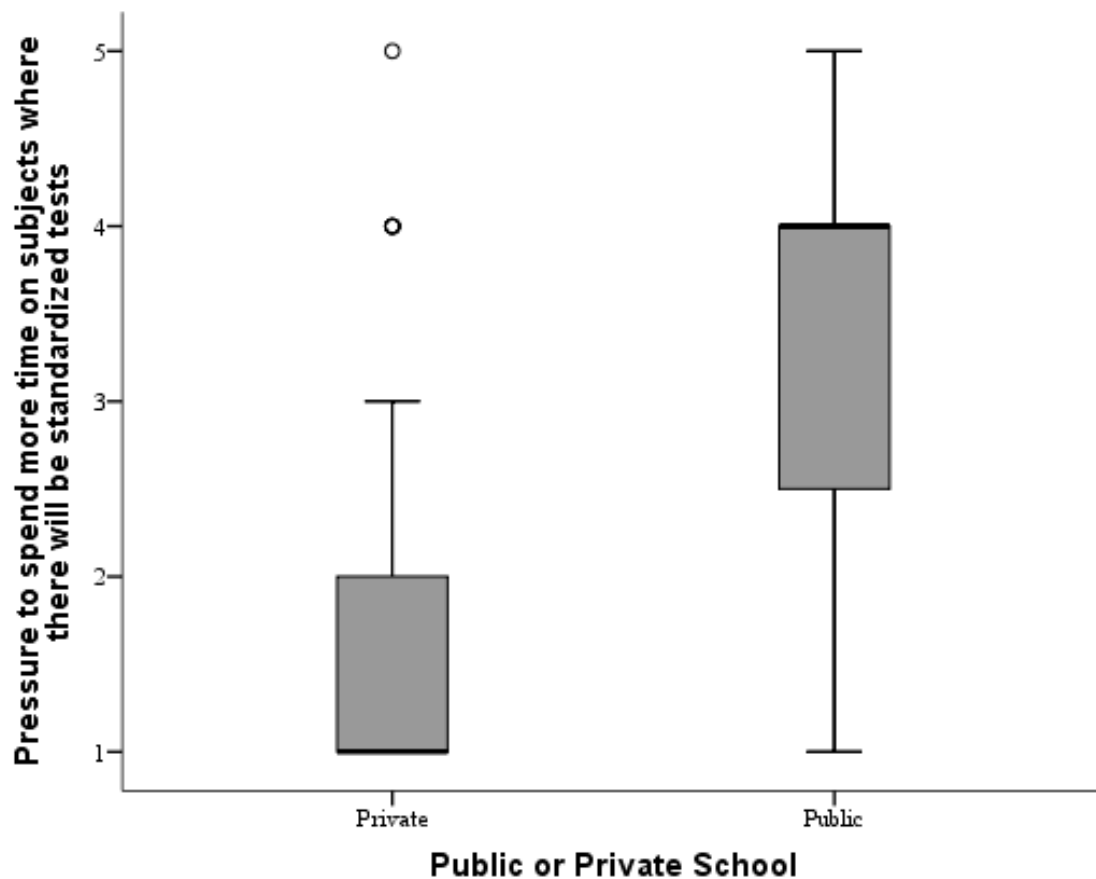


Figure 17. Comparison of the standardized test challenge rating reported by survey respondents between public and private schools. Source: Challenge data are from surveyed schools with active habitats. Public/private status data are from NCES. (N=159)

Interviewed schools were split into seven groups based on the grade levels taught, as shown in Figure 18. Elementary schools comprised a substantial 63 percent of the sample, but they were not the most likely to keep active habitats. Rather, high schools, followed by preschools/daycares, and K-12 schools were most likely to have active habitats. It was thought that perhaps curriculum-based challenges would be most prevalent in elementary schools, since these face heavy language arts requirements under

NCLB. However, as seen in Figure 19, there is little difference between elementary, middle, and high schools in terms of reported curriculum-based challenges to the habitats.

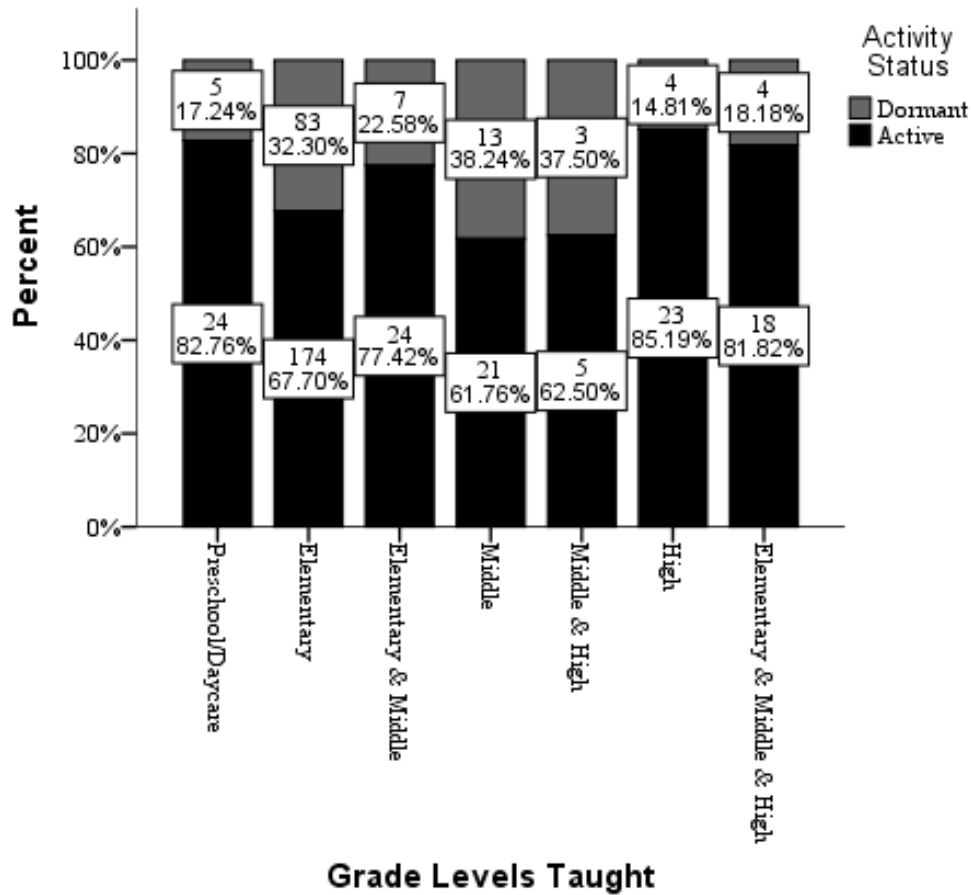


Figure 18. Comparison of active and dormant habitat schools by grade levels taught. Source: Activity status is from schools contacted for interviews with active or dormant habitats. Grade level data are from NCES. Does not include schools that closed or were selected non-randomly. (N=408)

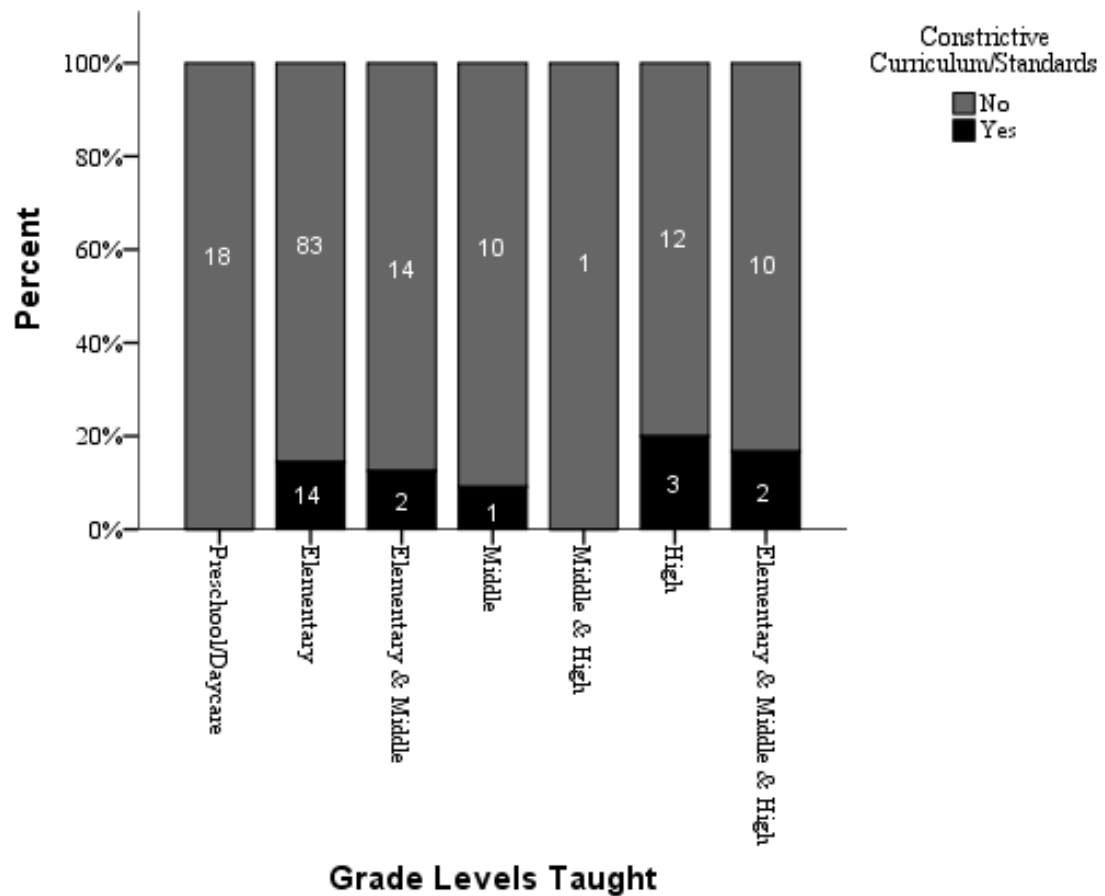


Figure 19. Comparison of active habitat schools whose interviewees reported facing curriculum-based challenges and those that did not to grade levels taught at the school. Source: Challenge data are from interviewed schools with active habitats. Grade level data are from NCES. Does not include schools that were selected non-randomly. (N=170)

### *Lack of Teacher Involvement*

Lack of teacher involvement in the use of the schoolyard habitat was a challenge expressed by 28 of 182 interviewees from active habitat schools. An additional 15 of 172 dormant habitat school interviewees described a lack of teacher involvement or reasons for teachers not using the outdoors as leading to the disuse of the habitat. Figure 20 shows that most schoolyard habitats from the survey sample do not involve the majority of the



schools' teachers. Fifty five (55) percent of the sample responded that less than a quarter of their school's teachers used the habitat, with only 17.20 percent reporting that the habitat was used by 75 to 100 percent of teachers at the school. Several of the habitat leader interviewees mentioned unsuccessful attempts to convince other teachers to use the habitat. For example, one veteran teacher stated that after teaching for 25 years, one thing she had learned is that you cannot force other teachers to use the habitat, no matter how easy you make it. Another said that it is the teacher's choice, and if they do not want to use it, there is nothing you can do.

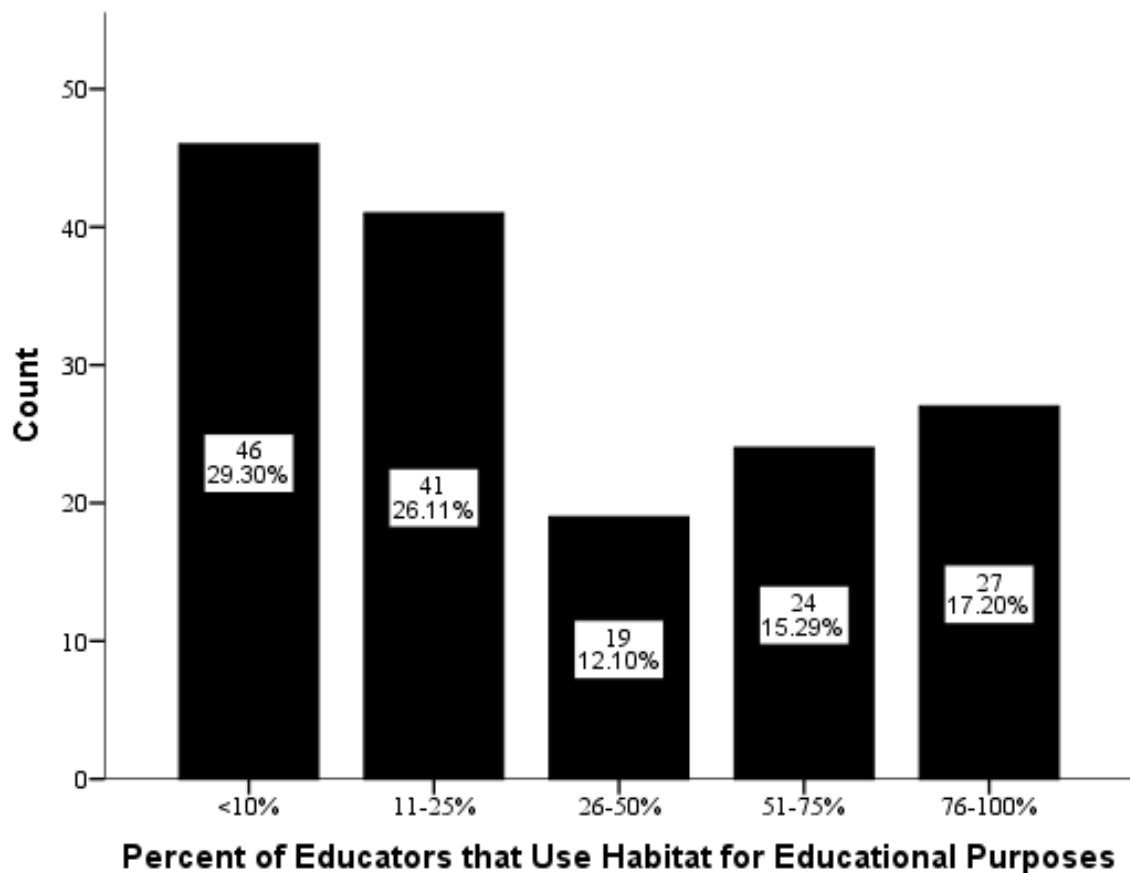


Figure 20. Reported percentages of educators in schools that use their school's habitat for educational purposes. Source: Survey data from active habitat schools. (N=157)

Of course, that does not necessarily mean that teachers that do not immediately take to the habitat will never use it. As one habitat leader stated, some teachers just need the gentle push of being shown how to use the habitat effectively. It was hypothesized that perhaps schools with fewer teachers would have less difficulty with teacher involvement, because in schools with fewer teachers, there might be more opportunities for repeated communication about the habitat between specific teachers. Or, in other words, a habitat leader would only have a handful of other teachers to encourage to use

the habitat in small schools, whereas in a large school, there might be dozens of non-users. However, Figure 21 shows that this does not seem to be the case. The median numbers of full-time equivalent (FTE) teachers in schools that did and did not report challenges with teacher involvement are almost identical.

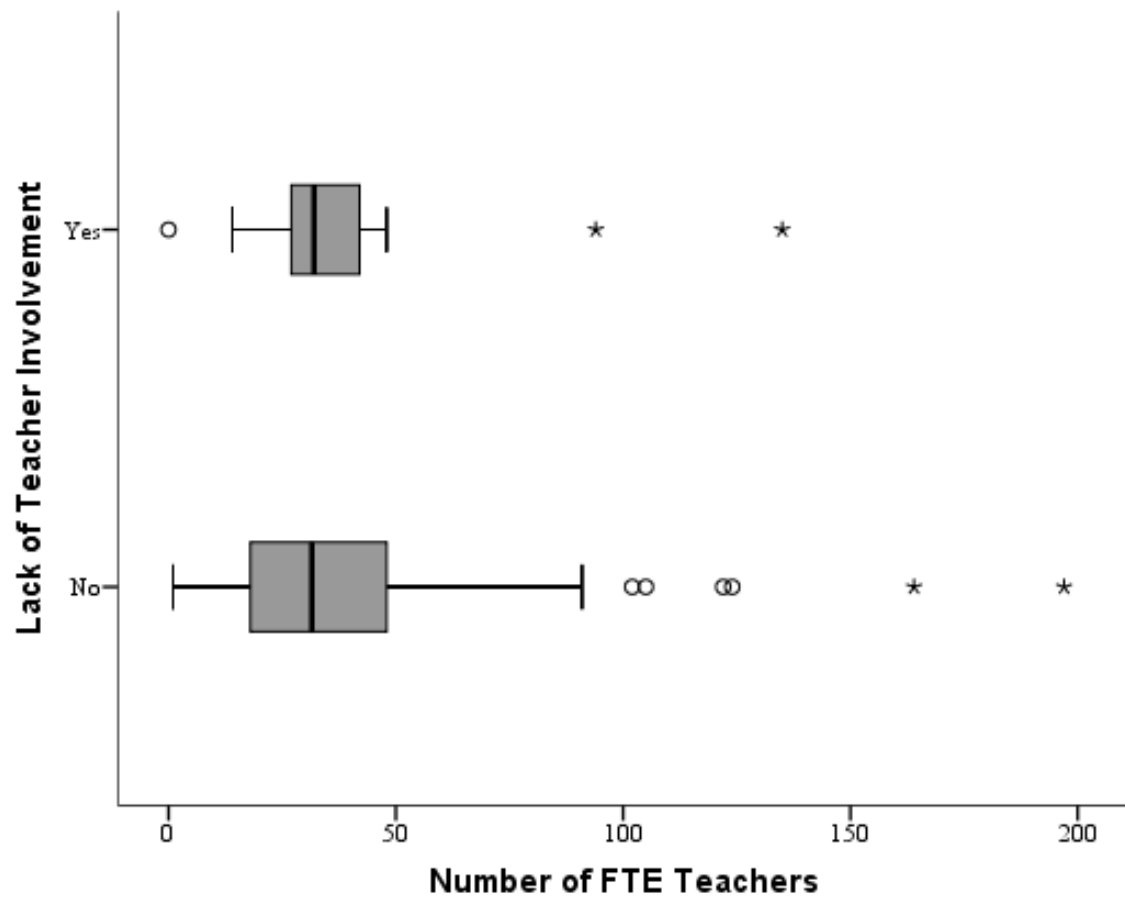


Figure 21. Comparison of the number of FTE teachers to whether or not the active habitat school's interviewee reported experiencing challenges with teacher involvement. Source: Challenge data are from interviewed schools with active habitats. Number of teachers is from NCES. Does not include schools that were selected non-randomly. (N=135)

Although the interviews were conducted primarily with habitat leaders rather than non-users of the habitats, interviewees posited a number of theories as to why their colleagues might not use schoolyard habitats for educational purposes. One educator explained that other teachers are not necessarily against the habitat; the teachers at his school mostly appreciated the habitat, but as they were located in an urban area, people tended to think “indoor thoughts.” He said that fellow teachers had told him that they did not know the habitat was there, even though they walked past it all the time. Another educator mentioned that perhaps teachers are “stuck in their ways;” they enjoy viewing the habitat from their windows, but prefer to stick to indoor science experiments rather than going out.

Seven interviewees from active habitat schools said that teachers simply lacked interest. This was the case in two dormant habitat schools, as well, where life science teachers or teachers in general just did not want to use the habitat. But other habitat leaders held that besides a lack of interest, some teachers simply were not comfortable being outdoors. Dirt, heat, and bugs were mentioned as deterrents for the non-outdoorsy folks. Using the habitat was not always matter of liking the outdoors; instead, interviewees mentioned that other teachers might lack the confidence or skills to teach a class outside. For example, one habitat leader stated that it can be intimidating to bring a whole class outside, and another added that the situation can make teachers nervous and that reading a book is easier than leading a class outdoors.

Another big issue restricting teacher use of the habitat related back to curriculum demands and lack of time. A half dozen interviewees from active habitat schools

mentioned some version of the story that testing demands placed on teachers left little time to use the habitat, which would be an add-on to the curriculum. Three interviewees from dormant habitat schools cited curriculum pressures or a lack of time as reasons for teachers not using the habitats anymore. This issue could be worsened when teachers viewed the habitat not as an educational haven, but solely as a play area, which was a challenge mentioned by two interviewees, one from an active habitat school and the other from a dormant habitat school. Still another potential inhibitor for using the habitat was that habitat use did not show up on teacher evaluations, so there was no incentive for teachers to use it.

In several other instances, the structure of the school made it difficult for teachers to use the schoolyard habitat. In one active habitat elementary school, for example, science was only taught by science specialist teachers, rather than by the majority of the educator population. Since science instruction is one of the primary uses of schoolyard habitats (see Figure 3), this setup made it challenging for other teachers to use the habitat more often. Three interviewees from dormant habitat schools cited a change in grade levels or a switch to a cognitively disabled student population as eliminating the usefulness of the habitat for educators.

### *Lack of Time*

A theme that overlapped curriculum-based challenges and lack of teacher involvement was a lack of time. As mentioned previously, several interviewees from dormant habitat schools found a lack of time to be a major reason for their discontinued

use of schoolyard habitats. One woman even noted that having a natural area was always a dream for the school, but that there was just no time to use it. Fourteen (14) of 182 interviewees from active habitat schools specifically mentioned a lack of time as presenting challenges or limiting use of the habitat. While some noted that this was an ordinary challenge, others said that lack of time was one of their greatest difficulties. Survey-takers were asked to rate the challenge of having too little time or space in the curriculum to use the habitat more often (see Figure 22), and the results were mostly even. Few respondents said a lack of time was an overwhelming challenge, but about as many said it was not a challenge or a minimal challenge as said it was a moderate concern.

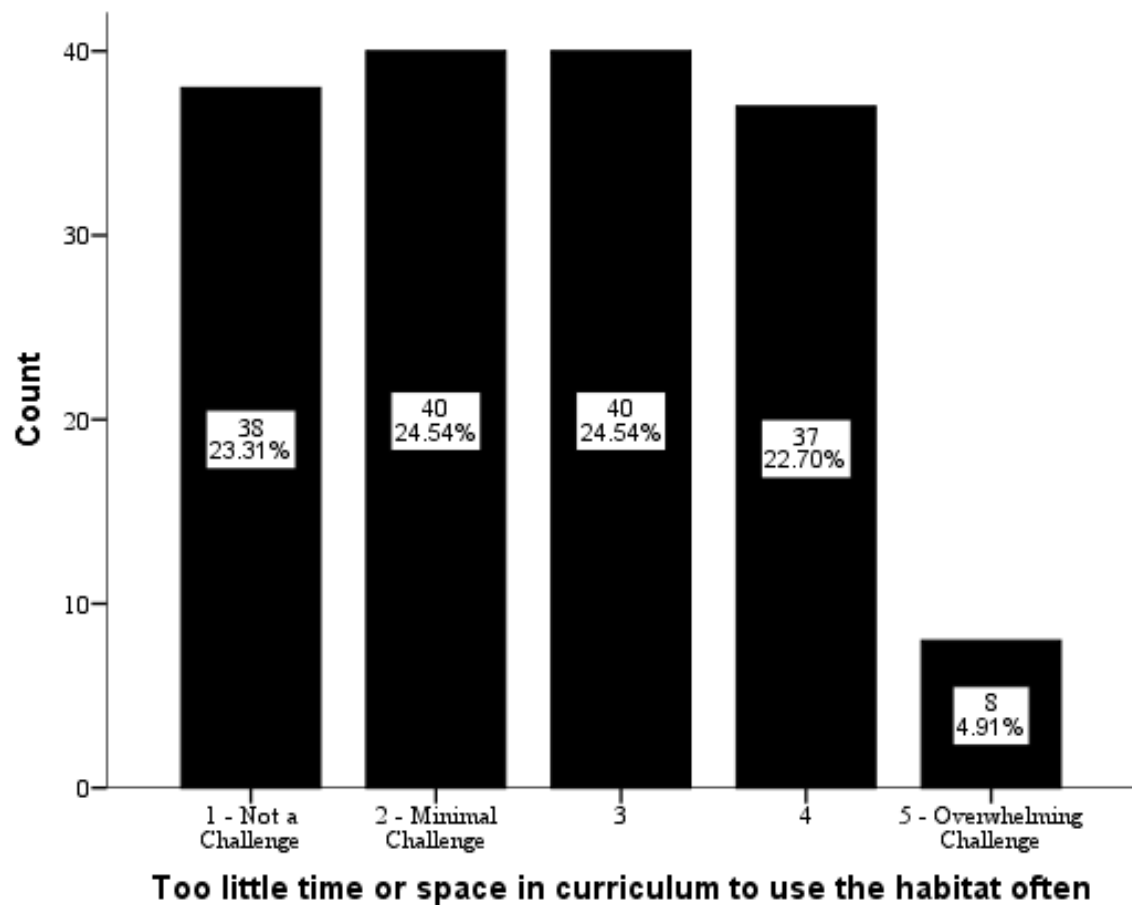


Figure 22. Survey respondents' ratings of too little time or space in the curriculum as a challenge on a scale of 1 to 5. Source: Survey data from active habitat schools. (N=163)

#### *Administrative Conflicts or Lack of Administrative Support*

Nineteen (19) of 182 interviewees from active habitat schools and eight of 172 dormant habitat school interviewees mentioned conflicts with administrators or lack of administrative support regarding their habitats. These challenges were mostly to do with the school principal, but occasionally involved district-level officials as well. Perhaps the most detrimental administrative challenge, which occurred in several schools, was when administrators ordered the complete removal of schoolyard habitats, usually for cosmetic

purposes. As one educator pointed out, schoolyard wildlife habitats often are not meant to look the same as neat “English gardens.” Rather, they tend to have a wilder look and utilize native plants instead of typical exotic ornamentals. To the untrained eye, a habitat garden with “a wild and free” look may appear unattractive, as was the case in a handful of schools where administrators wanted habitats removed in favor of more landscaped designs. One educator described an administrator with this mindset by saying that “he doesn’t get it [the purpose of the habitat]” and there was “no convincing him.” Another interviewee from a school with a dormant habitat indicated a similar problem by saying an administrator did not know what the habitat was and had it paved over for that reason.

Sometimes the challenge was a less severe difference of opinions. For example, two interviewees from active habitat schools noted that administrators ordered the application of pesticides to schoolyard habitats, which was harmful for plants or wildlife. Other interviewees mentioned that administrators concerned with the liability issues of letting students near ponds limited use of the habitat or caused a downsizing in the design plans for the habitat. Figure 23 shows that few habitat leaders in the survey sample experienced conflict with administrators. Those respondents that did were most likely to rate the challenge as minimal, with none reporting administrative conflicts as overwhelming.



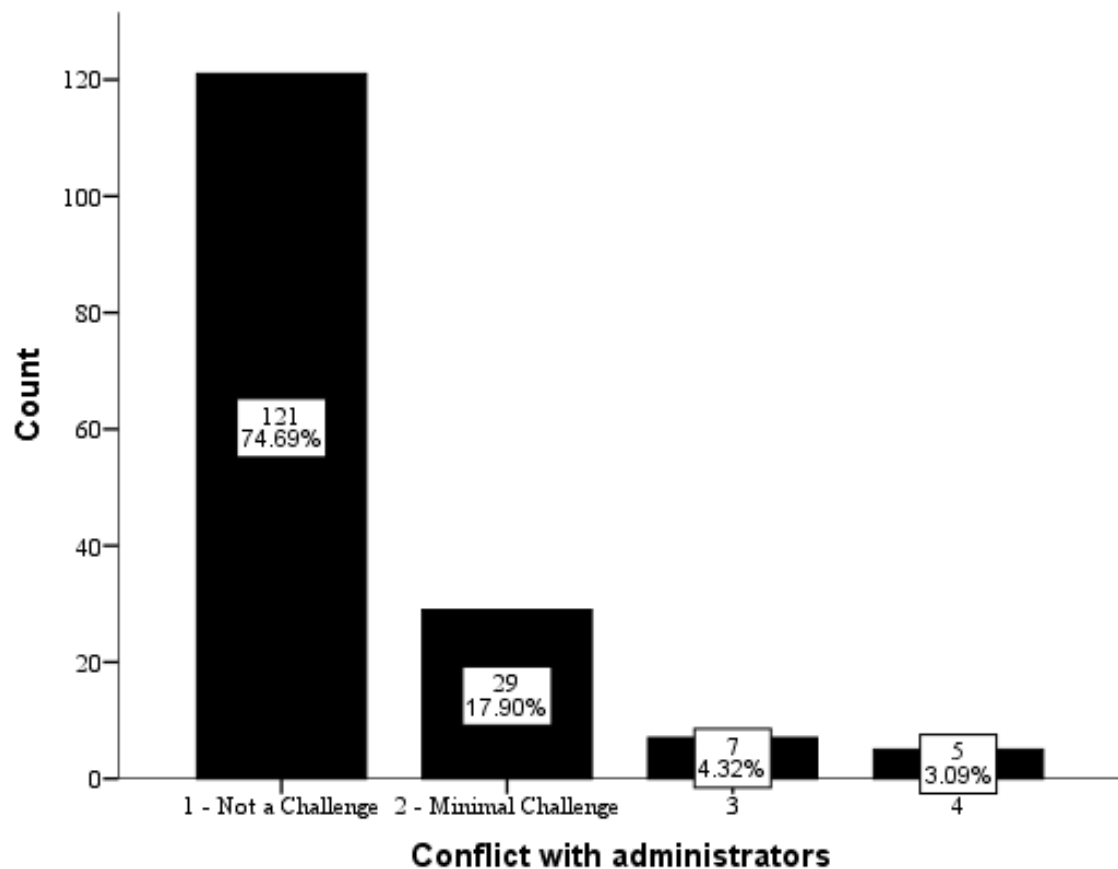


Figure 23. Survey respondents' ratings of conflict with administrators as a challenge on a scale of 1 to 5. The fifth category corresponding to "overwhelming challenge" was empty. Source: Survey data from active habitat schools. (N=162)

However, perhaps it would have been wiser to phrase the survey question as "lack of administrative support," because although few interviewees reported actual conflicts with administrators, many noted the different issue of lack of support from administrators. For example, one teacher stated that although administrators were supportive on paper, the schoolyard habitat was not a priority. Another teacher noted that administrators were slow to sign documents needed for habitat grants. Three others said

that administrators were not science-oriented or were not interested in environmental education and that they placed more emphasis on test scores than the schoolyard habitat.

Finally, administrator turnover may have a large effect on a school's habitat. Seven of eight dormant habitat schools that cited administrative challenges as leading to the disuse of the habitat mentioned a problem with new or changing administrators. Several active habitat school interviewees noted the same issue. One teacher stated that switching from an involved, hands-on principal to a new administrator left her concerned about lack of support.

### *Lack of Funding*

Depending on the size and type of project, funding a schoolyard habitat can be costly. Struggles with funding were described by 26 of 182 interviewees from schools with active habitats, and another five educators from dormant habitat schools said that lack of funding was at least partially the reason for the abandonment of their schools' habitats. Funding problems may be even more common than interviewees let on, because 81 percent of survey respondents noted that a lack of funding for their schoolyard habitat was at least a minimal challenge (see Figure 24).

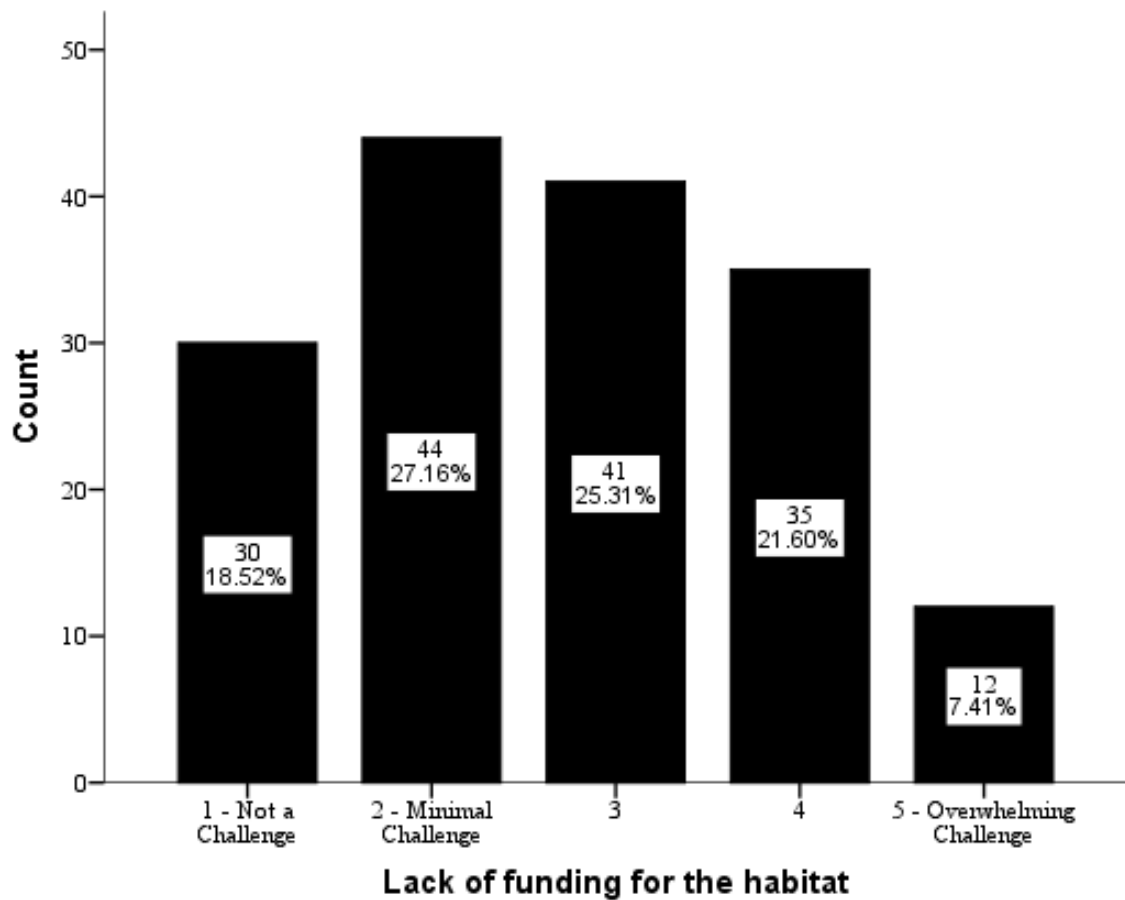


Figure 24. Survey respondents' ratings of lack of funding as a challenge on a scale of 1 to 5. Source: Survey data from active habitat schools. (N=162)

In the course of discussing the financial difficulties of having a schoolyard habitat, educators brought up costs associated not just with the startup of the habitat, but also with regular maintenance and unforeseen repairs. One teacher noted that finding funding was hard at the outset of the project, but once the major expenses had been taken care of, costs were relatively low and could be covered with bulb sales and donations. But others found that expenses associated with birdseed, mulch, plants, and general upkeep were hard to cover. Costs for improvement projects and replacement tools could also add

up. Paying to keep the habitat running became even more strenuous when expensive repairs were needed, as was the case in one dormant habitat school where the cost of repairing a pond was too great, and the schoolyard habitat stopped being used. Two interviewees mentioned a funding challenge indirectly related to the habitat: attendance at habitat symposiums and travel between schools. One woman explained that visiting other certified habitats or attending habitat symposiums helped educators to get ideas, but budget cuts meant that these activities were now too costly for participation.

One interviewee from an active habitat school lamented that the schoolyard habitat is such a valuable asset to the school, yet it was not built into the school's budget. Another stated that since the budget was limited, teachers had to work to persuade the school board to get funds for the habitat. Many educators were successful with receiving grants for habitat construction and improvement, but a few drawbacks to the grant writing process were noted. First, grant writing was seen by at least one interviewee as time-consuming and tedious without a guaranteed return. Another person noted that businesses offering grants or resources only give at certain times and are not necessarily responsive when schools need resources right away.

Another source of funding for schoolyard habitats is donations from parents and the surrounding community, but as one educator pointed out, it can be difficult to get donations because of the current state of the economy. To assess whether schools in affluent neighborhoods were less likely to have funding difficulties compared to schools in impoverished areas, the proportion of students eligible for free or reduced price lunch in each school was graphed against the survey respondents' ratings of the challenge posed

by a lack of funding for the habitat. As shown in Figure 25, as the proportion of students eligible for free or reduced price lunch increased, so did the survey-takers' ratings of the challenge posed by lack of habitat funding. The direct linear relationship between the two variables held for the ratings of "1" to "4," but there was a slight decrease in the median poverty level associated with the "overwhelming challenge" rating. A nonparametric correlation significance test indicated that the rating of funding challenges was weakly correlated with poverty levels (Spearman's  $\rho=0.229$ ,  $N=114$ ,  $p<.05$ ).

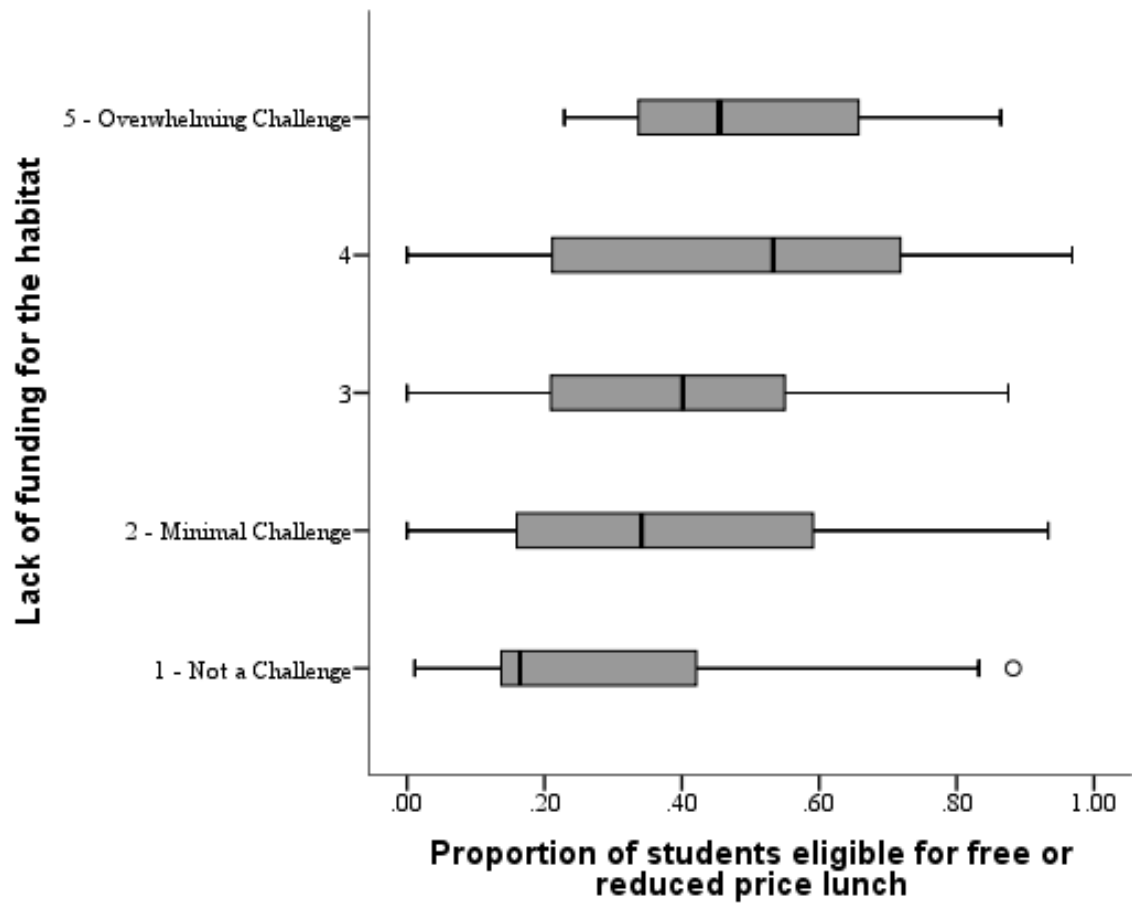


Figure 25. Survey respondents' ratings of the challenge posed by a lack of funding plotted against the proportion of students eligible for free or reduced price lunch in their schools. Source: Funding challenge data are from survey data of active habitat schools. Lunch data are from NCES. Only public schools were considered. (N=114)

Data on eligibility for free or reduced price lunches were only available for public schools, though. Since public and private schools have different sources of funding, it was thought that they might face different levels of funding challenges. Upon comparing the interviews of public and private schools, it was clear that there was a difference, with interviewees from public schools being more likely to report funding challenges ( $X^2=7.033$ ,  $df=1$ ,  $p<.01$ ; see Figure 26). However, no such relationship existed in the

survey data. The distribution of funding challenge ratings was very similar across public and private schools (see Figure 27).

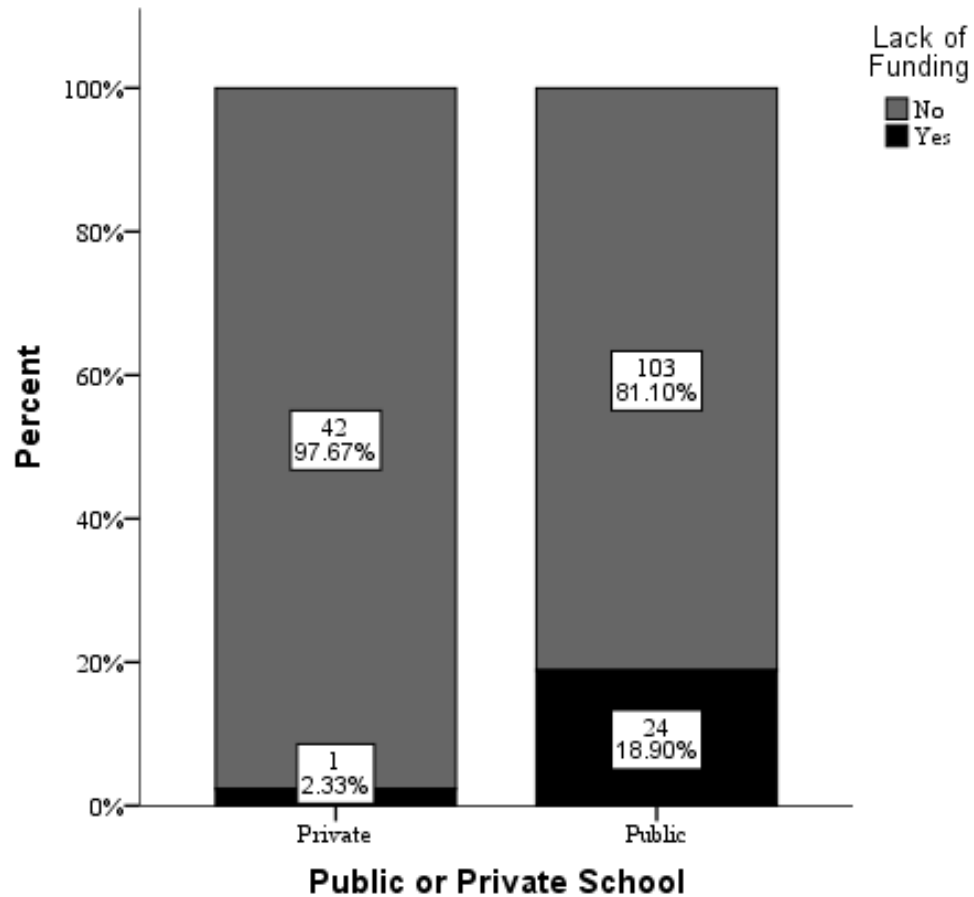


Figure 26. Comparison of the percentages of interviewees from public and private schools reporting funding-based challenges. Source: Data on funding challenges are from interviewed schools with active habitats. Public/private data are from NCES. Does not include schools that were selected non-randomly. (N=170)

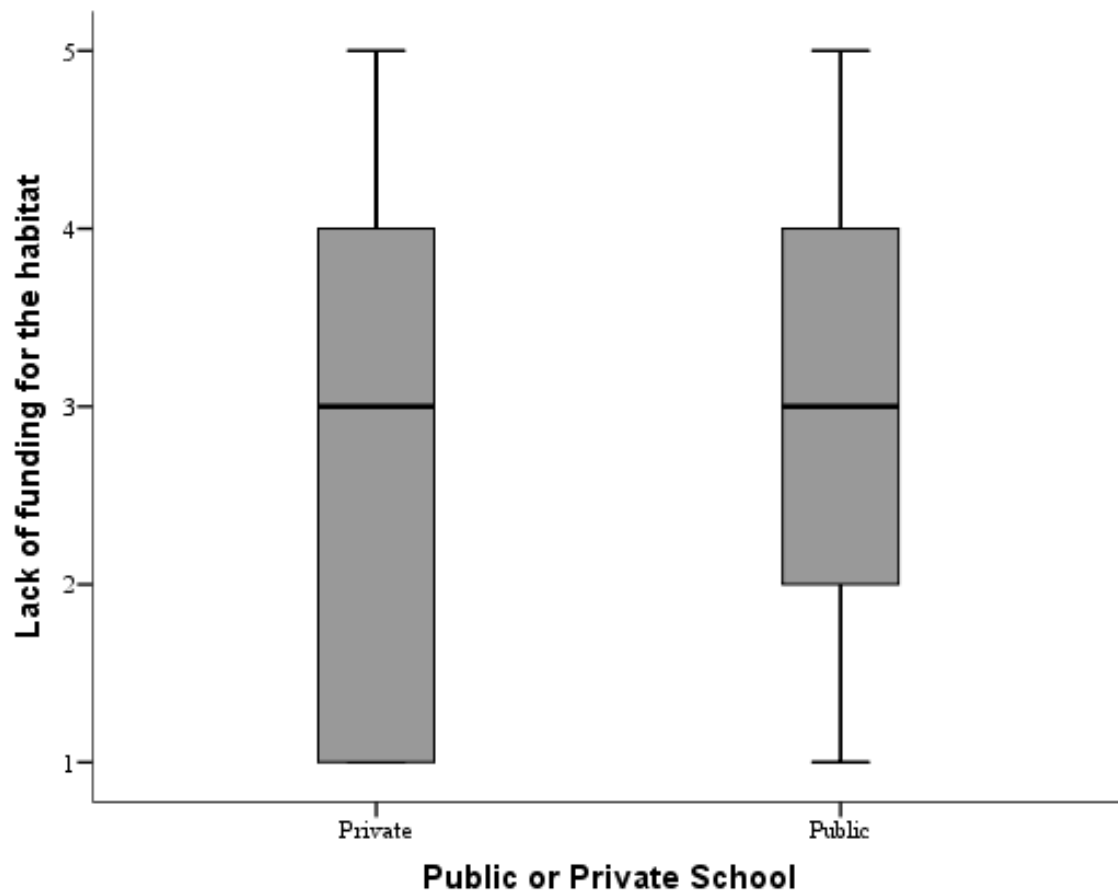


Figure 27. Public and private school survey respondents' ratings of the challenge posed by a lack of funding for the habitat. Source: Challenge data are from survey responses from active habitat schools. Public/private status is from NCES. (N=159)

Public and private schools did seem to acquire funding from different sources, however, because public schools were more likely to report having received grants for their habitats than private schools ( $X^2=13.873$ ,  $df=1$ ,  $p<.001$ ; see Figure 28). However, there was little difference in the likelihood of receiving grants based on student poverty (see Figure 29). Table 2 shows the logistic regression results comparing these two variables. The odds ratio was not significantly different from 1, meaning that the odds of



a habitat being active or dormant did not differ significantly with the percentage of students eligible for free or reduced price lunches.

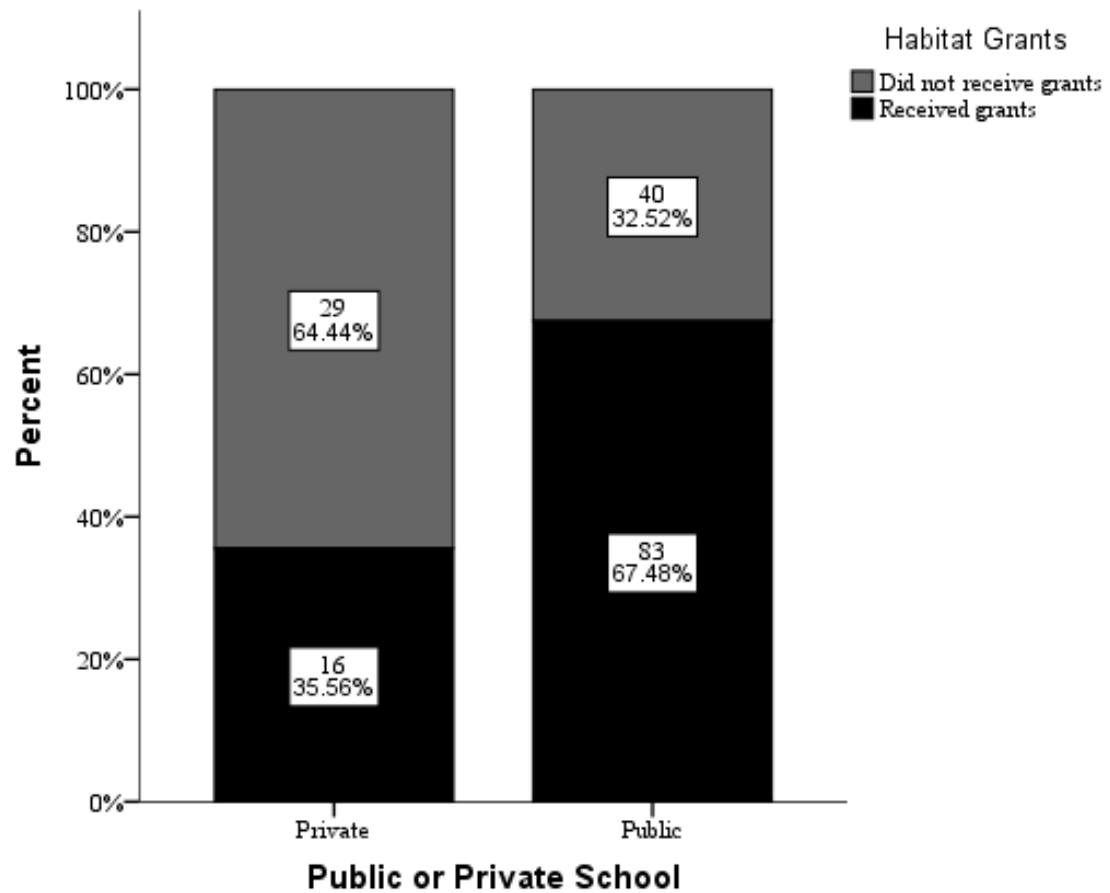


Figure 28. Percentages of public and private schools whose survey-takers reported receiving habitat grants. Source: Grant data are from survey responses from active habitat schools. Public/private status is from NCES. (N=168)

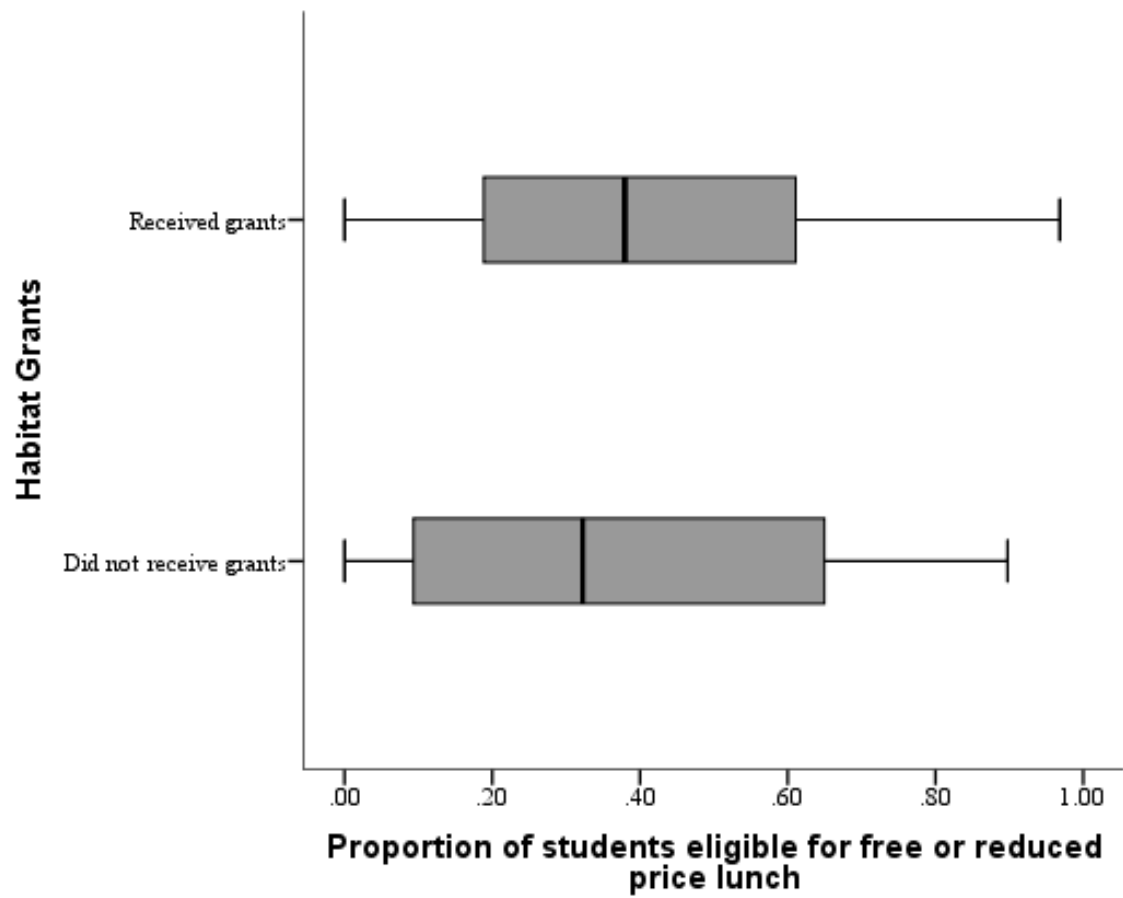


Figure 29. Survey respondents' report of whether or not their schools received grants for the habitats plotted against the proportion of students in the schools eligible for free or reduced price lunch. Source: Grant data are from survey responses from active habitat schools. Lunch data are from NCES. Only public schools were considered. (N=121)

Table 2. Whether or not survey-taker reported receiving habitat grants logistically regressed on the percent of students in each school eligible for free or reduced price lunch. The dependent variable was coded as 1 if the school had received habitat grants and 0 if not. Source: Grant data are from survey responses from active habitat schools. Lunch data are from NCES. Only public schools were considered.

	Exp(B)	95% C.I. for Exp(B)		Standard Error
		Lower	Upper	
Percent of students eligible for free or reduced price lunch	1.007	.993	1.021	.007
Constant	1.540			.342
N	121			
X <sup>2</sup>	.921			
Cox & Snell R <sup>2</sup>	.008			
Nagelkerke R <sup>2</sup>	.011			

Note: \*\*  $p < .05$

### Discussion

When taking on the installation of a schoolyard habitat, one interviewee matter-of-factly stated that it is best to “spend more time planning than doing.” In other words, strategizing the best possible habitat design for an individual school should take precedence over rushing into the construction process. Another educator described how their school exemplified this principle; while attempting to revitalize their school’s overgrown habitat, their habitat team sought input from other teachers about what habitat elements would be most conducive to teaching outside before reconstructing the space.

The linkage between habitat design and curriculum is an important one, because many interviewees noted that building the habitat into their curriculum was part of the key to their successes. As one administrator stated, the habitat should enhance curriculum, not take away from it. Since the current educational climate places emphasis on teaching academic standards, particularly in public schools, finding ways to use the

schoolyard habitat to link to these allows teachers to justify its use. Some educators found that it was both simple and crucial to implement strategies for habitat use within the curriculum. As one woman aptly put, you can show a child fifty pictures of a butterfly, but that does not have the same impact as going outside and actually seeing one. Another educator said that their habitat stayed in use because of their school's agriculture program, which has an obvious outdoor component. In instances where the connection between curriculum and the outdoors was not as obvious, one teacher pointed out that it was only a matter of sitting down and looking at unit lessons to find innovative new ways to teach outside.

In the course of describing their habitats and the uses of outdoor classrooms during interviews, many educators linked specific habitat design elements with required curriculum. This was perhaps most prevalent with butterfly gardens in elementary schools, since many states mandate that students must learn the stages of the butterfly life cycle. Other creative approaches that matched habitat design to curriculum included alphabet gardens, fraction gardens, colonial gardens, and storybook gardens. Furthermore, a good number of schools grew vegetables with the intent of teaching students about nutrition and the origins of their food. While gardens were one of the most popular options for a schoolyard habitat, some schools used ponds to go along with lessons about water quality and aquatic invertebrates, and others used woods to teach children about seasonal changes of trees. As many teachers noted, there is increased pressure to stick to subjects and units that will be incorporated into standardized tests, and

so logically, the easier it is to connect the habitat to curriculum, the more useful the habitat can be to the school.

At the same time, the habitat area must invite teachers and students in for meaningful educational experiences. Thus, carefully balancing wildness with accessibility is important when maintaining a habitat, as one garden club leader stated. A science coordinator noted that having a seating area was essential for conducting the most effective lessons. Having an area for the class to come together after exploring the habitat helped to create a focused experience with lasting impact for classes in her school. Another interviewee stated that their school kept an outdoor classroom complete with seating and a whiteboard. This type of setup that mimics a traditional classroom can further expand the range of uses for a schoolyard habitat, since educators can teach lessons outside that would otherwise need to be conducted indoors. The location of the habitat should also be a matter of convenience. Placing a garden habitat right near a water spigot prevents the necessity of carrying buckets across the school to water the plants. Constructing a habitat in a centralized location or nearest to the classrooms that would use it the most (such as the science wing of a middle or high school) reduces travel time and encourages teachers to take students out more often.

Making the habitat accessible and easy for educators to teach in is vital, because as mentioned previously, involvement in an outdoor program can be “one more thing” on top of a host of other demands already placed upon teachers. While some schools had nearly complete involvement of all teachers, for many schools, this was not the case. However, one interviewee made clear that choosing whether or not to use the habitat was

not a matter of teacher ambition or laziness. Rather, educators just have different styles of teaching. Plus, it was noted that many teachers that were at first reluctant to use the habitat just needed a push to see the educational value of the space. Several interviewees pointed out that it is important to have a team of passionate people (often science teachers) invested in the schoolyard habitat program, and it may become the duty of these people to encourage use of the habitat by fellow teachers. It was evident that some teachers needed more of a push than others, but several interviewees mentioned conducting teacher training or sending information, ideas, and lesson plans regarding the habitat to their colleagues to encourage use. As one school director put it, getting reluctant teachers to go outside was just a matter of giving them the tools, time, and reminders. One teacher even said that at his school, eventually all educators started using the habitat, because when they saw other classes going outside, they did not want to be left out of the program.

According to Huberman and Miles (1984), successful innovations are those that are in widespread use by teachers. While some interviewees found that reluctant teachers could be persuaded to use schoolyard habitats, this was probably not the case in most schools. More than a quarter of the survey sample indicated that less than 10 percent of their schools' teachers used schoolyard habitats for educational purposes, and just 17 percent of respondents reported that their habitats were used by 76 to 100 percent of educators. Perhaps the habitats used by fewer teachers are representative of the "islands of innovation" phenomenon discussed by Tubin et al. (2003) and Forkosh-Baruch et al. (2005), wherein an innovative program is only carried out by one or a few teachers. In

some schools, this “island” structure is warranted, such as when one teacher is hired as the outdoor coordinator or when a secondary school teacher uses the habitat to teach agriculture classes. Thus, even though few educators are involved, the habitat is still a valuable asset to the school with intentional uses. However, in most cases, it is probably more likely that one or a few teachers started the habitat project, but then its use failed to spread to other teachers at the school. These latter projects would be more likely to be short-lived, because they lack the support of the school community.

Administrative support was mentioned by 25 interviewees from active habitat schools as important for their habitat’s success. One person stated that the school’s leadership could have a positive or negative effect depending upon the administrator’s views about the habitat. In a few schools, administrators with backgrounds in science or with experience gardening or growing up in a rural area were seen as natural advocates for outdoor education. In other situations, however, support from the school principal was hard-won. As one person noted, selling administrators on the project right away was imperative. Several interviewees found themselves in situations where school principals or the district were opposed to the construction or existence of the habitat and they had to convince their superiors of the values of a habitat versus lawn or traditional exotic ornamental gardens. One teacher even commented that getting the NWF Schoolyard Habitat certification gave her voice more authority to persuade an administrator away from paving over the school’s habitat. On the other hand, one person cautioned against pushing too hard for new habitat projects, because that approach carried with it the potential to make enemies.

Administrators were seen as important not only for getting permissions to construct or maintain schoolyard habitats, but also for pushing use of the habitat and for being a conduit through which conflicts could be resolved. For example, after nervous parents were able to get one habitat mowed, the habitat leader was able to get the principal to intervene and prevent future mowing of the habitat. In another school, district level officials were able to assist in the acquisition of a sprinkler system after a habitat leader had difficulty getting water to the habitat. Additionally, since administrators are able to make hiring decisions, three interviewees stated that they should seek out employees that are enthusiastic about the habitat to replace habitat leaders that leave the school.

While administrative challenges were sometimes solved with persuasion, the difficulties posed by limited funding required more creative solutions. Interviewees described looking to plant sale and dance ticket fundraisers, Eagle Scouts, local businesses, and garage sales to acquire funds and resources for maintaining the habitat. Other schools looked to planting seeds rather than saplings or transitioning to a more wild rather than landscaped design to minimize costs. Many schools were able to support their habitats with grants and donations, but as noted previously, drawbacks to the grant process and the down economy could make these sources of funds hard to come by.

From the interviews, it appeared that public schools were at a disadvantage in terms of funding their habitats, since interviewees from these schools were much more likely to mention funding as a challenge. However, the survey data show that this is probably not the case. Public and private school survey-takers were about as likely to rate



lack of funding as a major challenge or a minor inconvenience. The sample of interviewees and survey-takers were not the same, and so it can be difficult to make sense of these two sets of results that are so at odds with each other. One explanation, however, can be gathered by looking at survey data comparisons between public and private schools and the likelihood of receiving grants. Public schools reported getting habitat grants much more often than private schools did. Perhaps interviewees from public schools mentioned funding challenges so often, because they were more likely to have gone through the difficult grant writing process. Private schools may have been more likely to receive funds that were built into the school budget or came from donations (although there is no strong evidence to support this notion). If this is the case, it would mean that while neither public nor private schools were at a greater advantage for actually receiving habitat funds, public schools had a more difficult time acquiring funds. Thus, public and private schools rated the challenge of “lack of funding” equally, but public school interviewees were more likely to bring up the hardships of acquiring funding in interviews. Additionally, the fact that private schools received grants less often and yet were not more likely to report that funding was a challenge suggests that, in general, perhaps public schools have a greater need for habitat grants than private schools.

There was no statistically significant difference between the likelihood of receiving grants and the rate of student poverty in schools, though. This is troubling considering that schools with higher levels of student poverty are more likely to report funding-based challenges than schools with low levels of poverty. Part of this problem could be that schools with higher poverty levels are not applying for grants any more

often than schools with lower levels of poverty. However, it could also be the case that granters of funds for green schoolyard projects do not heavily consider socioeconomic status in their decisions. Since there is a demonstrated disparity in the occurrence of funding challenges between schools with low and high levels of poverty, suppliers of green schoolyard grants might do well to increase their focus on schools in economically disadvantaged areas. Dymont (2005a) also noted that schools in areas with lower socioeconomic status were more likely to experience difficulty in acquiring funding, and her research found that schools with low socioeconomic status rated their green schoolyard features as less adequate than schools with high socioeconomic status. If this gap in adequacy truly does exist, then that is evidence for even more support of need-based grants to ensure equality in students' access to green spaces.

Apart from the presence or absence of various challenges, there seems to be another influencing factor at the school level that could lead to the success or abandonment of a schoolyard habitat: the degree to which the schoolyard habitat becomes part of the school culture, similar to the process described by Huberman and Miles (1984) as institutionalization. Many interviewees spoke of enjoyment of the habitat by students and teachers, as well as the sense of pride and ownership exhibited by the school community, but some described the habitat as even further ingrained into the school environment. When speaking about a school garden that had been in place for nearly two decades, one woman stated, "It's part of our culture. It's part of who we are." She went on to say that no one person was in charge of the habitat, but if it were to grow over, there would be five more people ready to work on it. At another school, an educator described

the mindset of people at the school as “expecting the habitat to be there.” Once the habitat had been constructed and the community and teachers began to use it, “the culture had been set.” As a third example, one educator said that they did not consider the habitat separate from “regular life.” When asked about the key to their habitat’s success, she responded by saying that it was part of their schoolyard, and they would not let their yard die.

For other schools, habitats were part of tradition or symbolic of peace. And several interviewees described their habitat as benefiting the school in terms of admissions. One person described their school’s habitat as unique in their community and not something that a lot of schools have, making it a selling point for the school. Other interviewees echoed this view of the habitat as another “feather in the school’s cap” to attract parents and students, with one habitat coordinator stating that the school could never let the habitat go because it was such a big draw for admissions. If the current habitat leader were to leave, they would just hire a new one. Considering that turnover of habitat leaders has the potential to devastate a habitat that depends upon one or a few people to utilize and maintain it, engraining the schoolyard habitat into a school community’s culture and awareness could have the potential to sustain the habitat over the years.

## CHALLENGES ARISING FROM LACK OF COMMUNITY INVOLVEMENT

### Results

Three categories of challenges relating to lack of community involvement with schoolyard habitats were noted in the course of interviewing educators and volunteers from active habitat schools. These were a lack of community understanding about the habitat, the workload associated with maintaining a habitat, and troubles with lack of volunteers or the habitat workforce. Figure 30 shows the number of schools whose interviewees mentioned each of these challenges.

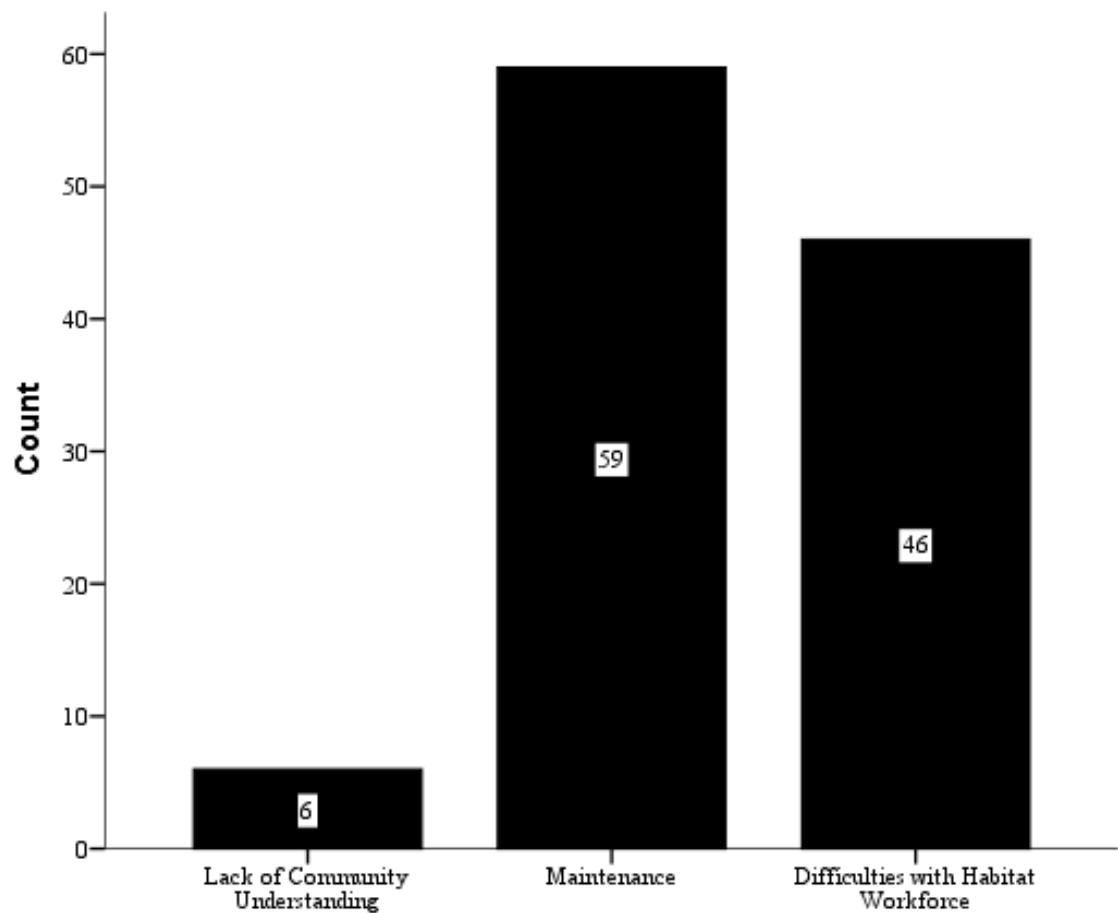


Figure 30. Number of interviewees from active habitat schools that mentioned each of three challenges arising from lack of community involvement. Eight interviewees were not asked about challenges in their habitats but may have mentioned challenges elsewhere in the interview, and those responses would be included in the chart. Source: All interviewed schools with active habitats. Includes both randomly and non-randomly selected schools. (N=182)

### *Lack of Community Understanding*

Only six of 182 interviewees from schools with active habitats mentioned experiencing a lack of community understanding about the habitat. For example, one educator from a rural community stated that the public thought the school was letting their habitat go to weeds, when in fact, the area was a restored prairie. After putting explanatory articles in the newspaper, though, there was more understanding amongst the

public. Another educator noted that their school is located in a community with the mentality that “everything should be mowed,” and this led to negative views of the schoolyard habitat. Three other interviewees mentioned similar issues, where visitors to the schools did not understand why the wildlife gardens looked “messy” or un-manicured. Each of these three emphasized the importance of explaining the purpose of the gardens to people who might otherwise hold negative views about them.

Signage was mentioned twice by these interviewees as being helpful for conveying the purpose of the habitat to passersby, and it was hypothesized that perhaps there would be a relationship between the presence of signage in a habitat the chances of the habitat remaining active. Not only do signs notify the community about the existence and purpose of schoolyard habitats, but they can also alert uninformed teachers and administrators to the educational and conservational potential of habitats, especially in schools with high employee turnover. In many schools that were contacted for interviews during this study, particularly in schools that had certified their habitats many years ago, secretaries and staff were not aware of their schoolyard habitat certification with NWF or did not know where on the school grounds the habitat might be. A sign could serve as a practical reminder of the habitat’s existence and history. Furthermore, a positive relationship between displaying signs and keeping an active habitat could reflect a measure of socioeconomic status, because purchasing signs or materials to make them costs money.

Two sources of data on signage in the sampled schoolyard habitats were available. First, NWF offers their own official signage which declares that certified sites provide

food, water, cover, and places to raise young for wildlife, and the organization kept digitized records of which schools purchased official signage and which did not. In the interview sample, 76.1 percent of active habitat schools and 65.7 percent of dormant habitat schools had purchased signage. Upon comparison with a logistic regression, it would at first appear that the purchasing of NWF signage increased the chances of an interviewed school having an active habitat (see Table 3). The odds of a habitat being active were expected to be 66.2 percent higher in schools that had purchased signage than in schools that had not, although the confidence interval around this odds ratio was quite large. However, after controlling for the number of years the school was certified, the purchase of signage was no longer significant, because more newly certified schools were more likely to have purchased signs. The odds ratio of 0.907 for the years certified variable suggested that older habitats were less likely to be active, as expected.

Table 3. Habitat activity status logistically regressed on the purchase of NWF signage and the number of years each habitat had been certified. The dependent variable was coded as 1 if the habitat was active and 0 if the habitat was dormant. Source: Activity status is from schools contacted for interviews with active or dormant habitats. Signage and years certified data are from NWF database. Does not include schools that closed or were selected non-randomly.

	Model 1: Signs				Model 2: Signs and Years Certified			
	Exp(B)	95% C.I.		Standard Error	Exp(B)	95% C.I.		Standard Error
		Lower	Upper			Lower	Upper	
Purchased NWF Signage	1.662**	1.081	2.555	.219	1.116	.695	1.792	.242
Years Certified	-			-	.907**	.869	.947	.022
Constant	1.912**			.150	5.465**			.288
N	411				411			
X <sup>2</sup>	5.403**				26.523**			
Cox & Snell R <sup>2</sup>	.013				.062			
Nagelkerke R <sup>2</sup>	.019				.089			

Note: \*\* p < .05

The second data source on signs came from the survey sample, where respondents were asked if they had a sign in their habitat to mark its existence or purpose.

Unfortunately, a reasonable comparison of schools that displayed habitat signs versus schools that did not cannot be made amongst survey respondents, because only 19 responses were received from schools with dormant habitats. Additionally, the survey question only inquired after the current display of signs, and might have misrepresented dormant habitat schools that had signage in the past but do not have it now, for example, if their habitat was removed. As expected, however, from the previously presented results on the purchase of NWF signage, the majority of active habitat schools in the survey sample did have signage present (see Figure 31).



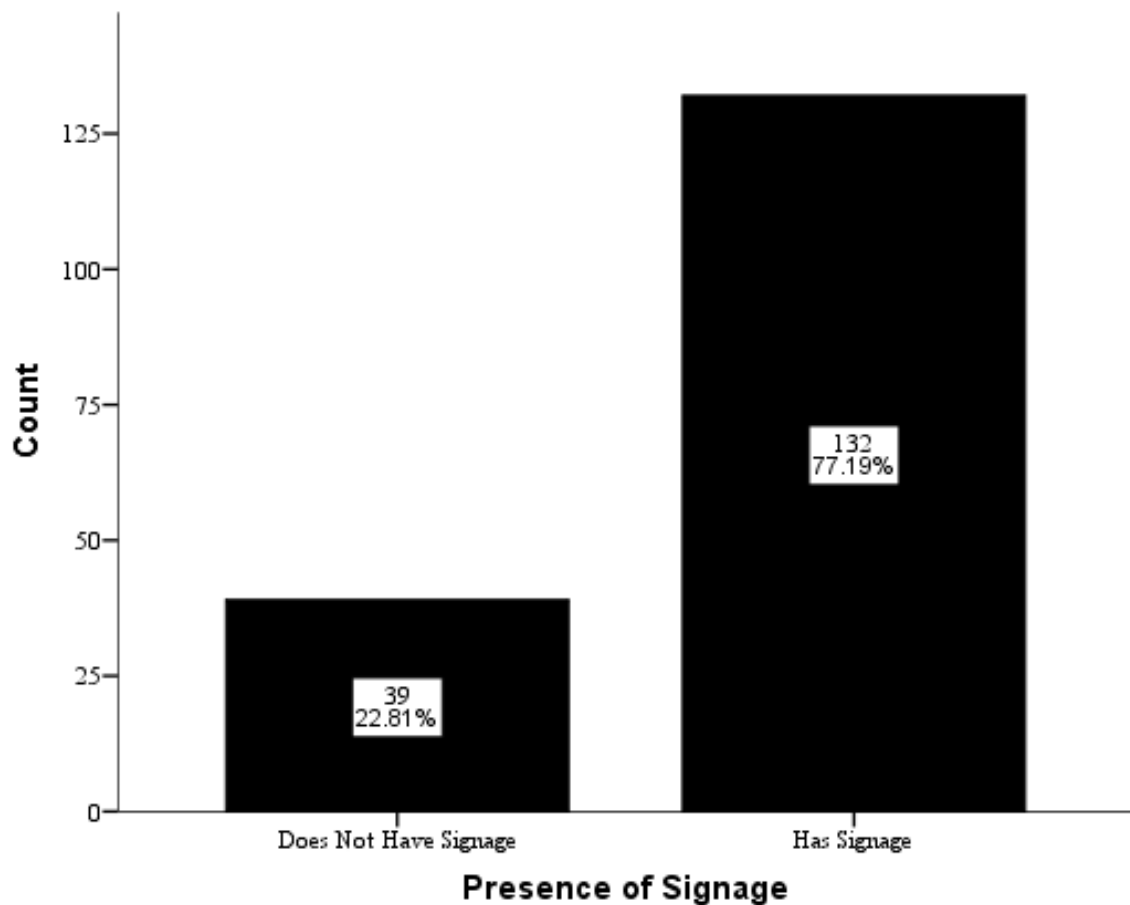


Figure 31. Survey responses to question regarding the presence of signage in the schoolyard habitat. Answer choices were initially separated into three categories: “yes, an NWF sign,” “yes, a non-NWF sign,” and “no.” However, respondents were only able to select one of these answer choices, even though they may have had both official NWF signage and other signage. Therefore, the two “yes” categories were combined. Source: Survey data from active habitat schools. (N=171)

It was also thought that perhaps the locale, whether urban, suburban, town, or rural, might play a role in community engagement and thus affect the success of schoolyard habitats. Although locale type was not heavily discussed with interviewees, it did come up a few times as a benefit or barrier in terms of community members. Take, for example, the previously mentioned teacher that described his rural community as not immediately understanding the purpose of the habitat. But another educator portrayed his

rural community as just the opposite by noting that people in the area appreciate wildlife. On the other end of the spectrum, one principal from an urban environment described their schoolyard habitat as a target for vandals, but said that the surrounding community acted as watchdogs to protect the area. While speaking about a suburban habitat, another interviewee said that there were few other natural spaces nearby for children to experience and that parents liked the habitat.

Of course, it was also noted by several people that living in a rural area meant that it was easier to attract wildlife, whereas city- and suburb-dwellers found that the deficit of natural areas nearby meant fewer animal visitors. Upon comparison, however, there was no statistically significant difference in the proportions of active and dormant habitats across locale types ( $X^2=2.279$ ,  $df=3$ ,  $p=0.516$ ; see Figure 32). But notably, there was approximately an 11 percent decrease in the likelihood of habitats remaining active in towns as opposed to the other three locale types. Had the group size in the town category been larger, this 11 percent difference might have been statistically significant.

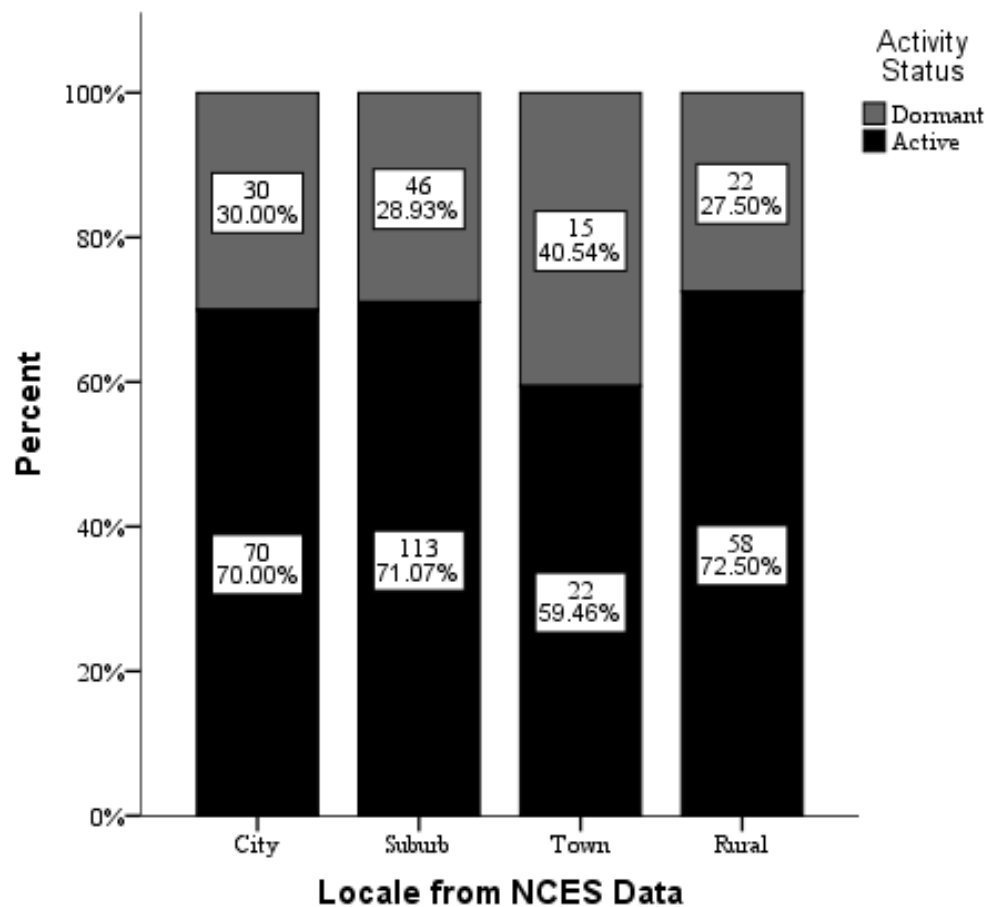


Figure 32. Proportions of active and dormant habitats based on their locations in cities, suburbs, towns, and rural areas. Source: Activity status is from interviews with active and dormant habitat schools. Locale data are from NCES. Does not include schools that closed or were selected non-randomly. (N=376)

Although the relationship between locale and habitat continuity was statistically non-significant, there was a more discernible relationship between the status of the habitat as active or dormant and poverty in the school community. The proportion of students eligible for free or reduced price lunches was used as an indicator of poverty in public schools. Schools with active habitats had a median proportion of 0.372 eligible students, but schools with dormant habitats had a higher median of 0.464 for the 2010 to 2011 school year, indicating that as poverty goes up, the chances of a schoolyard habitat

remaining active go down (see Figure 33). In the logistic regression results shown in Table 4, the odds ratio for the student poverty variable was 0.992, meaning that for a one percent increase in the percentage of students eligible for free or reduced price lunch, there was an expected 0.8 percent decrease in the odds of a habitat being active.

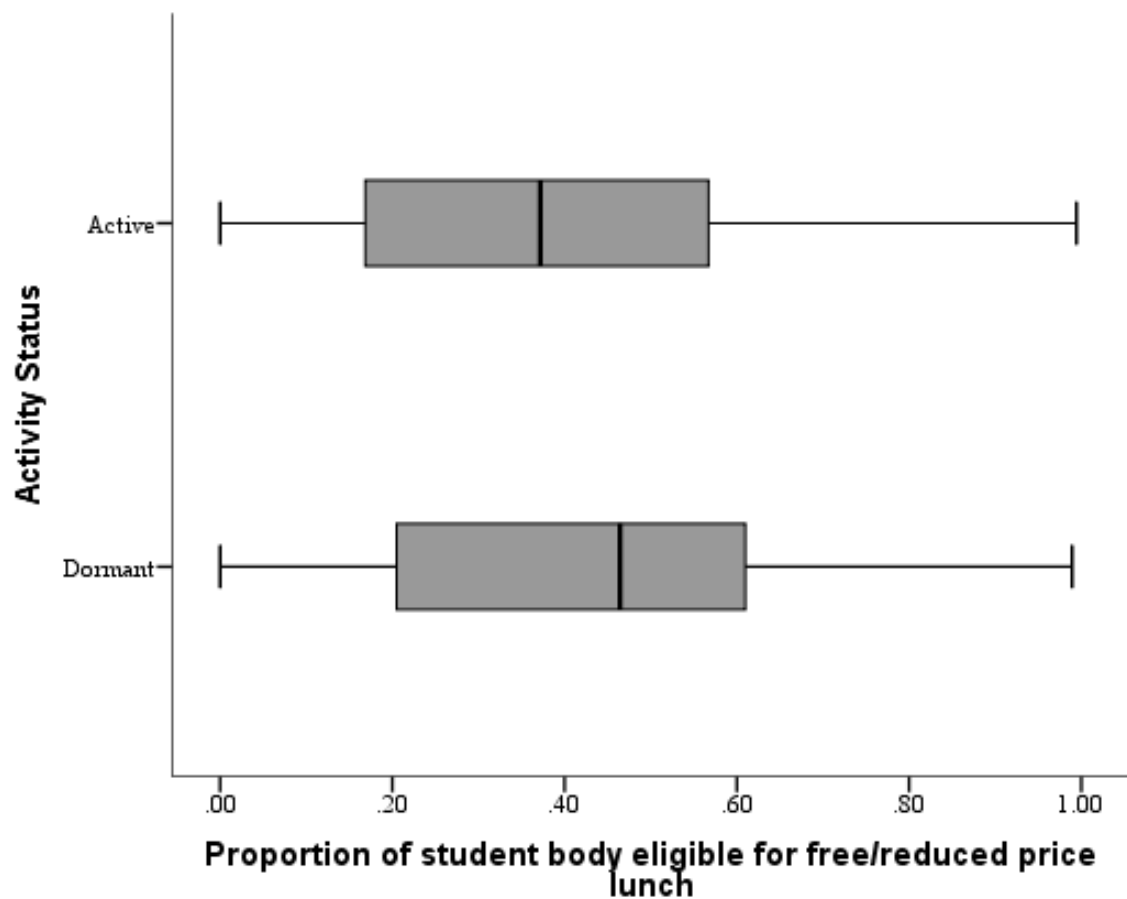


Figure 33. Schoolyard habitat activity status across the proportion of students in public schools eligible for free or reduced price lunches. Source: Activity status is from interviews with active and dormant habitat schools. Lunch data are from NCES. Only includes public schools. Does not include schools that closed or were selected non-randomly. (N=326)

Table 4. Habitat activity status logistically regressed on the percent of students in each school eligible for free or reduced price lunch. The dependent variable was coded as 1 if the habitat was active and 0 if the habitat was dormant. Source: Activity status is from interviews with active and dormant habitat schools. Lunch data are from NCES. Only includes public schools. Does not include schools that closed or were selected non-randomly.

	Exp(B)	95% C.I.		Standard Error
		Lower	Upper	
Percent of students eligible for free or reduced price lunch	.992*	.983	1.001	.005
Constant	3.015**			.228
N	326			
X <sup>2</sup>	2.821*			
Cox & Snell R <sup>2</sup>	.009			
Nagelkerke R <sup>2</sup>	.012			

Note: \*\*  $p < .05$ , \*  $p < .10$

### *Schoolyard Habitat Maintenance*

The upkeep of schoolyard habitats was mentioned as a challenge by interviewees in two contexts. First, some interviewees specifically noted that the workload associated with habitat maintenance was challenging, and second, some interviewees found that attracting volunteers or using a habitat workforce to complete maintenance tasks was difficult. Often, these two categories overlapped, but the former is the topic of this subsection. Fifty nine (59) of 182 interviewees from active habitat schools commented that habitat maintenance was a challenge, making it the most frequently reported habitat hurdle of this study.

Weeding and the removal of invasive plants were by far the most mentioned maintenance challenges with the habitats. A few interviewees noted that they were committed to organic gardening practices, such as not spraying harmful pesticides, and this made keeping weeds away all the more difficult. Getting water to the habitats was

seen as challenging by several individuals, and one volunteer master gardener<sup>15</sup> stated that the dry summer climate of her state made gardening a challenge. Conducting controlled burns of prairies and clearing out sediment from filling ponds were less typical maintenance challenges described by some interviewees.

Maintenance was not necessarily viewed as an overwhelming obstacle by each of the 59 people that mentioned it. When asked about challenges with their schoolyard habitats, some interviewees responded immediately that there were not really any challenges associated with the habitat, but then went on to discuss maintenance. Others first mentioned maintenance, but then clarified their views by saying that maintenance tasks were just a part of having a habitat or by explaining steps they had taken to solve maintenance challenges. But in other cases, interviewees were more direct in saying that maintenance was their biggest challenge or describing in detail specific difficult aspects of maintenance or problematic invasive plants. At a more severe level, one woman noted that the habitat was a “nightmare to maintain” and another man stated that maintenance was a “huge inconvenience,” but both went on to say that the work was well worth it and was what was best for the students.

Along with the ecosystem type of the habitat (whether garden, aquatic, forest, etc.) and the number of people responsible for maintaining it, habitat size affects the amount of maintenance needed to sustain a habitat, and thus could influence whether or not a habitat is able to be sustained in the long term. If size were the only variable related

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<sup>15</sup> Master gardeners are individuals who have gone through rigorous horticulture training programs, usually taken through universities. These gardening experts then volunteer in their communities (American Horticultural Society 2013).

to maintenance workload, then one would expect to see larger habitats requiring more maintenance; likewise, if maintenance challenges always deterred the continual upkeep and use of habitats, then large habitats would be least likely to remain active over the years. However, results show the exact opposite ( $X^2=8.727$ ,  $df=4$ ,  $p<.10$ ; see Figure 34). At five or more acres, the largest schoolyard habitats were the most likely to remain active, and the smallest habitats (less than 1/8 acre) were least likely to remain active. Additionally, there was no significant relationship between habitat size and an interviewee reporting a challenge with maintenance ( $X^2=5.068$ ,  $df=4$ ,  $N=149$ ,  $p=0.280$ ). Nor was there a relationship between size and reporting a challenge with maintenance and/or habitat workforce ( $X^2=7.532$ ,  $df=4$ ,  $N=149$ ,  $p=0.110$ ).

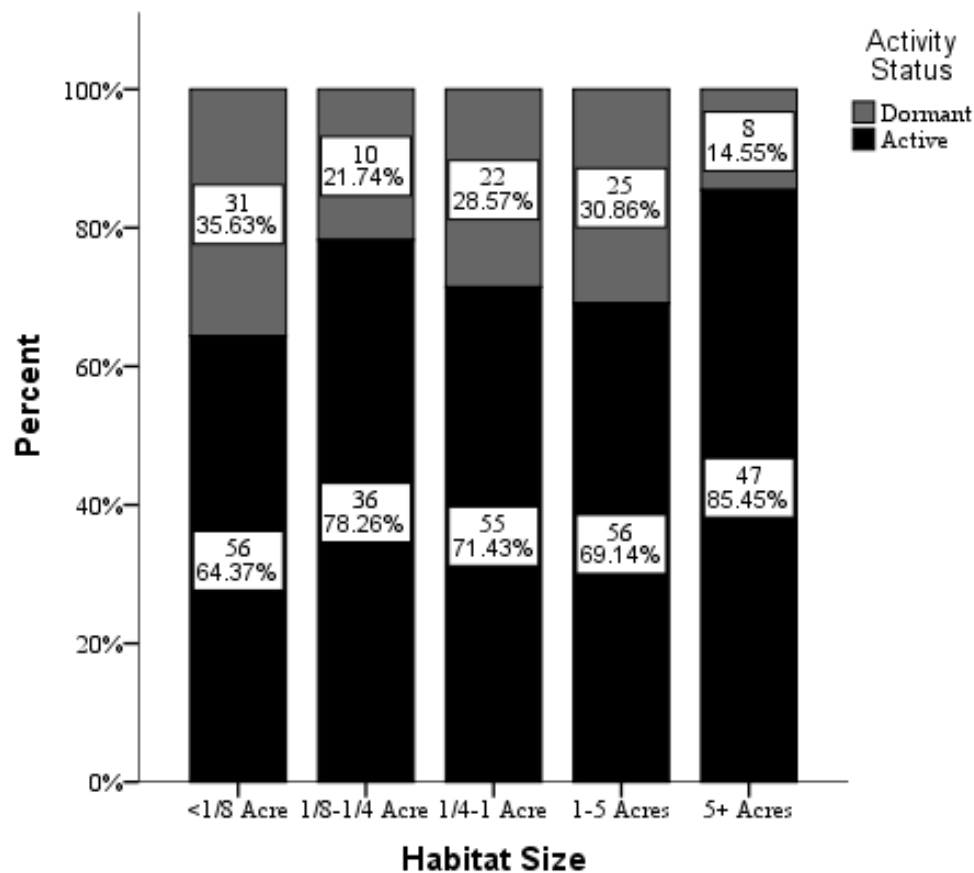


Figure 34. Percentages of active and dormant schoolyard habitats in each of five habitat size categories. Source: Activity status is from interviews with active and dormant habitat schools. Size data were reported to NWF by each school when they certified their habitats. The sample is slightly biased toward schools that certified habitats more recently, since habitat size data were not always recorded electronically. Does not include schools that closed or were selected non-randomly. (N=346)

### *Difficulties with Habitat Workforce, Including Turnover and Lack of Volunteerism*

A lack of volunteerism and related troubles with habitat workforces were challenges brought up by 46 of 182 interviewees from active habitat schools. In the course of conducting interviews, a number of different groups involved with maintenance were mentioned, and this information was used to construct a survey question regarding the caretakers of schoolyard habitats (see Figure 35). The group most involved with care



was students (81.9 percent), followed closely by the survey-taker, or presumed habitat leader (80.1 percent). Assistance from other educators at the school was not as high; only 48.5 percent of survey respondents reported receiving help from fellow teachers, but the majority of the sample did have some level of volunteerism (66.1 percent<sup>16</sup>).

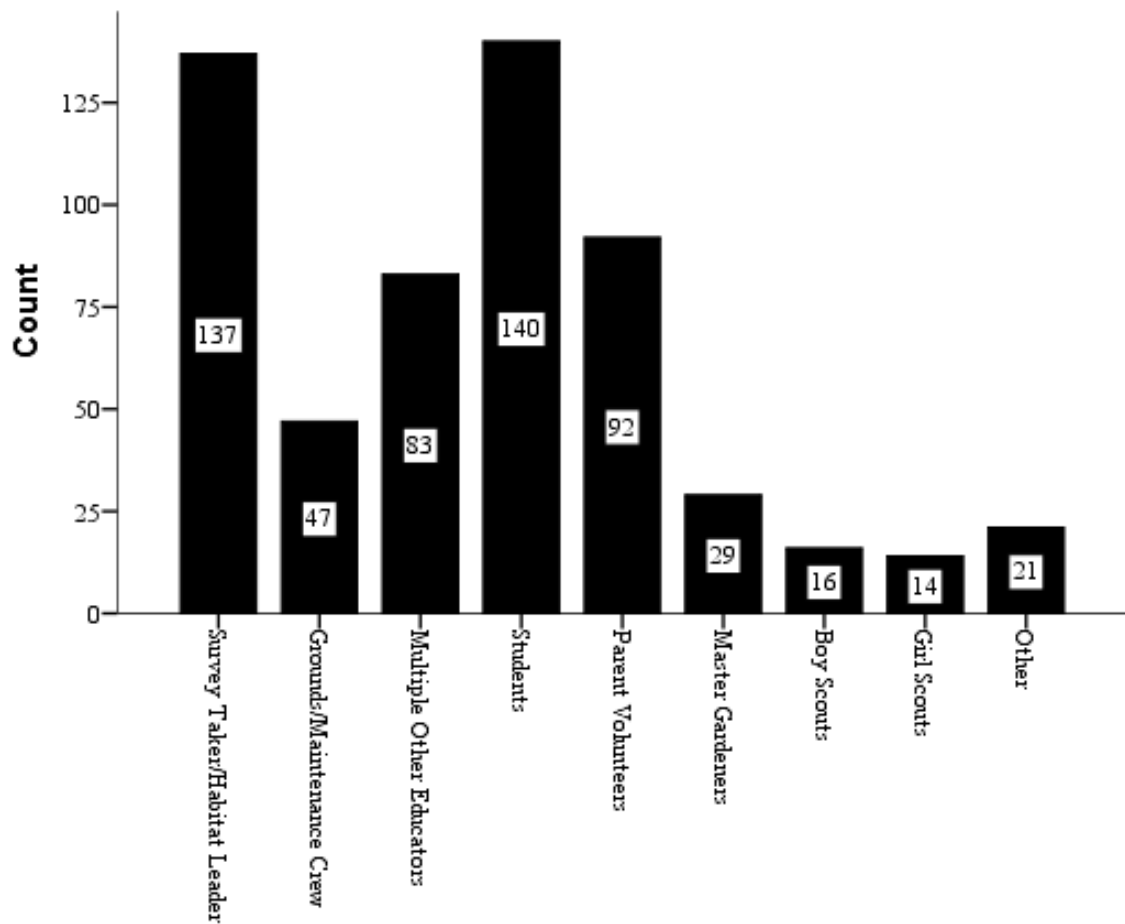


Figure 35. Survey responses to question inquiring as to who takes care of the habitat. Respondents could choose any number of options. Source: Survey data from active habitat schools. (N=171)

<sup>16</sup> This statistic is not shown on Figure 35. It was calculated by adding the number of schools that selected at least one of the five right hand groups on the figure and dividing by the sample size of 171.

Lack of volunteerism was the most commonly reported difficulty with the habitat workforce. The bulk of interviewee responses that fell into this subsection were directly related to lack of volunteerism (either from fellow school staff or the community), with some respondents mentioning the overlapping issue of a habitat being too much work for one person or a small team to maintain. Less typical responses were given by a handful of educators that described troubles reconciling their views of what the habitat should look like with the desires of a grounds crew to mow the habitat or discard native plants. Survey responses indicate that experiencing a lack of volunteers is even more common than let on by interviewees (see Figure 36). Nearly 80 percent of the survey sample noted that lack of volunteers was a challenge for their schoolyard habitats, although for about a third of the sample, this was seen as a minimal difficulty.

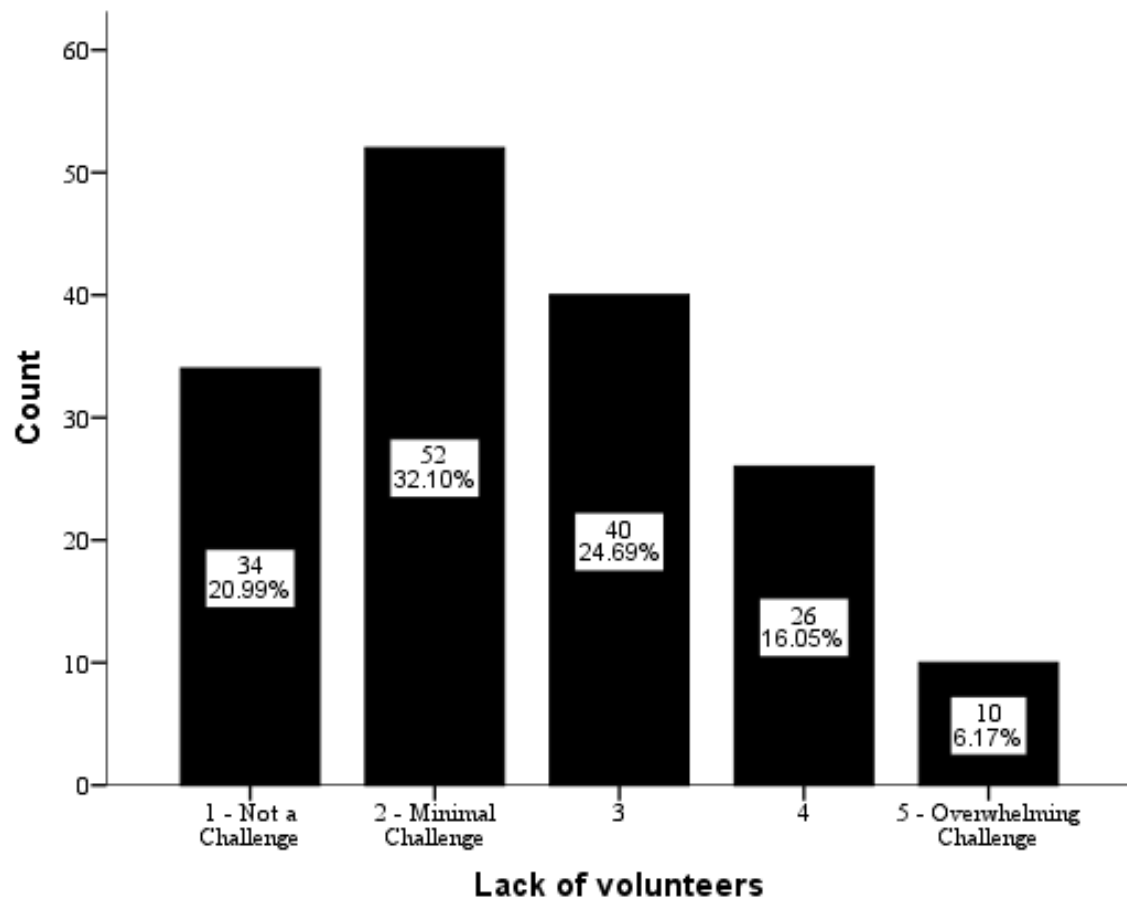


Figure 36. Survey respondents' ratings of lack of volunteers as a challenge on a scale of 1 to 5. Source: Survey data from active habitat schools. (N=162)

Several educators noted that although volunteerism was high in the beginning, the initial enthusiasm quickly wore off, and attracting volunteers for routine maintenance was tough. Even when habitat leaders actively sought out extra helping hands, that was no guarantee that volunteers would come. For example, one interviewee described sending out a school-wide notice for participation in a maintenance session, and only one family showed up to work. As another example, one woman stated that she thought the challenge was getting people to take responsibility for the habitat. Without her sending out

reminders, no one would take the initiative to do weeding on their own. Several interviewees found that maintenance challenges were greatest during the summer when students and staff were away, which made volunteer acquisition especially difficult. The state of the economy and the socioeconomic status of the surrounding community were also mentioned by a few as inhibiting the formation of a solid volunteer base. One interviewee noted that potential volunteers were hesitant to spend money, even on gas, to get to the school, while two others said that most parents were working and did not have time to volunteer with habitat maintenance. However, there was no demonstrable relationship between the percentage of school students in poverty and whether or not an interviewee reported experiencing a challenge with their habitat workforce (see Table 5). Likewise, there was little difference in the rating of the lack of volunteers challenge amongst survey-takers from schools with high or low levels of poverty (see Figure 37). Survey-takers from public and private schools also rated the lack of volunteers challenge nearly identically (see Figure 38).

Table 5. Whether or not an interviewee reported a habitat workforce challenge logistically regressed on the percent of students in public schools eligible for free or reduced price lunches. The dependent variable was coded as 1 if the school experienced a workforce challenge and 0 if not. Source: Challenge data are from active habitat interviewees. Lunch data are from NCES. Does not include private schools or schools that were selected non-randomly.

	Exp (B)	95% C.I.		Standard Error
		Lower	Upper	
Percent of students eligible for free or reduced price lunches	.993	.976	1.009	.008
Constant	.461**			.338
N	125			
X <sup>2</sup>	.826			
Cox & Snell R <sup>2</sup>	.007			
Nagelkerke R <sup>2</sup>	.010			

Note: \*\* p < .05

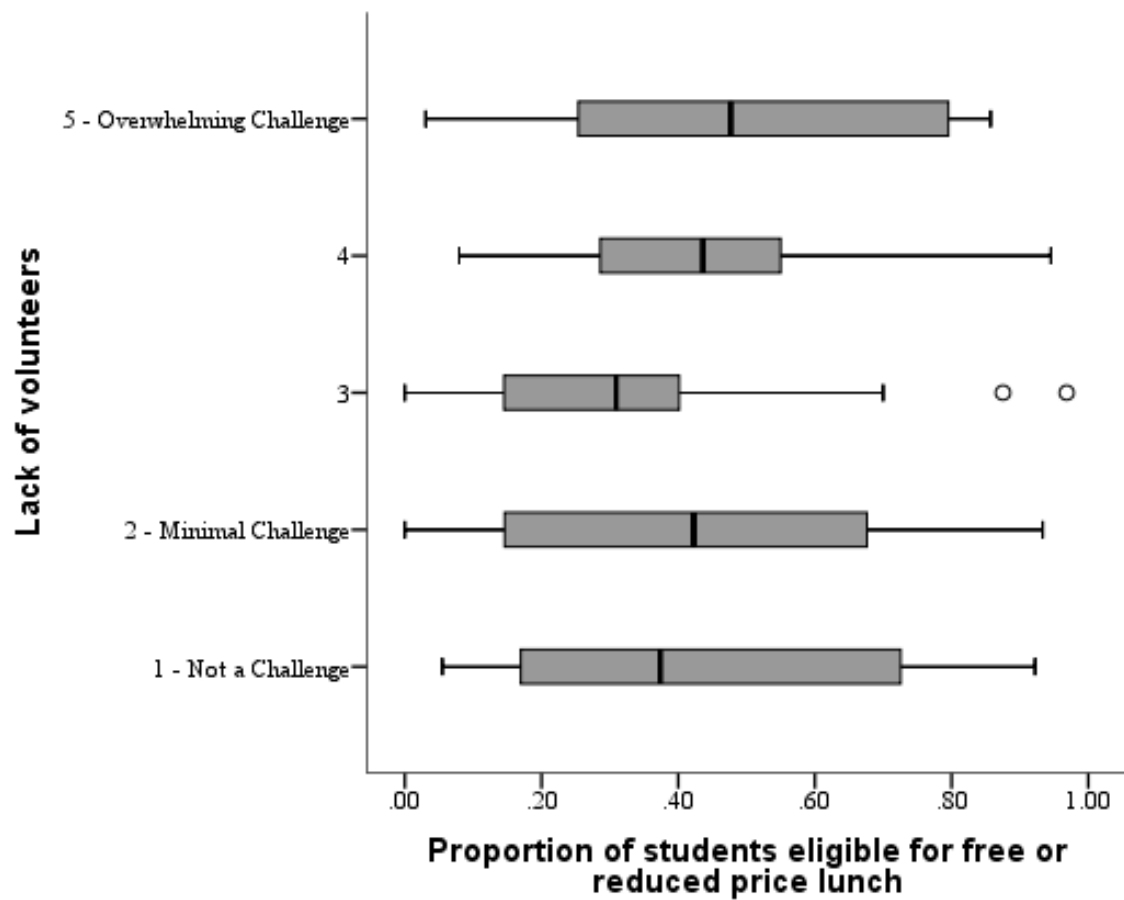


Figure 37. Survey respondents' ratings of the challenge posed by a lack of volunteers plotted against the proportion of students eligible for free or reduced price lunch in their schools. Source: Challenge data are from survey responses from active habitat schools. Lunch data are from NCES. Only public schools were considered. (N=115)

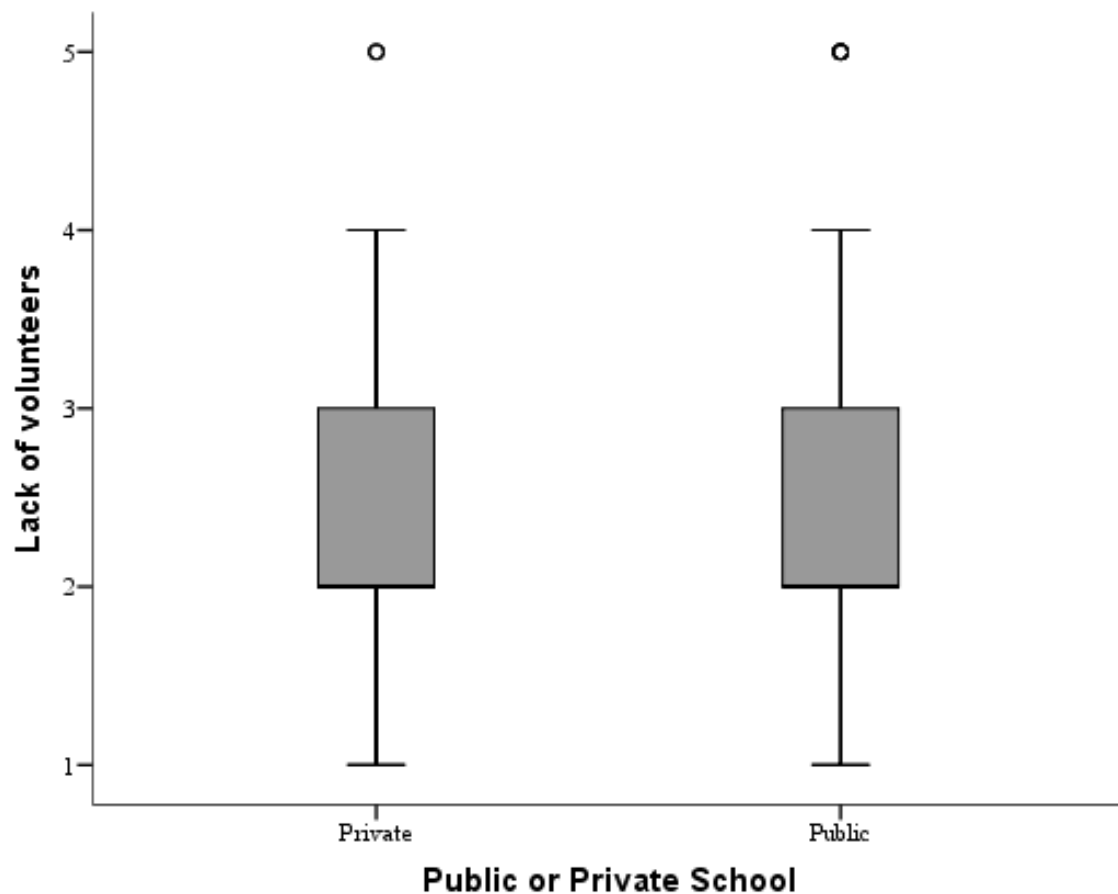


Figure 38. Public and private school survey respondents' ratings of the challenge posed by a lack of volunteers. Source: Challenge data are from survey responses from active habitat schools. Public/private status is from NCES. (N=159)

While schools with high and low levels of poverty did not differ significantly in their ratings of the lack of volunteers challenge, they did differ in their reports of the habitats' caretakers. Figure 39 shows that schools with the highest levels of student poverty are more likely to be maintained only by school personnel. Conversely, the maintenance in schools with low levels of poverty was led solely by volunteers. Schools where both groups were involved with maintenance were more toward the middle of the poverty spectrum. Twenty-one (21) survey-takers from public schools noted that they had

help from neither volunteers nor school personnel and that only they (the survey-taker) and/or students cared for the habitat<sup>17</sup>. Dropping this latter category and treating the “people who maintain the habitat” as an ordinal variable resulted in a statistically significant relationship between habitat caretakers and student poverty levels (Spearman’s  $\rho = -.234$ ,  $N = 100$ ,  $p < .05$ ).

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<sup>17</sup> The construction of these variables was as follows: School personnel were considered “ground/maintenance crews” and “multiple other educators.” Volunteers were considered “parent volunteers,” “master gardeners,” “boy/girl scouts,” and “other.” (See Figure 35 for a visual breakdown of these categories.) If the respondent indicated that only school personnel cared for the habitat, then they were put into the category “only school personnel maintain.” Similarly, if the respondent selected only volunteer categories, then they were put into the category “only volunteers maintain.” If groups from both categories were selected, then they were put in the category “both maintain.” Two more groups that the respondents could choose (“survey taker” and “students”) were dropped when constructing these variables, because since nearly all respondents selected either the “survey taker” or “students” choices, most responses would fall into the “both” category. Respondents that indicated that neither school personnel nor volunteers maintained the habitat—only the survey taker and/or students maintained—were dropped from the following statistical analysis.



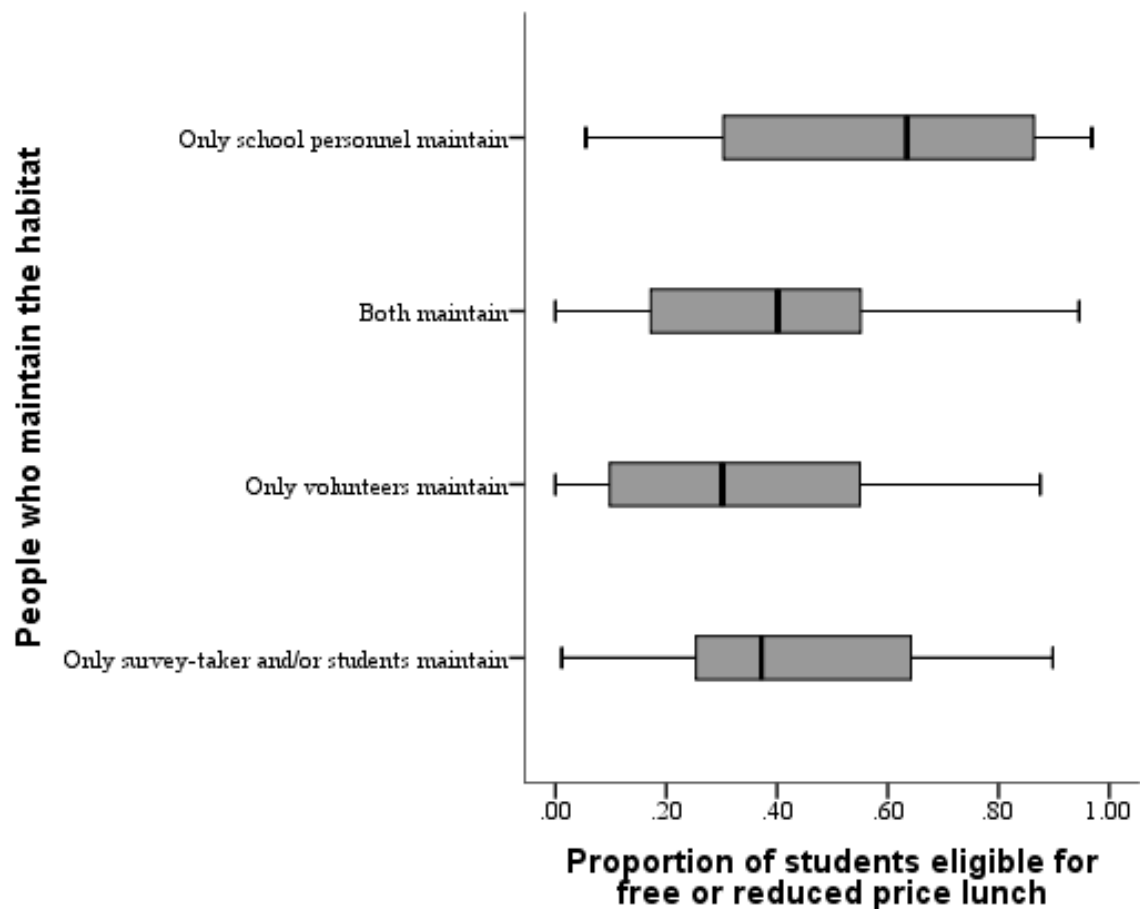


Figure 39. Groups that care for the habitat according to survey-takers plotted against the proportion of students in each school eligible for free or reduced price lunch. Source: Maintenance data are from survey responses from active habitat schools. Lunch data are from NCES. Only public schools were considered. (N=121)

The situation reported by 21 public school survey-takers, wherein they had little help caring for the habitat other than from students, was reflected in interviews as well. Some interviewees were specially hired as garden coordinators or were paid a stipend for their work in the schoolyard habitat, but even those that were not sometimes found that most of the maintenance fell on them. Without volunteerism, a few interviewees noted that maintenance could be overwhelming. One man mentioned that caring for the various

habitat projects around the school was comparable to a part time job in addition to his full time teaching duties. When asked about the key to keeping their habitats active, many interviewees in habitat leadership positions with little support expressed worries that no one would care for the habitat when they retired or left the school. A total of 42 interviewees noted in some way the importance of a habitat leadership role, even if they did not explicitly state worries about the future of the habitat. For example, many educators stated—sometimes bashfully—that the habitat stayed active because of their presence and that gardening was a labor of love for them. Others stressed how critical it was to have one or two adults take ownership.

And, indeed, turnover of these leaders did seem to have a negative impact on the habitats. Interviewed schools that still had at least one of their original habitat leaders present were more likely to keep active habitats than schools where all of the initial leaders had left ( $X^2=31.969$ ,  $df=1$ ,  $p<.001$ ; see Figure 40). Occasionally, turnover was inferred to be a good thing, such as when a cycling of new teachers into schools supplied a dormant habitat with interested new individuals to revitalize it. For the most part, however, interviewees from active habitat schools mentioned turnover in a neutral or negative context. Turnover was a big issue in dormant habitat schools, where 56 of 172 interviewees mentioned habitat leader turnover, lack of volunteers, or overwhelming maintenance as reasons for the disuse of the habitat.

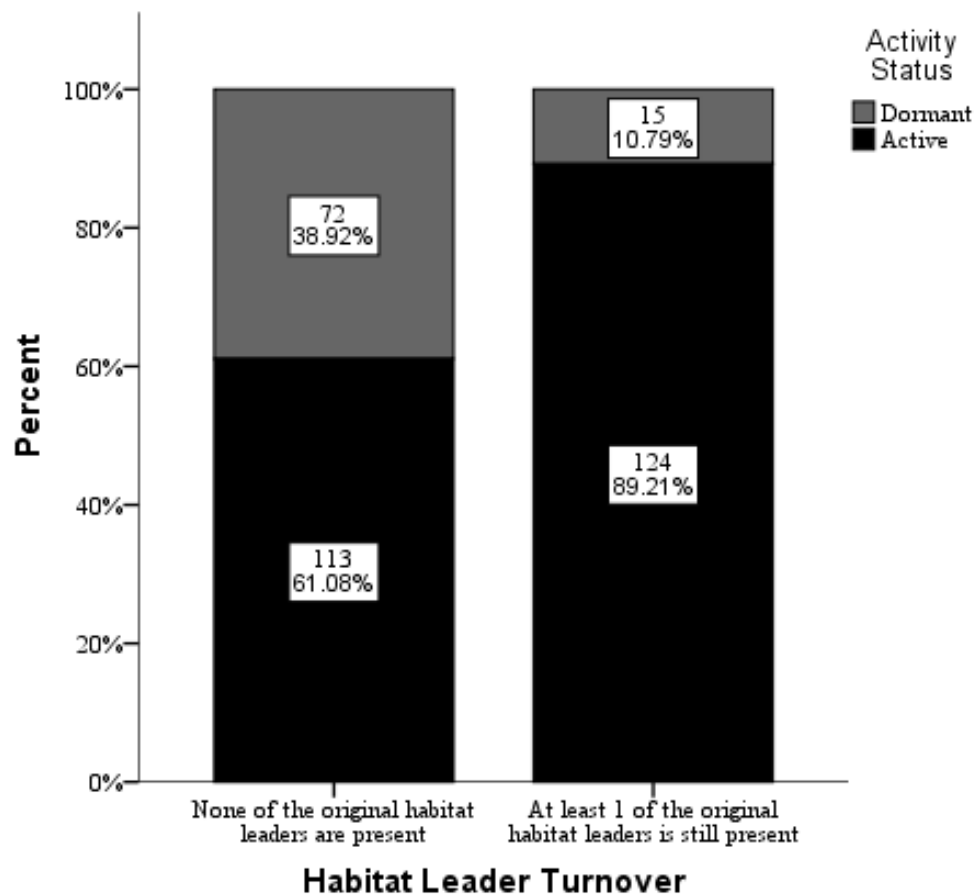


Figure 40. Percentages of schools with active and dormant habitats based on whether any of their original habitat leaders were still present at the time of the interview. Source: The original habitat leaders were considered to be the individuals who provided their contact information to NWF within six months of habitat certification. There were usually one or a few contacts, and their presence or absence at the school was confirmed while speaking to secretaries. Schools that had not provided any individual contact information to NWF within six months were dropped. Does not include schools that closed or were selected non-randomly. (N=324)

### Discussion

The community surrounding the school should be a place from which to draw support, according to nearly three dozen interviewees that stated that community engagement was part of the key to their success. Very few individuals reported experiencing opposition to the habitat from their community, but information on steps

that they took to remedy the problem, as well as thoughts from other interviewees, could be valuable to newly certified schools that are trying to get their communities on their sides. One habitat coordinator stressed the importance of communicating the educational value of the habitats to parents, and it seemed that this could be an important tactic to gain parent volunteers. If parents understand why a schoolyard habitat is good for their children, then they will be more likely to help take care of it. This could be especially important in low-income communities where volunteers and donations are hard to come by. Even non-parent community members that do not have a vested interest in the school could be made to see the importance of the habitat for wildlife. Putting up signs or garnering attention for the habitat in local media could be excellent outlets for getting recognition for the habitat's purpose, as several interviewees stated. For whatever reason, more newly certified schoolyard habitats were more likely to have purchased official NWF signage than older habitats, and thus, after controlling for habitat age, purchasing signs did not have a statistically significant effect on a habitat's chances of remaining active for the long term. However, signage could still have the potential to produce positive effects in some schools, as noted in the qualitative results.

As one man insightfully put, part of the issue is changing people's idea of "what is beauty." His example was that manicured lawns, while neat and pretty, have little value for wildlife and require an abundance of harmful chemicals to maintain. Wildlife gardens, contrarily, are not always designed to be tidy and landscaped, and typically incorporate more native plants than exotic ornamentals. The beauty of a wildlife habitat is not always in its outward appearance, but in its purpose, in its benefits to both wildlife and students.

Communicating this message to administrators has already been noted to be important, because they have the power to order the removal of the habitat. But interviewed habitat leaders have also found themselves needing to convey this information to the community as well, and doing so could be a strategy to gain support.

In addition to gaining community support, several interviewees noted that one of the keys to long-term success was not building a habitat bigger than could be maintained. Size is not everything, and as one interviewee put it, it is better to “think small [and] go slow” than to end up with a massive project requiring overwhelming maintenance. He emphasized starting small and knowing how much maintenance was involved with each component, which seems appropriate, since several educators found that their volunteer workforce waned after initial installation. It was not uncommon for interviewees to discuss changes to their habitats, including cutbacks to the original projects. For example, one educator noted that they replaced the most difficult to maintain section of their habitat garden with a rock garden. Small-scale reductions, while inconvenient, certainly do not spell doom for the habitat. However, some interviewees expressed frustration over the lack of volunteers for their project, and six interviewees from schools with dormant habitats mentioned that maintenance got to be overwhelming and that was part of the reason for the habitat’s decline. Therefore, starting small and taking “baby steps” toward improvements and expansions to the habitat could be one strategy to avoid these situations.

Interestingly, however, the quantitative results related to habitat size told a much different story than cautionary advice from interviewees. The largest habitats (five or

more acres) were actually more likely to remain active than the smallest habitats (less than 1/8 acre).<sup>18</sup> There could be several reasons as to why the qualitative and quantitative results seem to be at odds with each other. First, there was no good dataset to test for relationships between ecosystem type and size or activity status. No two habitats are identical, and the ecosystems they represent include gardens, forests, wetlands, ponds, prairies, etc. Clearly, five acres of gardens would require much more maintenance than a few small plots. Perhaps the five-acre habitats are mostly woodlands and require little maintenance, whereas the smaller habitats consist of gardens and manmade water features that require frequent, intense upkeep. As another theory, it could be that the larger habitats are harder to abandon or demolish than smaller ones. Multiple interviewees from dormant habitat schools noted that their habitats were wiped out due to building renovations, and it makes sense that small, garden habitats close to the school would be in greater jeopardy than acres of forest or prairie. Additionally, it would be easier to walk away from the maintenance of a small area that could be mowed over than from a huge area constantly in view of the school.

Although the largest habitats would likely have been found in rural areas, there was no significant relationship between activity status and locale. Those habitats found in rural areas were just as likely to remain active as those in urban areas. Although both types of locales, as well as suburbs and towns, have their virtues and drawbacks, it was thought that urban areas would be least likely to keep active habitats, partly because there is less space in cities and fewer natural areas. However, it is important to note that the

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<sup>18</sup> An assumption here is that schoolyard habitats did not change vastly in size over the years, since size information was reported to NWF only at the initial certification.

locale data used for this study were only for the start of the 2010 school year. Considering that 33.7 percent of active and dormant habitat schools from the interview sample certified habitats more than a decade ago, the current locale type for many of these schools is probably different than it was when they first installed the habitat. A handful of interviewees mentioned something to this effect by saying that they have seen less wildlife since their community grew from rural to suburban. A growing community could also mean greater chances of school building additions, which have the demonstrated potential to damage habitats. Perhaps also examining the locale type at the certification date of the habitat could yield more insightful results about the effects of a changing locale.

After installation, having a maintenance plan was mentioned as a strategy to keep schoolyard habitats up and running by nearly 20 interviewees. For some, having set “cleanup days” helped to ensure that the habitat did not get out of hand. One parent coordinator noted that setting cleanup dates and communicating them to volunteers meant that the habitat workforce had to stick to a schedule and could not continually put off maintenance tasks. Another interviewee described a clever strategy of coordinating summertime maintenance days with the school’s weekly library opening to attract volunteers. It was also noted that volunteers should not be overused, lest they lose enthusiasm for the project.

Even though 46 interviewees from active habitat schools reported experiencing a problem with their habitat workforce, 63 interviewees said that working with community or staff volunteers or having a committed leader was part of the key to their success. As

one man stated, habitats are “personnel driven” and require motivated individuals willing to take on maintenance responsibilities. A small number of interviewees from active habitat schools said that they hired professional landscapers for most of the major maintenance tasks in the habitat, but for the most part, interviewees mentioned conducting the maintenance themselves with help from fellow staff or volunteers. Helpful PTAs and PTOs were often described as sources of volunteers, but volunteerism was not limited to parents. For example, one educator sought help from their local garden club, whose members were able to assist in the identification of native and invasive plants, a service described as “very valuable, yet free of charge.” Other interviewees described successful interactions with Boy Scouts hoping to complete schoolyard habitat improvement projects as part of their Eagle Scout requirements.<sup>19</sup> Students were also described as an important part of some schools’ workforces, both during class time and outside of school hours in garden or outdoor clubs.

In regard to habitat caretakers, some of the results presented by Dymont (2005a) were mirrored in this research. In her sample of Canadian green schoolyard projects, Dymont found that schools with high socioeconomic status were more likely to have a strong volunteer workforce than schools with low socioeconomic status, where teachers were more likely to be the primary caretakers of the schoolyard. This same pattern was observed in the sample of schoolyard habitat survey respondents. Schools with greater levels of poverty (measured by students eligible for free or reduced price lunch) were less

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<sup>19</sup> “Eagle Scout” is the highest ranking awarded by the Boy Scouts of America and requires, among other things, that a Boy Scout must “plan, develop, and give leadership to a service project for any religious organization or any school or community” (Boy Scouts of America 2012).



likely to have parent volunteers involved, and teachers and custodians were left to handle the projects. Dymont suggested that schools with higher socioeconomic status were thus at an advantage, because they had greater levels of social capital. This could be the case with schoolyard habitats, because as mentioned above, the knowledge and extra hands of community volunteers helped to create successful habitats in some interviewed schools. However, even though habitats with high and low levels of poverty experience different levels of volunteerism, the survey respondents from both types of schools did not differ significantly in their ratings of the lack of volunteers challenge. Thus, perhaps schools with high levels of poverty have learned to cope without volunteers. Unfortunately, data on past levels of volunteerism in dormant habitat schools are unavailable, so it is difficult to assess whether the interaction of socioeconomic status and volunteerism ultimately influences whether or not a habitat project will succeed over the long term.

Socioeconomic status does seem to have the potential to affect a habitat's long-term success, though, because schools with higher levels of poverty were more likely to have dormant habitats than schools with low levels of poverty. Like locale, however, poverty rates change over time, and thus, it might be even more interesting to compare poverty rates from when the habitats transitioned from active to dormant status.

But it would seem that at the heart of the issue of sustaining schoolyard habitats in the long term is leadership. One interviewee insisted that there was no singular person in charge of their habitat and that all staff members took equal responsibility, but this usually was not the case. Nearly a quarter of the active habitat interview sample mentioned the importance of having one or several leaders to inspire other teachers,

conduct maintenance activities, and/or coordinate volunteers. Turnover of these people can have a major impact on habitats, as evidenced by the disparity in the proportions of active and dormant habitats in schools where habitat leaders have left versus those where they have stayed. Additionally, a large number of interviewees from dormant habitat schools cited turnover as at least part of the reason for the disuse of their habitats, and habitat leaders nearing retirement frequently expressed fears for the future of their habitats. When speaking about turnover, one man said that “the emphasis is on creating [schoolyard habitats], and little is said about what happens when something happens.” Thus, he concluded, schoolyard habitats can be temporary when no one is willing to take on responsibility, and schools need to have an exit strategy. Another teacher summed up the matter by stating that long-term success depends on a determined individual, and if this primary person retires or leaves, then the habitat will be abandoned unless the school makes it a priority. This statement is in agreement with conclusions discussed by Avidov-Ungar and Eshet-Alkakay (2011), which stated that innovative programs that are implemented in a bottom-up process with little administrative support do not tend to last. Additionally, research conducted on school garden programs often states the need for leadership and administrative support (Demarco et al. 1999; Hazzard et al. 2011, 2012; O’Callaghan 2005; Graham et al. 2005).

Interviewees in this study expressed different types of challenges, and situations vary school by school, but perhaps one of the main keys to sustaining schoolyard habitats rests in promoting the habitat to a school priority, rather than leaving it as one person’s project. This relates back to the previous discussion of the schoolyard habitat as part of a

school's culture. In schools where the schoolyard habitat is highly valued by teachers, administrators, and community alike, interviewees expressed views that the school could never let the habitat go, that their success could be attributed to dedicated volunteers and staff, and that if they, as the current habitat leader, left the school, then someone would be available to take their place. However, advancing schoolyard habitats to the point where they are highly valued by an entire school community can be a monumental task, complicated by a lack of funding and constrictive curriculum, among other difficulties.

## CHAPTER 5: CONCLUSION

The impression given thus far may have been that habitats start off in “active” status before eventually transitioning into dormancy. However, schoolyard habitats are much more dynamic than this. Multiple interviewees from active habitat schools described periods of inactivity where their habitats were overgrown and unused but were later revitalized. Several others mentioned that their habitats were destroyed by renovations and had to be reconstructed elsewhere. Additionally, when interviewees from dormant habitat schools were asked if they might be interested in restarting the program, less than a quarter of the sample responded with a definite “no.” Therefore, just because some schoolyard habitats were classified as dormant in this study does not necessarily mean that they have been abandoned forever. Another critical point is that schools with dormant habitats should not be considered unsuccessful; even habitats that do not achieve long-term success have the potential to produce positive impacts while they are active, and this is surely not an indicator of failure.

However, long-term success should be a big picture objective for schools. Green schoolyards can act as oases for native wildlife, especially in urban and suburban environments where there may be fewer areas of suitable habitat. Thus, from a conservation standpoint, keeping schoolyard habitats active for as long as possible will

have the most benefits for wildlife. And if findings from previous studies on the importance of nature in the lives of children are assumed to be true, then green schoolyards play a role in producing smarter, healthier, and happier kids that will hopefully be more sympathetic to the environment as adults. Keeping green schoolyards green, therefore, will enable them to touch the lives of more students.

There are some practical applications that can be gleaned from this study, but there is no laundry list of steps to take to ensure a schoolyard habitat's long-term success. There are simply too many variables, and circumstances differ across schools. Several universal suggestions can be made, though. First, attempting to sell the school community on the project from the very beginning has the potential to increase administrative "push" for the habitat, teacher involvement, and parent volunteerism. If the majority of the school appreciates the habitat, then the negative effects of turnover may be reduced. Before installation, careful planning can prevent problems associated with inconvenient location or adding more elements than can be reasonably maintained. And sometimes, getting more use out of a habitat means finding more creative ways to apply outdoor learning to required curriculum. Overwhelmingly, the number one use of schoolyard habitats was science. However, outdoor learning does not need to be limited to just one subject, as seen in survey results of educators that found ways to link their habitats to all subject areas.

There were several validity issues and methodological shortcomings to this study that should be addressed. First, the data collection portion of this study was conducted while working as a temporary employee at NWF. This meant that interviewees and

survey-takers were responding directly to an NWF staff member, rather than to an impartial interviewer. It is unknown whether interviewees altered their responses at all to shed a positive light on the program, but many respondents were quite candid about challenges they faced. Working for NWF while conducting this study could be seen as a conflict of interest. However, since the purpose of this paper was not to examine the benefits of the Schoolyard Habitats program but rather to get at a question relating to how to improve the program, there was little incentive to bias the study toward favorable results.

Several improvements could have been made to the methodological design of this study. First, schools selected for interviews should have been chosen in a completely random fashion to strengthen the validity of quantitative results. Second, it would have been more constructive to design the survey after analysis of the qualitative interview data to further refine individual questions and to eliminate unnecessary sections. Pilot testing the survey with habitat leaders would have also been useful to fine tune the survey and identify any potential problems.

The “sheer numbers” approach used here worked to get snapshots of all different facets of the issue surrounding challenges with schoolyard habitats and green schoolyard continuity. Future research, however, might focus on a case study approach to delve deeper into the question of why some schools are so successful in elevating their habitats to school priorities while others are not. The results in this study reflected information retrieved only from habitat leaders, for the most part, and could not fully explore why some teachers use the habitat and others do not or why community involvement is high

with some habitats and not others. Also of interest would be the study of schoolyard habitats in transition from active to dormant status or vice versa to discover specific processes and events that trigger the changing status of schoolyard habitats.

## APPENDIX I: SAMPLE INTERVIEW QUESTIONS

### Questions for Schools with Active Habitats

- 1a. Describe the habitat. What features are present?
- 2a. What types of plants and wildlife can be found in your habitat?
- 3a. How is the habitat used for education? Do only certain classes or subjects use it?  
What activities are done in the habitat?
- 4a. How many children get to use the habitat each year? On average, how frequently does an individual student get to use the habitat, and how long is the average use?  
(Please only include student use that occurs with an educator present.)
- 5a. Has the Schoolyard Habitats program had an impact on the children? If so, how?
- 6a. Has the habitat changed (in size or quality) over the years since it was certified? If so, how?
- 7a. Have you had any challenges at keeping the habitat maintained and in use?
- 8a. Have you ever used any materials from the National Wildlife Federation (How-To Guide, lesson plans, webinars, etc.)? Do you have any suggestions for us?
- 9a. Are there any specific factors that have contributed to the habitat's success over the years? In other words, what might prevent a habitat from being abandoned?



### Questions for Schools with Dormant Habitats

- 1b. Is the habitat still physically located on the school grounds?
- 2b. If it is no longer used for education, is it being used for any other purpose?
- 3b. What year (or best approximation) did the habitat stop being used?
- 4b. What was the habitat like when it was in use? How was it used for education?
- 5b. Why did it stop being used?
- 6b. Did you use any of National Wildlife Federation's materials (How-To Guide, lesson plans, webinars, etc.)? Do you have any suggestions for us?
- 7b. Would your school be open to starting a schoolyard habitat again, or are there any challenges to rebuilding or putting the habitat back in place?

## APPENDIX II: SURVEY TEXT

### Schoolyard Habitats Survey 2012

National Wildlife Federation would like to thank you for creating a Schoolyard Habitat. We would greatly appreciate it if you could take a few minutes of your time to complete this survey to tell us how your habitat is doing and how we can help you with your habitat. Once you've completed this survey, you will be sent a copy of our newly updated bat curriculum "Night Friends," which was created in partnership with Bat Conservation International.

Your responses are important, as they will help us to understand which resources educators, students, administrators and community members most need to maintain or utilize a schoolyard garden. Specifically, your feedback will be used in a research project by a graduate student at George Mason University in Fairfax, VA, in conjunction with National Wildlife Federation. The results of this survey will be published, but your cooperation is voluntary and all responses will remain confidential.

If you have any questions or concerns, please contact:

Margaret Redman

Schoolyard Habitats, National Wildlife Federation

Environmental Science & Policy Graduate Student, George Mason University

[Phone number removed]

[Email address removed]

Ready to begin?

### **School or Organization and Schoolyard Habitat Contact Information**

1. Please enter the contact information for the school/organization.

Contact Name:

Title/Position:  
School/Organization Name:  
Address:  
Address 2:  
City/Town:  
State:  
ZIP/Postal Code:  
Email Address:  
Phone Number:  
Phone Type:

2. Is the primary contact for the Schoolyard Habitat or garden the same as the contact listed in question 1 above?

- ☐ Yes
- ☐ No

#### Additional Contact Information

1. If you answered "no" to Question 2, please provide the contact information for primary contact for the Schoolyard Habitat or garden.

Contact Name:  
Title/Position:  
School/Organization Name:  
Address:  
Address 2:  
City/Town:  
State:  
ZIP/Postal Code:  
Email Address:  
Phone Number:  
Phone Type:

#### **School or Organization Classification Information**

1. Which category best describes your school or organization?

- ☐ Public elementary school
- ☐ Parochial school

- ☐ Public middle school
- ☐ Charter school
- ☐ Public high school
- ☐ Community school
- ☐ Private elementary school
- ☐ Nature center
- ☐ Private middle school
- ☐ Religious
- ☐ Private high school
- ☐ Community center
- ☐ College or university
- ☐ Museum
- ☐ Early childcare center
- ☐ Home
- ☐ Other (please specify)

2. What is the total enrollment of the school/organization? Please approximate if uncertain or enter "not sure."

3. Which of the following best describes your school zone or campus/organization location?

- ☐ Urban
- ☐ Suburban
- ☐ Rural

4. Do most students in your area have access to natural outdoor green spaces (parks, forests, etc.) to learn, play, and/or experience outside of school?

- ☐ Yes
- ☐ No
- ☐ Not sure

### **Status of the Schoolyard Habitat or Garden**

1. What is the status of the habitat/garden?

- ☐ Still maintained and in use by educators and students
- ☐ Still maintained but not used for educational purposes

- ☐ Still exists but not maintained or used
- ☐ Habitat/garden has been removed

1. Why is the habitat/garden no longer used or maintained?

2. Do you have plans to put the habitat/garden back in use?

- ☐ Yes
- ☐ No
- ☐ Other (please specify)

1. Why was the habitat/garden removed?

2. Do you have plans to reinstall the habitat/garden?

- ☐ Yes
- ☐ No
- ☐ Other (please specify)

### **Habitat or Garden Installation**

1. Why was the habitat/garden established? (Check all that apply)

- ☐ For use as an outdoor classroom
- ☐ To teach a particular unit
- ☐ For nutrition and health purposes
- ☐ For wildlife conservation/environmental reasons
- ☐ To expose children to the outdoors
- ☐ To become a certified Schoolyard Habitat
- ☐ As a memorial
- ☐ For school beautification
- ☐ Not sure
- ☐ Other (please specify)

2. Has your school/organization received any grants, awards, recognition, or other certifications in relation to the habitat/garden? (Check all that apply)

- ☐ Yes, grants
- ☐ Yes, awards or recognition
- ☐ Yes, other certifications

- ☐ No

3. Which of the following is your habitat/garden used for? (Check all that apply)

- ☐ Outdoor classroom/teaching tool
- ☐ School beautification/aesthetics
- ☐ Recreation/recess
- ☐ Lunch area
- ☐ Community use
- ☐ Memorial
- ☐ Gardening/nature clubs
- ☐ Vegetable/herb gardening for human consumption
- ☐ Monetary purposes (i.e. flower/vegetable sales)
- ☐ Citizen science programs
- ☐ None
- ☐ Other (please specify)

4. Is the habitat/garden built into the curriculum (required/planned for certain uses) or is it used spontaneously when relevant/convenient?

- ☐ Built into the curriculum
- ☐ Mostly built into the curriculum with some spontaneous use
- ☐ Equal levels of both
- ☐ Mostly spontaneous use with some planned use
- ☐ Spontaneous use

5. How important is the habitat/garden as a part of the curriculum?

- ☐ Critical for conducting certain lessons in the school's curriculum
- ☐ Helpful for conducting certain lessons in the school's curriculum, but not essential for these lessons
- ☐ Not particularly helpful; the lessons could be taught just as well inside

6. Do you attempt to involve parents or the surrounding community in the habitat/garden? If so, how? (i.e. planned events, volunteer requests, etc.)

7. Who takes care of the habitat/garden? (Check all that apply)

- ☐ Myself
- ☐ Grounds/maintenance crew

- ☐ Multiple teachers, administrators, or other educators
- ☐ Specific student organization
- ☐ Students during class time
- ☐ Student volunteers
- ☐ Parent volunteers
- ☐ Master gardeners
- ☐ Boy scouts
- ☐ Girl scouts
- ☐ Other (please specify)

8. Prior to receiving this survey or a recent phone call, did you know that your habitat/garden was certified as a Schoolyard Habitat by the National Wildlife Federation?

- ☐ Yes
- ☐ No

9. To the best of your knowledge, in what year was your habitat/garden certified by the National Wildlife Federation?

10. Do you have a sign in your habitat/garden to mark its existence or purpose?

- ☐ Yes, an NWF sign
- ☐ Yes, a non-NWF sign
- ☐ No

### **Habitat or Garden Use**

1. Approximately how many students use the habitat/garden each year for visits lasting at least 15 minutes?

2. Approximately how many months of the year do weather and the school calendar permit habitat/garden use?

3. In the table below, please put the approximate number of students that visit the habitat/garden for each time period and from each grade. Please only include visits lasting at least 15 minutes and with an educator present.

\*If none, leave the drop down blank. If you know some students use the habitat/garden on a regular basis, but are unsure of how many, select the last option in the menu, "Not sure."

This question will be continued with grades 8 through post high school in the next question.

	Pre-K (Ages 1-4)	K	1st	2nd	3rd	4th	5th	6th	7th
Daily									
Weekly									
Monthly									
Quarterly									
Annually									

4. (Continued from previous question) In the table below, please put the approximate number of students that visit the habitat/garden for each time period and from each grade. Please only include visits lasting at least 15 minutes and with an educator present.

\*If none, leave the drop down blank. If you know some students use the habitat/garden on a regular basis, but are unsure of how many, select the last option in the menu, "Not sure."

	8th	9th	10th	11th	12th	Post High School	Youth Group	After or Before School Care
Daily								
Weekly								
Monthly								
Quarterly								
Annually								

5. Approximately what percent of educators at your school/organization use the habitat/garden for educational purposes?

- ☐ <10%
- ☐ 11-25%



- ☐ 26-50%
- ☐ 51-75%
- ☐ 76-100%

6. What subjects are taught in the habitat/garden? Please put the letter "X" in the textbox next to each subject taught in the habitat/garden. Then, specify any particular units within the subject that are taught in the habitat/garden if applicable.

- ☐ Science
- ☐ Environmental studies
- ☐ English/language arts
- ☐ History/social studies
- ☐ Math
- ☐ Art
- ☐ Music
- ☐ Technology
- ☐ Health/physical education

7. Which of the following are present in your habitat/garden? (Check all that apply)

- ☐ Bird feeders
- ☐ Water/rain garden
- ☐ Deciduous trees
- ☐ Butterfly feeders
- ☐ Seasonal pool
- ☐ Evergreen trees
- ☐ Squirrel feeders
- ☐ Spring
- ☐ Shrubs
- ☐ Other feeders
- ☐ Butterfly puddling area
- ☐ Grass
- ☐ Flowers/nectar
- ☐ Rain barrels
- ☐ Host plants for caterpillars
- ☐ Fruits/nuts
- ☐ Pond
- ☐ Meadow/prairie

- ☐ Seeds/berries
- ☐ Stream
- ☐ Brush/log pile
- ☐ Bird blind
- ☐ Wetland
- ☐ Dead trees/snags
- ☐ Nesting box
- ☐ Vegetable garden
- ☐ Rock pile or wall
- ☐ Toad abode
- ☐ Herb garden
- ☐ Cave
- ☐ Bat box
- ☐ Native plants
- ☐ Burrow
- ☐ Bird bath
- ☐ Wooded area
- ☐ Greenhouse
- ☐ Water dish
- ☐ Nature trail
- ☐ Seating/hardscape
- ☐ Other (please specify)

8. What sustainable gardening techniques do you employ to help conserve resources?  
(Check all that apply)

- ☐ Riparian buffer
- ☐ Reduce erosion
- ☐ Use native plants
- ☐ Capture rain water from roof
- ☐ Use mulch
- ☐ Reduce lawn areas
- ☐ Xeriscape
- ☐ Rain garden
- ☐ Eliminate chemical pesticides
- ☐ Drip or soaker hose for irrigation
- ☐ Practice integrated pest management

- ☐ Eliminate chemical fertilizers
- ☐ Limit water use
- ☐ Remove non-native species
- ☐ Compost
- ☐ Other (please specify)

9. Please rank the following challenges from "not challenging" to "overwhelming" in regard to the habitat/garden.

	Not a Challenge	Minimal Challenge			Overwhelming Challenge
Conflict with administrators					
Lack of volunteers					
Too little time or space in curriculum to use the habitat often					
Pressure to spend more time on subjects where there will be standardized tests					
Lack of funding for the habitat					
Accidental mowing by grounds crew					
Removal of habitat features					
Difficulties attracting wildlife					
Vandalism					

Other (please specify)

10. How has the habitat/garden had an impact on students? (Check all that apply)

- ☐ Educational - Students demonstrated a better understanding of the concepts being taught and retained them for tests
- ☐ Behavioral - Student behavior improves or changes
- ☐ Attitude - Students demonstrate a better attitude toward learning or school
- ☐ Health - Students physical or nutritional health improves
- ☐ Psychological - Students gain a greater appreciation for nature
- ☐ Other (please specify)

### **Educator Resources**

1. What types of resources would be helpful to you for creating or maintaining your habitat and using the outdoors for teaching?

2. Do you have any additional comments?

11. Thank You!

Thank you for taking a few minutes to complete the survey. Your responses are very important and will help National Wildlife Federation shape and build new resources and programs to support teachers, educators, parents and others working to build a new generation of environmental stewards.

Want to keep in touch? Please consider signing up for the educator's newsletter:  
<http://www.nwf.org/Global-Warming/School-Solutions/Eco-Schools-USA/E-Newsletter-Signup.aspx>

If you have any questions or comments, please contact:

Margaret Redman

Schoolyard Habitats, National Wildlife Federation

Environmental Science & Policy Graduate Student, George Mason University

[Phone number removed]

[Email address removed]

As a special thank you for completing the survey, we will send you a copy of our newly updated bat curriculum "Night Friends," which was created in partnership with Bat Conservation International. The curriculum is designed for grades 4-8 but can easily be adapted for younger or older students.

If you would like this to be sent to a different address than you entered earlier in the survey, please fill out the information below. If you leave this question blank, the curriculum will be sent to the school/organization address.

Name:

Address:

Address 2:

City/Town:

State:

ZIP/Postal Code:

## REFERENCES

## REFERENCES

- American Horticultural Society. (2013). Master Gardeners. Retrieved March 21, 2013, from <http://www.ahs.org/gardening-resources/master-gardeners>
- Assadourian, E. (2003). The Growing Value of Gardens. *Encounter*, 16(3), 39.
- Avidov-Ungar, O. (2010). "Islands of Innovation" or "Comprehensive Innovation." Assimilating Educational Technology in Teaching, Learning, and Management: A Case Study of School Networks in Israel. *Interdisciplinary Journal of E-Learning and Learning Objects*, 6, 259–280.
- Avidov-Ungar, O., & Eshet-Alkay, Y. (2011). The Islands of Innovation Model: Opportunities and Threats for Effective Implementation of Technological Innovation in the Education System. *Issues in Informing Science and Information Technology*, 8, 363–376.
- Barros, R. M., Silver, E. J., & Stein, R. E. K. (2009). School recess and group classroom behavior. *Pediatrics*, 123(2), 431–436.
- Blair, D. (2009). The Child in the Garden: An Evaluative Review of the Benefits of School Gardening. *The Journal of Environmental Education*, 40(2), 15–38.
- Boy Scouts of America. (2012). Eagle Scouts. Retrieved March 9, 2013, from <http://www.scouting.org/About/FactSheets/EagleScouts.aspx>
- Burghardt, K. T., Tallamy, D. W., & Gregory Shriver, W. (2009). Impact of Native Plants on Bird and Butterfly Biodiversity in Suburban Landscapes. *Conservation Biology*, 23(1), 219–224.
- California Department of Education. (2002). *A Child's Garden of Standards: Linking School Gardens to California Education Standards*. Sacramento, CA.

- Chawla, L. (1998). Significant life experiences revisited: A review of research. *Journal of Environmental Education*, 29(3), 11.
- Cheng, J. C.-H., & Monroe, M. C. (2012). Connection to Nature Children's Affective Attitude Toward Nature. *Environment and Behavior*, 44(1), 31–49.
- Clements, R. (2004). An Investigation of the Status of Outdoor Play. *Contemporary Issues in Early Childhood*, 5(1), 68–80.
- Coffee, S. R., & Rivkin, M. S. (1998). Better Schools and Gardens. *Science Teacher*, 65(4), 24–27.
- Cohen, J. (1994). The Earth is Round ( $p < .05$ ). *American Psychologist*, 49(12), 997–1003.
- Cronin-Jones, L. (2006). Are Outdoor Schoolyard Learning Activities Really Effective?: A Standards-Based Evaluation. Presented at the Annual Meeting of the North American Association for Environmental Education, Minneapolis, MN.
- Cubie, D. (2012). Certified Success. *National Wildlife Federation*. Retrieved February 21, 2013, from <http://www.nwf.org/news-and-magazines/national-wildlife/gardening/archives/2012/certified-habitats.aspx>
- Danforth, P. (2005). *An Evaluation of the National Wildlife Federation's Schoolyard Habitat Program in the Houston Independent School District: Environmental Education, Integrated Curriculums and Academic Standards* (Master's Thesis). Texas State University.
- Danks, S. (2010). *Asphalt to ecosystems: design ideas for schoolyard transformation*. Oakland, CA: New Village Press.
- Danks, S. (2011). Resources. *Asphalt to Ecosystems*. Retrieved July 31, 2012, from <http://www.asphalt2ecosystems.org/home/resources>
- Darling-Hammond, L. (2000). Policy and change: Getting beyond bureaucracy. In A. Hargreaves, A. Liberman, M. Fullen, & D. Hopkins (Eds.), *International handbook of educational change* (pp. 642–667). Kluwer Academic Publishers.



- DeMarco, L., Relf, D., & McDaniel, A. (1999). Integrating Gardening into the Elementary School Curriculum. *HortTechnology*, 9(2), 276–281.
- Dobbs, K., Relf, D., & McDaniel, A. (1998). Survey on the Needs of Elementary Education Teachers to Enhance the Use of Horticulture or Gardening in the Classroom. *HortTechnology*, 8(3), 370–373.
- Dyment, J. (2005a). There's only so much money hot dog sales can bring in: The intersection of green school grounds and socio-economic status. *Children's Geographies*, 3(3), 307–323.
- Dyment, J. (2005b). Green School Grounds as Sites for Outdoor Learning: Barriers and Opportunities. *International Research in Geographical & Environmental Education*, 14(1), 28–45.
- Dyment, J. E., & Bell, A. C. (2007). Active by Design: Promoting Physical Activity through School Ground Greening. *Children's Geographies*, 5(4), 463–477.
- Dyment, J. E., & Bell, A. C. (2008). "Our garden is colour blind, inclusive and warm": reflections on green school grounds and social inclusion. *International Journal of Inclusive Education*, 12(2), 169–183.
- Dyment, J. E., Bell, A. C., & Lucas, A. J. (2009). The relationship between school ground design and intensity of physical activity. *Children's Geographies*, 7(3), 261–276.
- Ewert, A., Place, G., & Sibthorp, J. (2005). Early-Life Outdoor Experiences and an Individual's Environmental Attitudes. *Leisure Sciences*, 27(3), 225–239.
- Forkosh-Baruch, A., Nachmias, R., Mioduser, D., & Tubin, D. (2005). "Islands of Innovation" and "School-Wide Implementations": Two Patterns of ICT-Based Pedagogical Innovations in Schools. *An Interdisciplinary Journal on Humans in ICT Environments*, 1(2), 202–215.
- Glenn, J. L. (2000). *Environment-Based Education: Creating High Performance Schools and Students*. Washington, DC: National Environmental Education and Training Foundation.

- Graham, H., Beall, D. L., Lussier, M., McLaughlin, P., & Zidenberg-Cherr, S. (2005). Use of School Gardens in Academic Instruction. *Journal of Nutrition Education and Behavior*, 37(3), 147–151.
- Graham, H., Feenstra, G., Evans, A., & Zidenberg-Cherr, S. (2004). Davis school program supports life-long healthy eating habits in children. *California Agriculture*, 58(4), 200–205.
- Graham, H., & Zidenberg-Cherr, S. (2005). California Teachers Perceive School Gardens as an Effective Nutritional Tool to Promote Healthful Eating Habits. *Journal of the American Dietetic Association*, 105(11), 1797–1800.
- Griffith, G. (2008). Initial Impacts of No Child Left Behind on Elementary Science Education. *Journal of Elementary Science Education*, 20(3), 35–48.
- Hanson, M. (2001). Institutional theory and educational change. *Educational Administration Quarterly*, 37(5), 637–661.
- Hazzard, E. L., Moreno, E., Beall, D. L., & Zidenberg-Cherr, S. (2011). Best Practices Models for Implementing, Sustaining, and Using Instructional School Gardens in California. *Journal of Nutrition Education and Behavior*, 43(5), 409–413.
- Hazzard, E. L., Moreno, E., Beall, D. L., & Zidenberg-Cherr, S. (2012). Factors Contributing to a School's Decision to Apply for the California Instructional School Garden Program. *Journal of Nutrition Education and Behavior*, 44(4), 379–383.
- Henley, J., McBride, J., Milligan, J., & Nichols, J. (2007). Robbing Elementary Students of Their Childhood: The Perils of No Child Left Behind. *Education*, 128(1), 56–63.
- Herrington, S. (2008). Perspectives from the ground: early childhood educators' perceptions of outdoor play spaces at child care centers. *Children, Youth and Environments*, 18(2), 65–87.
- Houghton, E. (2003). *A breath of fresh air: celebrating nature and school gardens*. Toronto: Learnxs Foundation.

- Huberman, A. M., & Miles, M. B. (1984). *Innovation up close: how school improvement works*. New York: Plenum.
- Hungerford, H. R., & Volk, T. L. (1990). Changing Learner Behavior through Environmental Education. *Journal of Environmental Education*, 21(3), 8–21.
- Hussein, H. (2012). Affordances of Sensory Garden towards Learning and Self Development of Special Schooled Children. *International Journal of Psychological Studies*, 4(1), 135–149.
- James, J. J., Bixler, R. D., & Vadala, C. E. (2010). From play in nature, to recreation then vocation: a developmental model for natural history-oriented environmental professionals. *Children, Youth and Environments*, 20(1).
- Juster, T., Ono, H., & Stafford, F. (2004). *Changing Times of American Youth: 1981-2003* (pp. 1–15). University of Michigan.
- Keena, K. (2011). *Portraiture of a Green Schoolyard: A Natural History of Children's Experiences* (Dissertation). University of Colorado.
- Kellert, S. R. (1998). *A National Study of Outdoor Wilderness Experience*. Yale University.
- Kozma, R. (2000). *Qualitative studies of innovative pedagogical practices using technology* (SITES M2 design document). International Association for Evaluation of Educational Achievement.
- Kuo, F. E., & Taylor, A. F. (2004). A Potential Natural Treatment for Attention-Deficit/Hyperactivity Disorder: Evidence From a National Study. *American Journal of Public Health*, 94(9), 1580–1586.
- Lady Bird Johnson Wildflower Center. (2013). Why Native Plants. Retrieved February 21, 2013, from <http://www.wildflower.org/whynatives/>
- Lopez, R., Campbell, R., & Jennings, J. (2008). *Schoolyard Improvements and Standardized Test Scores: An Ecological Analysis* ( No. 121) (pp. 1–9). Gastón Institute Publications.

- Louv, R. (2008). *Last child in the woods: saving our children from nature-deficit disorder*. Chapel Hill, N.C.: Algonquin Books of Chapel Hill.
- Marx, R. W., & Harris, C. J. (2006). No Child Left Behind and Science Education: Opportunities, Challenges, and Risks. *The Elementary School Journal*, 106(5), 467–478.
- Matsuoka, R. H. (2008). *High School Landscapes and Student Performance* (Dissertation). University of Michigan.
- McCurdy, L. E., Winterbottom, K. E., Mehta, S. S., & Roberts, J. R. (2010). Using Nature and Outdoor Activity to Improve Children's Health. *Current Problems in Pediatric and Adolescent Health Care*, 40(5), 102–117.
- Morgan, P. J., Warren, J. M., Lubans, D. R., Saunders, K. L., Quick, G. I., & Collins, C. E. (2010). The impact of nutrition education with and without a school garden on knowledge, vegetable intake and preferences and quality of school life among primary-school students. *Public Health Nutrition*, 13(11), 1931–1940.
- National Wildlife Federation. (2012). Schoolyard Habitats. Retrieved July 31, 2012, from <http://www.nwf.org/schoolyard>
- National Wildlife Federation. (2013). Attracting Wildlife With Native Plants. Retrieved February 21, 2013, from <http://www.nwf.org/how-to-help/garden-for-wildlife/gardening-tips/using-native-plants.aspx>
- National Wildlife Federation. (n.d.) *Schoolyard Habitats How-to-Guide*.
- No Child Left Inside Coalition. (2013). About the No Child Left Inside Coalition. *Chesapeake Bay Foundation*. Retrieved February 26, 2013, from <http://www.cbf.org/ncli/action/about>
- Obama, Barack. (2012). *Remarks by the President on No Child Left Behind Flexibility*. The White House. Retrieved from <http://www.whitehouse.gov/the-press-office/2012/02/09/remarks-president-no-child-left-behind-flexibility>
- O'Callaghan, A. M. (2005). Creating a School Gardens Program in the Challenging Environment of Las Vegas, Nevada. *HortTechnology*, 15(3), 429–433.

- Ozdemir, A., & Yilmaz, O. (2008). Assessment of outdoor school environments and physical activity in Ankara's primary schools. *Journal of Environmental Psychology*, 28(3), 287–300.
- Parmer, S. M., Salisbury-Glennon, J., Shannon, D., & Struempfer, B. (2009). School Gardens: An Experiential Learning Approach for a Nutrition Education Program to Increase Fruit and Vegetable Knowledge, Preference, and Consumption among Second-grade Students. *Journal of Nutrition Education and Behavior*, 41(3), 212–217.
- Rasberry, C. N., Lee, S. M., Robin, L., Laris, B. A., Russell, L. A., Coyle, K. K., & Nihiser, A. J. (2011). The association between school-based physical activity, including physical education, and academic performance: A systematic review of the literature. *Preventive Medicine*, 52, S10–S20.
- Ratcliffe, M. M., Merrigan, K. A., Rogers, B. L., & Goldberg, J. P. (2009). The Effects of School Garden Experiences on Middle School-Aged Students' Knowledge, Attitudes, and Behaviors Associated With Vegetable Consumption. *Health Promotion Practice*, 12(1), 36–43.
- Rickinson, M., Dillon, J., Teamey, K., Morris, M., Choi, M. Y., Sanders, D., & Benefield, P. (2004). *A Review of Research on Outdoor Learning*. National Foundation for Educational Research.
- Rivkin, M. (1997). The Schoolyard Habitat Movement: What It Is and Why Children Need It. *Early Childhood Education Journal*, 25(1), 61.
- Schulman, A., & Peters, C. A. (2007). GIS analysis of urban schoolyard landcover in three U.S. cities. *Urban Ecosystems*, 11(1), 65–80.
- Simmons, D. (1998). Using natural settings for environmental education: Perceived benefits and barriers. *Journal of Environmental Education*, 29(3), 23.
- Tallamy, D. W. (2007). *Bringing nature home: how native plants sustain wildlife in our gardens*. Portland: Timber Press.
- Tallamy, D. W. (2009). A Call For Backyard Biodiversity. *American Forests*, Autumn, 24–31.

- Tallamy, D. W., & Shropshire, K. J. (2009). Ranking Lepidopteran Use of Native Versus Introduced Plants. *Conservation Biology*, 23(4), 941–947.
- Tanner, T. (1980). Significant Life Experiences: A New Research Area in Environmental Education. *Journal of Environmental Education*, 11(4), 20–24.
- Taylor, A., & Kuo, F. E. (2011). Could Exposure to Everyday Green Spaces Help Treat ADHD? Evidence from Children's Play Settings. *Applied Psychology: Health and Well-Being*, 3(3), 281–303.
- Tubin, D., Mioduser, D., Nachmias, R., & Forkosh-Baruch, A. (2003). Domains and Levels of Pedagogical Innovation in Schools Using ICT: Ten Innovative Schools in Israel. *Education and Information Technologies*, 8(2), 127.
- U.S. Department of Education (USED). (2004). Executive Summary of the No Child Left Behind Act of 2001. *U.S. Department of Education*. Retrieved February 26, 2013, from <http://www2.ed.gov/nclb/overview/intro/execsumm.html>
- U.S. Department of Education (USED). (2010). *A Blueprint for Reform: The Reauthorization of the Elementary and Secondary Education Act*. Washington, D.C.: U.S. Department of Education, Office of Planning, Evaluation and Policy Development. Retrieved from <http://www2.ed.gov/policy/elsec/leg/blueprint/blueprint.pdf>
- U.S. Department of Education (USED). (2013). U.S. Department of Education Green Ribbon Schools. *U.S. Department of Education*. Retrieved February 26, 2013, from <http://www2.ed.gov/programs/green-ribbon-schools/index.html>
- U.S. Environmental Protection Agency. (2012). Landscaping with Native Plants. Collections & Lists. Retrieved February 21, 2013, from <http://www.epa.gov/greenacres/>
- U.S. Forest Service. (2011) Celebrating Wildflowers - Native Gardening. Retrieved February 21, 2013, from <http://www.fs.fed.us/wildflowers/nativegardening/>
- Vesilind, E. M., & Jones, M. G. (1998). Gardens or graveyards: Science education reform and school culture. *Journal of Research in Science Teaching*, 35(7), 757–775.

Wells, N. M., & Evans, G. W. (2003). Nearby Nature A Buffer of Life Stress among Rural Children. *Environment and Behavior*, 35(3), 311–330.

Wells, N., & Lekies, K. (2006). Nature and the Life Course: Pathways from Childhood Nature Experiences to Adult Environmentalism. *Children, Youth and Environments*, 16(1), 1–24.

World Health Organization. (2004). *Fruit and Vegetables for Health: Report of a Joint FAO/WHO Workshop*. Kobe, Japan.

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