Environmental Education and Community Stewardship

STRENGTHENING AND EXPANDING THE NATIONAL FISH AND WILDLIFE FOUNDATIONS’ S CONSERVATION STEWARDSHIP PORTFOLIO

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Abstract

We dream of thriving landscapes, with abundant clean water and healthy habitats which support flourishing fish and wildlife populations. To conserve, protect, and restore these landscapes we need to understand not only the science of how they function, but how and why people treat their landscapes as they do. Humans are an integral part of ecosystems everywhere. People live, work, travel, advocate, and vote in ways that can either cause environmental harm or benefit. Therefore, investment in citizen stewards is vital to effectiveness and long-term success of any National Fish and Wildlife Foundation (NFWF) conservation initiative. How do we create environmental stewards? Fortunately, a body of theory and research exists to answer this question. People’s choices are shaped by many things including their knowledge, values, and community context (Ardoin et al. 2013). Environmental education and community stewardship programs actively engage people in this understanding and empower them to become stewards of their environments (Palmer 1998; Stapp 1969).

To create effective environmental education and community stewardship:

1) **Support collaborative, community-wide environmental education** including leadership development as well as formal and non-formal education to produce significant stewardship outcomes.

2) **Encourage best practices for environmental education** curriculum and program design, and continue to improve them using adaptive management based on evaluation. Focus some collaborative, long-term efforts on targeted communities.

3) **Leverage existing capacity** and expand NFWF’s current stewardship programs, as well as develop a new grant portfolio, with guiding advisory committee, to strengthen NFWF’s impact.

By doing so NFWF will foster human participation in conservation which will **produce significant, measurable, and durable change** to support thriving landscapes.
1) Introduction

What is Environmental Education?

Environmental education helps people “to learn about and investigate their environment, and to make intelligent, informed decisions about how they can take care of it” (NAAEE). In 1977 at a UN conference in Tbilisi, Georgia, USSR, delegates from over sixty countries created a common vision of environmental education. According to the Tbilisi Declaration, effective environmental education builds awareness and sensitivity to environmental problems, develops the knowledge to understand issues, helps individuals define their attitudes about environmental harm and acquire skills to identify and solve environmental problems, as well as provides an opportunity for participation in finding environmental solutions (UNESCO 1978). Environmental education is not environmental advocacy. Environmental education teaches students how to think about environmental issues, not what to think about them. In contrast, environmental advocacy’s goal is to persuade an audience to take a particular stance on an issue and adopt desired behaviors.

What is Community Stewardship?

Compared to environmental education, focus on environmental actions on the community level is fairly recent. Environmental education programs historically focused primarily on changing actions at the individual level: increasing recycling, buying local products, voting green, etc. However, more substantial changes require collaboration between many stakeholders. In concert with the grass-roots movement within the environmental field, bottom-up approaches to conservation are being increasingly
recognized. The blooming abundance of programs, both domestic and abroad, that recognize the importance of community involvement in environmental stewardship speaks to the accelerating popularity of the field. Programs like the Atlantic Center for the Environment in Massachusetts, the Ocean Discovery Institute in California, Malpais Borderland Group’s project in Arizona and New Mexico, and the Community Based Tourism Network in Thailand all embrace and harness the important role that communities play in conservation. NFWF has been a leader in this area. In 2011, nearly 40,000 local residents in 32 states participated in NFWF’s community stewardship projects (NFWF).

The Landscape of Environmental Education in the U.S.

After four decades of sporadic growth, environmental education and leadership development are experiencing a resurgence of interest and attention. Elected officials, government agencies, grant makers, and foundations are increasingly looking to environmental education as a means to advance conservation, health, education, and other goals.

Evidence of an environmental education resurgence abounds:

- In 2010, for the first time since the short-lived National Environmental Education Act of 1970, the U.S. Department of Education proposed funding and policy support for environmental education. It was included in a new competitive grant program and the No Child Left Behind reform proposal, which the Obama Administration sent to Congress. In 2011, the Agency also established a popular new “Green Ribbon Schools” program to recognize schools, colleges, and universities that are leading the way to reduce environmental impacts, improve the health and wellness of schools, and provide environmental education.
- The No Child Left Inside Coalition – a broad-based coalition of 2200 groups representing all 50 states and 50 million Americans – prompted the development and adoption of State Environmental Literacy Plans (ELPS). Today 46 states are in various stages of integrating environmental education and outdoor experiences into their educational systems and academic achievement goals.
- The Obama Administration’s America’s Great Outdoors Initiative highlighted education as a key strategy to engage young people in conservation and cultivate a new generation of stewards. It resulted in an historic 2012 agreement between the Departments of Interior and Education to expand outdoor learning opportunities for students and professional development for teachers.
- Alliances such as E3 Washington, Chicago Wilderness, and the Environmental Education Collaborative of the San Francisco Bay area engage a broad range of stakeholders in environmental education and conservation to have a greater collective impact.
- Environmental, conservation, and sustainability leadership development programs are growing rapidly at universities and non-profit organizations nationally (Shriberg and MacDonald 2013).
- In December 2014, the White House Office of Science & Technology Policy launched a new Climate Education and Literacy Initiative to help educate American students and citizens about climate change.
Factors fueling this resurgence include:

- Starting in the mid-1990s, the North American Association of Environmental Education (NAAEE) began to develop a set of common practice standards, “Guidelines for Excellence,” and improved metrics for both formal and informal providers in the field. NAAEE continues to update the materials and incorporate new findings (STAC 2013; NAAEE).
- A strong and growing body of research confirms the benefits of environmental education.
- Numerous studies by the National Science Foundation, National Research Council, the private sector Partnership for 21st Century Skills, and conservation organizations call for raising the environmental literacy of American citizens and particularly our youth.
- There is raised awareness and widespread public support for environmental education to address pressing environmental problems, to improve children’s health (physical, intellectual, psychological, and spiritual), and to increase workforce preparedness. In part, this public awareness was inspired by Richard Louv’s popular book *Last Child in the Woods* which introduced the term *Nature Deficit Disorder* to describe the growing gap between kids and nature (Louv 2005). Research by the National Environmental Education Foundation (NEEF) shows 95% of the public supports including environmental education in public school curricula (Coyle 2005).
- Environmental education’s shares underlying principles such as inquiry and experiential learning with Science Technology Engineering and Math (STEM) and the Next Generation Science Standards (NGSS).

Despite these trends, environmental education and leadership development still receive a miniscule percentage of spending on natural resource conservation and education. Of the $13.5 billion appropriated to NOAA and EPA in fiscal 2014 – the two largest federal funders of environmental education – only $36.3 million was earmarked for environmental education. That is less than 9 cents per capita. State environmental literacy plans are still mostly unfunded or partially implemented, if at all. The consequence is an American public that is still largely environmentally illiterate and disconnected from nature (Juster et al. 2004; Pergams 2008).
Environmental Education & Community Stewardship Support NFWF’s Goals

The National Fish and Wildlife Foundation’s mission is “to sustain, restore, and enhance the nation’s fish, wildlife, plants, and habitats through leadership conservation investments with public and private partners, the foundation is dedicated to achieving maximum conservation impact by developing and applying best practices and innovative methods for measurable outcomes” (NFWF 2015). This report aligns an overview of environmental education and community stewardship with the core elements of NFWF’s guiding philosophy.

- **Section I) Introduction** frames the discussion and shows conceptually how environmental education and community stewardship contribute to NFWF’s conservation goals.
- **Section II) Collaboration** surveys the diversity of environmental education programs and how each contributes to community-wide stewardship.
- **Section III) Best Practices** provides methods for designing environmental education programs on strong, science-based evidence, emphasizing adaptive management based on evaluation.
- **Section IV) Recommendations** prioritizes initiatives and presents a cogent strategy for delivering ambitious, measurable, and durable outcomes.

How Environmental Education & Community Stewardship Support NFWF’s Conservation Goals
Environmental Education Creates Citizen Stewards

The evidence is abundant and growing that environmental education promotes understanding of conservation issues and pro-environmental behavior; it does more than change what people know about the environment, it changes how they feel, what they value, and how they act (Duerden 2010). Students develop nuanced understanding, personal values, and informed attitudes. Moreover, environmental education promotes a sense of ownership and empowerment linked to long-term stewardship. Over time, stewards support conservation outcomes.

In Nature: Research shows nature experiences foster environmental caring and behavior. For instance, they can increase compassion for the environment (Chawla 1998) and interest in performing pro-environmental behaviors (Zint 2002; Cheng and Monroe 2010). With meaningful experiences in nature children show more interest in studying the environment and related careers (James et al. 2010; Nature Conservancy 2011). Youth benefit from improved health and strengthened communities (Louv 2005). Environmental education even improves academic achievement and builds critical thinking and problem solving skills (Athman and Monroe 2004; Ernst and Monroe 2004). These competencies are central to responsible stewardship and scientific inquiry, but also to employment in the 21st century economy.

Experiential learning: Experiential programs increase awareness of issues, environmental consciousness, and pro-environmental behaviors. Action-oriented approaches, grounded in community, service-learning, and place-based methods, are particularly effective at developing environmental literacy into pro-environmental behavior (Zint 2003; Volk and Cheak 2003). For example, actual or simulated democratic decision-making activities, among other strategies, can increase student interest in and efficacy in political participation (Levy and Zint 2013). Moreover, experiential learning builds competence and encourages participation, which foster internal motivation and durable pro-environmental behaviors (DeYoung 2000). With good program design, students not only retain pro-environmental attitudes and behaviors, but gain new ones after programs end (Dillino et al. 2007; Schneller 2008). Moreover, students can became teachers themselves, encouraging these behaviors in siblings, parents, and community members (Duvall and Zint 2007; Schneller 2008).

Various education programs treat the community as...

1) **Learners/Participants:** Programs are directed at various audiences, from kids to leaders. By reaching many groups, environmental education builds stewardship values and social norms.

2) **A Resource:** Some educational programs solicit expertise or assistance from the community by receiving guest lectures or technical advice from natural resource managers, surveying public opinion on local issues, or inviting volunteer participation (Stevens 2002; Tompkins 2005).

3) **The Change Agent:** Community or place-based education engages the community deeply. Here, the educator’s role is as a facilitator. Community members and students identify needs, design and carry out interventions, and maintain them long-term (Stevens 2002; Tompkins 2005).
Experiential Learning Can Directly Benefit Nature

Certain types of environmental education not only produce long-term citizen stewards but have immediate conservation outcomes as well. Experiential learning curricula, including citizen science, service-learning, place- or community-based learning, and/or issue investigation are well suited to this (Braus 2009). Examples of these activities are contributions to shore-line habitat restoration, scientific monitoring of spring ‘bud burst’ by students, or building community gardens. Thus, experiential learning programs contribute both directly and indirectly to improved landscapes. A meta-analysis of educational programs aimed at air quality found that 46% of programs studied showed a measurable change in air quality over the course of their projects. Moreover, the schools that incorporated place-based learning which included service-learning and contributed to an authentic community need were more likely to have had a conservation outcome (Duffin et al. 2008).

MODEL PROGRAM: Conservation outcomes
An example of an education program with measurable outcomes is that of Kathleen Blanchard in the Gulf of St. Lawrence, Quebec. Over twenty years, puffin populations in the area dropped 85% due to illegal harvesting of birds and eggs. Surveys showed that social norms supported these practices. In response Blanchard initiated a cross-community effort including in-school presentations, out-of-school environmental youth programs, public information campaigns, citizen involvement as tour guides, and economic incentive programs. The suite of activities profoundly changed the region’s social norms. The result was a drop from 75% to 25% of local families harvesting and a rebound of puffin populations (Braus 2009; Blanchard 1995).

Citizen Stewards, Community Stewardship, and Landscapes
The more citizens that identify and act as environmental stewards in an area, the greater the potential for environmental stewardship at a community level. Communities that demonstrate stewardship improve the landscapes they live in. For instance, if there is a critical mass of citizen stewards in a city, the city might start prioritizing pro-environmental projects such as installing a public transportation network or placing a fee on the use of plastic.
shopping bags. Interestingly, this is a positive feedback relationship; a community collectively engaging in stewardship behavior creates a context for individuals to become better stewards. This can take the form of green social norms (e.g. culture of sustainability), access to sustainable alternatives (e.g. public transportation), or incentives/disincentives for behavior change (e.g. fee for plastic shopping bags).

Additionally, citizen stewards can directly contribute to conservation. These are the types of pro-environmental behaviors associated with living sustainably. For instance a homeowner might install solar panels or donate the development rights on their property to a land conservancy.

The collective impact of community stewardship, individual pro-environmental behaviors, and conservation contributions from educational initiatives is to have landscape-scale conservation outcomes. Along with ecological protection, conservation, and restoration efforts from natural resource initiatives, such as the NFWF’s other conservation programs, environmental education can produce large-scale environmental change. With improved landscapes, we can expect to enjoy healthy ecosystems, stable wildlife populations, and abundant, high-quality water.
II) Collaboration

Henry Ford concisely captured the challenge and importance of collaboration in his quote, “Coming together is a beginning; keeping together is progress; working together is success.” Collaboration is difficult, but lets us accomplish more than any individual effort. Communities are composed of diverse stakeholders, each requiring different educational programs. Using a diverse set of environmental education models, we can build an equally diverse and capable set of stewards who, working together, contribute to the success of community-wide conservation initiatives.

Who makes up a community?

Different types of environmental education programs – leadership development programs, formal education, and non-formal education – can be used in concert to reach an entire community. A guiding framework provides a common vision and facilitates partnerships, which maximizes learning and conservation outcomes.
Targeting deep cross-community engagement is vital for developing community stewardship in a landscape. Community leaders promote and direct change. Youth represent the community’s future. Finally, the general public make up the fabric of the community. Of course, these sectors interact. A change in the values and behaviors in one group will affect the others. For instance, kids learn from the behaviors of adults, and, in fact, vice versa (Duvall & Zint 2007). The general public may be inspired to action by visionary leaders, while the leaders of tomorrow are in the schools of today. Different programs target each of these groups. Yet the different programs have a synergistic effect. By targeting entire communities we increase the likelihood that partner organizations will carry similar messages, achieving a “surround sound“ effect (Crossett and Schneweis 2012). Partnerships serve to organize these various efforts to leverage existing capital and expertise, and to establish common goals and priorities. Community stewardship programs should target areas where environmental educational opportunities for multiple groups – leaders, students, and the general public – can be developed and sustained in order to maximize learning and conservation results.

Leadership Development

In a 2005 report funded by NFWF entitled Leadership for Sustainability: Developing Leaders for the Environment, the Environmental Leadership Collaborative, a network of organizations “working to expand the capacity of the environmental movement,” noted that “with the challenges facing the environmental field, targeted leadership development is no longer an option: it is a necessity.” The report summarized lessons learned, challenges, and goals for environmental leadership development among the Collaborative’s 19 member organizations. It recommended devoting more resources to building human capacity in the environmental field and supporting the individuals making a difference; supporting a diverse and complex environmental field through a variety of leadership development opportunities; and supporting collaboration and efficiency to help the field become greater than the sum of its parts (Claremont et al. 2005). This environmental leadership can be developed in two different ways.

1) Developing New Leaders: Teach leadership skills to an environmentally-minded person.
2) Transforming Existing Leaders: Provide existing leaders with the inspiration, attitudes, and/or skills to become champions for the landscape.

Developing New Leaders

Leadership development programs help people of all ages gain the skills to translate individual commitment into community action, capitalizing on these individuals’ awareness of the values, needs, and opportunities of their own communities.

One method to create environmental leaders is to find passionate environmental stewards and provide them with training in leadership skills such as communication, networking, conflict management, critical thinking, mentoring, and teamwork. By creating or supporting existing conservation leadership development programs, NFWF can help create effective environmental leaders and increase the capacity to advance community and landscape-level conservation goals. These leaders might be youth or young adults, preparing to one day move into politics, business, academia or another
management area and trained through NFWF’s Next Generation of Conservation leaders or the Student Conservation Association’s programs. They might be young or mid-career professionals from local conservation organizations, businesses, or governments seeking to build their skills and capacities to be agents of change. They might as easily be retired community members looking for a way to stay active and meaningfully engaged in their neighborhoods. Supporting people in making changes in their own communities helps foster leaders, who are tuned into local values, needs, and opportunities. Environmental education programs are more likely to be effective in producing conservation outcomes if they are supported by leadership; for this reason it can be important to aim leadership development at school system administrators and community leaders (STAC 2013). By finding and fostering the passion of visionaries, leadership development programs help stewards gain the skills and capacity to translate individual commitment into community action.

**RECOMMENDATION:** Create or invest in existing conservation leadership development programs that foster and empower environmental leaders, providing guidance, skills, and support for these passionate individuals to generate change in their communities.

### Transform Existing Leaders

*Transforming existing leaders is an efficient investment in environmental education that leverages existing power structures.*

To create environment leaders we can also teach the value of conservation to those who already have power and influence. By offering engaging, high-impact programming to likely candidates, existing leaders can be transformed into conservation champions. While raising environmental champions into positions of power takes a good amount of bottom up support from the community, educating existing leaders leverages existing power structures. They can then support top-down

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**MODEL PROGRAMS: Developing New Leaders**

Existing conservation leadership development programs vary widely in methodologies, approaches, audiences served, training lengths, and cost. Three impressive leadership development models are highlighted here:

- **The Environmental Leadership Program** is a non-profit organization which supports emerging environmental practitioners seeking to connect their work to larger environmental and social concerns through fellowships, multi-day training retreats, and coaching or networking. The program operates at the national level, as well as in the Chesapeake, Delaware, Eastern, New England, and Pacific Northwest regions (Environmental Leadership Program).

- **The TogetherGreen partnership** between Audubon and Toyota seeks to engage traditionally underrepresented communities in the conservation movement. Fellows participate through training and networking in a year-long program, and receive a $10,000 grant towards a required innovative community-based conservation project (TogetherGreen).

- **The National Conservation Leadership Institute** is a 9-month “adaptive leadership” program serving individuals nominated by natural resource-related organizations, including state fish and wildlife agencies, federal natural resource agencies, and NGOs. It consists of two weeks of residency and six months working on a project, issue, or challenge facing their home organizations (NCLI).
environmental initiatives and/or influence their constituents and communities by promoting environmentally responsible initiatives. This is an efficient investment in environmental education.

**MODEL PROGRAM: Transform Existing Leaders**
An example of the power of this technique is how leaders were transformed into more effective environmental advocates when they participated in experiential-based informal leadership development by kayaking on the Chesapeake Bay. Hundreds of federal, state, and local leaders participated in these trips and gained insight into, and knowledge of, the Bay’s problems. The effect has been an increase of funding to environmental issues, stronger partnerships between the public and private sectors, enhanced federal and state policies, and a distinct network and increased level of trust among the participants. Jeri Thompson, Secretary of the US Senate for 10 years, first kayaked on one such expedition. She called the experiences “transformative” explaining the bonds formed between nature and fellow leaders were powerful and enduring. She explains, “I can think of no better way to build a passionate, enduring network for the environment than by sharing the beauty and challenges of the environment, on expedition-based leadership development” (Thompson 2015).

**RECOMMENDATION:** Create or support programs for existing leaders to bring them the inspiration, attitudes, and/or skills to become environmental champions. This will result in expanded decision-maker support for environmental education and conservation initiatives.

**Environmental Literacy Plans (ELPs)**

*By leveraging existing organizations, ELPs promote mutually reinforcing and collaborative partnerships which make individual efforts more efficient and effective.*

Environmental Literacy Plans (ELPs) articulate a united vision and pathway towards environmental literacy. Public and private stakeholders collaborate to develop the comprehensive plans, which weave together existing and new programs. By promoting unifying goals and themes ELPs ensure that environmental education programs are integrated and leveraged. While this federal funding has not yet become available, the creation of these plans developed robust partnerships, and in many cases, progress towards implementation. As of October 2014, 29 states have completed ELPs and another 18 state plans are in drafting stages.

**MODEL PROGRAMS: State ELPs**

Maryland’s plan resulted in a formal partnership between the local, state, and higher education institutions and natural resources agencies, as well as conservation organizations, hunting and fishing groups, and politicians. This collaboration passed the nation’s first high school environmental education graduation requirement.

A key part of ELP success is the mutual reinforcement partnerships can provide. This concept is sometimes called “surround sound” (Crossett and Schneweis 2012). Most state environmental literacy plans promote this lifelong learning approach by weaving together in and after school experiences with opportunities for all ages, such as master naturalists programs or programs for seniors. Having specific roles for each partner allows
organizations to focus where they are specialized. For instance one partner might engage the grass roots community, another partner can deliver professional development, another writes grants, etc.

Continuing to support ELPs at the community, state or landscape levels is a significant opportunity for NFWF. ELPs are an especially powerful tool for coordinating and guiding environmental education in formal settings. Not only have ELPs been effective in states like Maryland, but requiring ELPs would build on existing institutional frameworks. Many states will recreate or update existing plans. This would harness the years of work, dozens of partnerships, and hundreds of meetings already invested in existing plans. The requirement would benefit all applicants, as simply taking part in the application process ignites collaboration. If desired, NFWF could emphasize certain aspects of the plans, for instance requiring direct conservation outcomes, encouraging student field experiences and service projects, making linkages between science standards and the plan or promoting leadership development. This would ensure a robust treatment of that part of the plan.

**RECOMMENDATION:** Make Environmental Literacy Plans (ELPs), or similar guiding documents, a requirement for NFWF funding at community, state or landscape scales. This would ensure a thoughtful and committed plan for programs to collaborate and mutually reinforce one another’s programming.

### Formal Education

One in six Americans – 55 million students – are enrolled in our nation’s K-12 public and private schools. An additional 21 million students are enrolled in degree-granting institutions (USDE 2015). As such, the formal educational system offers perhaps the greatest opportunity to reach, expand and diversify the number of citizen stewards. Research from the National Environmental Education Foundation (NEEF) shows that many subjects involving environmental stewardship and literacy are complex and require systematic, appropriately scoped, and sequenced education. The Foundation also showed how few American adults understand many of the cause-effect relationships inherent in conservation that underlie a solid understanding of nature (such as watersheds or food webs). This is not only because they received insufficient environmental education, but also because what they did learn was unconnected, episodic, and/or sporadic (NEEF). Formal education is well-suited for building a deep and well-organized underlying knowledge of nature and wildlife. There are several opportunities to bring environmental education to America’s students.

1) **Reach K-12 Classrooms:** Support the Next Generation Science Standards (NGSS) or similar state standards and Green Schools.

2) **Include Higher Education:** Support interdisciplinary and active-learning courses.

### Reach K-12 Classrooms

*Next Generation Science Standards (NGSS) and the Green School movement offer strategic opportunities for efficient investment in environmental education for K-12 students.*

**NGSS:** The Next Generation Science Standards (NGSS) are a set of voluntary educational standards and are widely considered the future of science standards. Released in 2013, the standards
were developed by 26 states in partnership with prominent educational and scientific agencies\(^1\) (NGSS 2015). So far 25 states have adopted NGSS or similar standards\(^2\). The NGSS framework is already embedded in education planning, curricula, and government-non-profit partnerships; as such, NGSS provides an excellent “in” to many educational programs. A major challenge to bringing environmental education into classrooms are the logistical investments of time, money, and administrative support. Another is teacher preparedness and confidence with environmental material. Currently, schools are in a science education transition phase. Teachers will already need to update curricula and receive professional development to implement NGSS. This provides a great opportunity to direct the new pedagogy. As NGSS standards are implemented by states they will become central to instruction in millions of classrooms across the country and greatly extend the reach of environmental education.

The NGSS are well-suited to environmental education content and pedagogy. There is a direct link for environmental education under a section titled “Earth and Human Activity” (STAC 2013). Moreover, the standards are based on teaching students to do science, over teaching them about scientific information in a passive way; by doing so, the standards emphasize how science and technology relate to the environment, humans, and society. This is a long-standing and developed practices of environmental education. The focus on inquiry-based real-world science in NGSS fits well with environmental education activities like citizen science, biological monitoring, or restoration activities. In fact, each of the three core dimensions of NGSS, is well suited to environmental education\(^3\).

Besides having a significant amount of environmental and nature content, such as energy, ecology, wildlife, fisheries, and water resources, the NGSS can help students develop specific knowledge that will be helpful in environmental stewardship. The NGSS prepare students to comprehend and resolve an environmental challenge, such as assessing a local stream or creating an onsite wildlife garden or sustainable food garden. This is because the NGSS recognizes that scientifically literate individuals should not only understand science principles but should be able to engage in science practices. This also means the NGSS can extend into applied science readily and support foundational engineering and technology knowledge. For example, students could do energy audits or create outdoor classrooms and learning gardens. Importantly, the NGSS emphasize teaching via multi-dimensional,

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\(^1\) National Science Teachers Association, the American Association for the Advancement of Science, and the National Research Council

\(^2\) The National Research Council’s Framework

\(^3\) Environmental Education’s fit with the Next Generation Science Standards (NGSS)

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<th>Science &amp; Engineering Practices</th>
<th>Core Disciplinary Ideas</th>
<th>Cross-cutting concepts</th>
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<td>Practices emphasizes the skills and knowledge needed to do science and engineering. Environmental education embraces the same emphasis on practices. Moreover, many conservation topics are ideal for teaching this, for instance engineering practices are fundamental to ecological restoration.</td>
<td>Several NGSS core disciplinary ideas are directly environmental such as “Human Impacts on the Earth” while many are related to environmental topics such as “Ecosystem dynamics, functioning, and resilience.”</td>
<td>Cross-cutting concepts emphasize the interdisciplinary connections between science branches and real-life relevancy. Environmental problems span traditional disciplinary boundaries and necessitate an interdisciplinary approach to understanding and solving them.</td>
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cross-cutting topics that give students the opportunity to synthesize their understanding in a real-world context. Environmental and nature based projects are ideal for this.

As states and schools districts across the U.S. implement the NGSS over the next decade, the theater for conservation and nature education will grow. Environmental science and education will be taught in deeper and more sequenced ways that will eventually reach millions of classrooms on a monthly and weekly (often daily) basis. The NGSS represent what is probably the greatest opportunity for environmental and conservation education to go mainstream in America’s K-12 schools. Yet to get there, schools will need organized professional development for educators (formal and non-formal). These workshops can provide models of integrated environmental lesson plans and projects that encompass the standards and their educational principles, assist in curricular alignments and more. As such there is a great need to develop, improve, distribute, and promote environmental education curricula which are NGSS aligned.

**Green Schools:** The national green schools movement has become a significant force to support sustainability in schools, inside and out. Green Schools can effectively implement the NGSS and integrate environmental education for K-12 students in states without NGSS or similar standards. The Green Schools National Network, the Green Schools Alliance, the National Wildlife Foundation’s Eco Schools USA, Schoolyard Habitats, and Project Learning Tree Green Schools are key players in this movement. Moreover, there are about two dozen states that have developed their own statewide green school programs (GSI). The US Department of Education Green Ribbon Schools’ was developed to help set a high bar for the nation’s green schools and defines a green school as having three pillars: 1) reducing environmental impacts and costs, 2) improving the health and wellness of students and staff, and 3) providing effective sustainability education (USDE 2015b). The advantage of sustainable schools is that they are part of student learning experiences each and every school day. Students can help create, learn from, and engage in technology projects such as energy audits, alternative energy models (e.g. solar panels on campus) or in nature-opportunities on school grounds including gardens, trails, natural habitats. Some green schools expand the classroom’s reach by adopting nearby nature areas including streams, pastures, woods and wetlands.

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**MODEL PROGRAM: Green Schools**

An excellent example of how a green school can benefit students and a community is at Centreville Elementary in Northern Virginia. Centreville is an ethnically diverse school of 1,000 students where 58 languages are spoken as the home language. Under the guidance of Principal Dwayne Young, Centreville has transformed into a vibrant collage of outdoor learning spaces, including school vegetable and monarch butterfly gardens, nature trails, and a native habitat demonstration. The learning environment is so rich with instructional opportunities that every teacher brings students outside for at least one hour each week, for instance to do watershed run-off studies. The results are increased student engagement in learning and vibrant community participation. Furthermore, Centreville sparked an organized movement in Fairfax County called Get2Green, where principals of over 140 schools meet quarterly to develop similar programs throughout the system.
There is no detailed inventory of just how many green schools there are in the U.S. However, by adding up the existing national and state programs, an estimate of 10,000 to 12,000 schools (out of 130,000) is reasonable. Many more have at least developed some form of outdoor classroom, such as school gardens, or employ energy-saving measures. The U.S. Green Building Council, the Department of Education, and the Green Schools National Network aim for every K-12 school to become green in the next decade. This will require:

- Greater cooperation and coordination among existing green school providers and programs
- Agreed upon definitions and goals for success
- Better educated school administrators, educators, and parent/teacher organizations
- Lesson plans and activities that are more aligned to state standards
- A more reliable base of research on educational and environmental literacy outcomes
- More effective partnerships with local parks, refuges, and nearby nature areas and agencies that can support and supplement on-campus programs

**RECOMMENDATION:** Support NGSS, or similar standards, and Green Schools to enhance environmental education in K-12 classrooms and build environmental literacy.

### Include Higher Education

*Higher education reaches older students and, as such, can provide deep, insightful, and systems-thinking investigations into complex environmental issues.*

Environmental and sustainability courses are gaining mainstream currency at many degree-granting institutions across the U.S (Brewer 2011). Participation rates in environmental science Advanced Placement (AP) exams by high school students preparing to enter degree-granting institutions demonstrates the growing interest. In 2002, 24,000 students took the environmental science AP exam, twice that number tested in 2006, and by 2013 the number of test-takers had grown to 118,000 (APC 2015). In the last two decades there has been a forceful call for reform of undergraduate education to support more active-learning practices; educational researchers increasingly recognize the value of teaching how science is done over covering a wide range of science topics shallowly. This type of learning uses case-studies, student research projects, and systems analysis, which are beautifully suited to real-world interdisciplinary environmental problems (Brewer 2011). This parallels the shift in pedagogy seen with NGSS. Inquiry-based and active-learning pedagogy is well suited for environmental education and as such offers an opportunity to direct college course content towards environmental issues. Incidentally, increasing active-learning about environmental education would have many benefits including: improve student learning and higher-order thinking (Anderson et al 2005), engage diverse students more in the scientific process (Brewer 2011), and increase student enthusiasm for learning (Thaman et al 2013). Moreover, these types of learning activities are linked to increased environmental action (Volk and Cheak 2003). Active-learning classrooms in science disciplines like engineering, biology or ecology could support environmental education by using conservation related field/lab experiments or providing environmental case studies to show the real-world relevancy of their disciplines. The same could be true for social sciences; sociology and psychology, for instance, might examine how to prompt pro-environmental behavior change.
There are various ways environmental education could be integrated into college and university classrooms. These include:

- Support for schools to enhance or develop environmental courses and majors in sustainability
- Promote active-learning curriculum materials for bringing deep and systems-based interdisciplinary environmental education into existing science and social science classrooms
- Provide professional development for educators to give them the skills and confidence to implement new pedagogical approaches.
- Offer conferences and symposia on bringing environmental themes to higher education
- Connect researchers and practitioners to collaborate in evaluating programs (Zint 2002).

In higher-education settings, conservation topics can often be examined more deeply than can be achieved in a K-12 environment. Furthermore, by reaching emerging professionals from many disciplines these programs promote a diversity of perspectives on environmental problems which are inherently broad and interdisciplinary.

**RECOMMENDATION:** Support interdisciplinary courses and active-learning curriculum development, as well as professional development to integrate conservation themes into higher education.

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**Non-Formal Education**

The majority of US citizens are neither in school nor directly involved in leadership. Yet it is this general public that is responsible for the bulk of human interactions with the environment, e.g. consumption, voting. As such citizens will be mostly responsible for deciding the imminent environmental threats of today; they can be reached through non-formal education.

Unfortunately, American citizens are largely uniformed and misinformed about the environment (Coyle 2005). A significant challenge to reaching the general public is that adults, busy with careers and families, are not a captive audience in the same way as students. Thus, this group is often deemphasized by environmental education programs because of the difficulty of reaching them. It is therefore important that concerted effort be put into reaching, supporting and promoting programs that reach the general public (Coyle 2005).
There are two main branches of programs that reach people outside of schools and leadership training programs.

1) **Support Out-of-school and Career-building Experiences**: Out-of-school programs, internships, employment opportunities, and service learning/conservation programs reinforce ideas from the classroom and benefit participants by providing career-building experiences.

2) **Educate the General Public**: Non-formal education reaches diverse audiences of all ages.

### Out-of-School and Career-building Experiences

*Out-of-school, internship, and employment opportunities for youth extend classroom learning and can provide career preparation for the next generation of conservation professionals.*

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**MODEL PROGRAMS:**

As part of the America’s Great Outdoors 21st Century Conservation Service Corps Initiative, NFWF’s Developing Next Generation of Conservationists grant program is providing paid internships for Latino youth in Alaska, California, Colorado and Oregon to work at BLM, FWS and USFS sites. These students receive conservation education and training in shorebird identification along with mentoring from natural resource professionals to learn important skills for future conservation leaders. This broadens the audience participating in conservation (NFWF).

Similarly, for more than 50 years, the **Student Conservation Association (SCA)** has provided education, outdoor experiences and leadership skills to high school students across the country, employing them in hands-on improvements to parks, wildlife refuges and green spaces and preparing them to be future conservation leaders (SCA).

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**RECOMMENDATION:** Provide or support opportunities for youth to engage in out-of-school environmental education programs and conservation-based internships and employment opportunities.
Educate the General Public

*Non-formal education reaches the general public, engaging a diverse based of learners of all ages.*

Distinct from formal education (education in schools) and informal education (information communication), non-formal EE is both voluntary and organized. These programs can reach broad and unusual audiences, for instance bringing exciting natural experiences to urban settings (Bruni 2008). While the reach of formal education programs is limited to students, non-formal programs give educators a way to engage broader audiences – while often including programing for school groups as well. After all, it is the general public who makes decisions on today’s environmental issues. With access to environmental education, they will be better prepared and motivated to make a positive difference in solving imminent environmental threats of the present.

**MODEL PROGRAM:**

Non-formal education programs can even contribute to local conservation outcomes as well. The Save the Bay weekend in San Francisco is an example of the impact non-formal education programs can have. This nonprofit regional network engages more than 50,000 supporters, advocates and volunteers. It reaches across the community engaging everyone from kindergarteners to businesses leaders in hands-on citizen science monitoring and restoration programs, including leading the effort to re-establish 100,000 acres of tidal marsh (STB 2015).

The term ‘general public’ is really an overgeneralization. Rather, broader audiences can be broken down into distinct population segments. Non-formal education programs should identify target audiences within the public sphere and cater their programing to best meet that group’s needs. For instance, one segment of the population that may be particularly important for non-formal environmental education is student families. Programs should “meet people where they are at” to be most successful, and people are “at” many different places. The Yale Project on Climate Change Communication is a program that does this well (YPCCC 2015). They divide the American public into six groups from those who are “alarmed” to “dismissive” about climate change. Their forthcoming *Handbook of Environment and Communication* (Hanson and Cox 2014) explains the sources of these diverse perspectives and how best to communicate with each group.

Non-formal education programs increase awareness of conservation and environmental challenges, from local to global scales, for people of all ages. Programs in community-based non-formal educational facilities such as nature centers, parks, zoos, aquariums, and museums, reach a wide and diverse range of audiences. For example, in the last few decades education has become central to the mission of zoos and aquariums (Ogden and Heimlich 2009), with one study finding that 96% of these institutions included education in their mission statements (Patrick et al. 2007). A recent three-year nation-wide study by the Association of Zoos and Aquariums found that visitors reconsidered their role in environmental problems, experienced a stronger connection to nature, and strengthened environmental attitudes and values (Falk et al 2007). Additionally, non-formal education can also be provided by community-based groups such as boys and girls club or churches.

**RECOMMENDATION:** Support non-formal environmental education programs by organizations such as nature centers, parks, zoos, aquariums, museums, boys and girls clubs, and churches to reach diverse audiences and people of all ages.
III) Best Practices

Following the research-based best practices in environmental education programs will result in the greatest improvements in learning and conservation outcomes. Furthermore, by evaluating programs once they are implemented we can prove program outcomes, as well as refine our understanding of what works and why. Adaptive management through iterative assessment, reflection, improvements, and reassessment should guide any environmental education program. Finally, to achieve significant, measurable, and ambitious outcomes, efforts should focus on a few target communities in the long term and apply the lessons of Collective Impact.

Section I) Introduction examined how environmental education and community stewardship contribute to NFWF’s conservation goals. Section II) Collaboration focused more narrowly to see how environmental education supports community stewardship. In this section we examine environmental education itself. What are the best-practices and means for evaluation? Which programs should we target to achieve significant and measurable impacts?

Evidence-based Best Practices

Of course not all educational experiences are equal. By evaluating programs we have learned much about the best-practices for producing citizen stewards and achieving behavior change. In this section we examine the research-based best practices for three types of environmental education programs: 1) Programs targeting student learning and behavior change, 2) outdoor education programs, and 3) leadership development programs. Yet others could be found by reviewing syntheses of relevant research such as Smith (2012) on place-based education, Minner, Jurist, and Century on inquiry-based science education (2010), or Fishman and Davis (2006) on professional development for science teachers (Zint et al. 2011).

Best Practices for Student Learning and Behavior Change: Recent literature reviews of environmental education evaluations synthesize cutting-edge findings on what produces student learning and behavior change. Zint (2012) analyzed 10 environmental education program evaluations that report behavioral outcome results, from which she describes program characteristics likely to be successful in fostering behavior change (Zint 2012). Stern (2014) conducted another synthesis review of 66 research articles from which he identifies lessons about promising approaches (Stern 2014). Both reviews found similar themes, including an emphasis on experiential learning. Below, their conclusions are synthesized into a research-validated summary of best practices.

1) Student Learning and Behavior Change

- Clearly defined behavior change goals: Design programs with clear goals (Zint 2012; Stern 2014), and base these objectives on behavior theories and models (Zint 2012).
Experiential approaches: Programs should implement “active experiential engagement in real-world environmental problems,” including project-based approaches, active discussion, or issue-based investigation, preferably involving communities facing real issues (Stern 2014), or service-learning and field trips (Zint 2012). Students often make emotional connections to conservation through experiences outdoors or in the community (Stern 2014).

Holistic experiences: Education should tell a complete story. Interdisciplinary, systems-based approaches help learners consider all aspects of an issue, providing a coherent picture of the issue’s relevance (Stern 2014).

Longer duration: The longer the duration of the experience the better. Moreover, classroom preparation and follow-up extend the experience and enhance it (Zint 2012; Stern 2014).

Address student needs, context, and background: Programs should take into account the unique characteristics of their audience, including their needs, context, and background (Zint 2012). In particular, programs should provide time for reflection, make content relevant to students’ home lives, and provide a sense of empowerment and self-efficacy (Stern 2014).

Best-practices for Outdoor Education: Many environmental education programs include an outdoor education component. Rickinson et al. conducted a review of 150 research pieces on outdoor learning in 2004. His findings are summarized and put in context of other works for best-practices by Dillion et al. in 2007 (Rickenson et al. 2004; Dillion et al. 2007). Their work and others are synthesized below into a set of best-practice recommendations.

2) Outdoor Education

Offer frequent experiences: Start in early childhood and continue through grade-school. Starting young may be important since one study suggests younger (secondary students) are more likely to change their behaviors (Powers 2004).

Prioritize extended experiences: Longer programs have greater impacts (Dillion et al. 2007; Cross et al. 2012) Outdoor experiences can be extended through classroom connections, for instance preparatory work helps students look forward to and enjoy the experiences more (Ballantyne and Packer 2002) and follow-up work is helpful for solidifying learning (Orion and Hofstein 1994).

Encourage role models: Where students develop role models programs are more effective (Dillion et al. 2007; Cross et al. 2012). For instance, when students’ regular teachers actively participate in field trips alongside environmental education instructors, students’ outcomes are generally more positive (Stern, Powell, and Ardoin 2008).

Recognize student backgrounds: Each target audience will have different backgrounds, prior experience, and emotional responses to the outdoors. Be conscious of student apprehensions and prepare students for new experiences with classroom briefing/debriefing of outdoor activities (Dillion et al. 2007).
Beware of negative emotions: Studies show when students feel overwhelmed, afraid, or helpless in the face of environmental issues they are less likely to act (Kaplan 2000; Covitt et al 2005; Negev et al. 2008). Exposing children to environmental tragedies too young, before about fourth grade, is damaging rather than helpful (Sobel 1995).

Best-practices for Leadership Development: Shirberg and MacDonald recently published an analysis of programs which develop conservation leaders. Their work compiled materials from 50 programs and interviews with 20 program directors. Several familiar trends emerged, including experiential project-based learning, building community, and integrating disciplines. They also identified trade-offs such as depth (specific skill building) versus breadth (analytical models). A summary of the best-practices the authors recommend is given below (2013).

3) Conservation Leadership (Shriberg and MacDonald 2013)

- Identify and recruit target audiences
- Employ experiential learning
- Build peer networks
- Integrate disciplines
- Envision positive futures
- Develop leadership skills

MODEL RESOURCES: Best-practices

Numerous best-practice materials are available for designing curricula. One of the most significant tools is the North American Association of Environmental Education’s “Guidelines for Excellence.” These guidelines pull together collective wisdom by diligently synthesizing existing literature then opening recommendations to an extensive public participatory process (STAC 2013). According to the guidelines, materials should be fair, accurate, and in-depth. Curricula should emphasize skill-building and action-orientation while being instructionally sound and useable (NAAEE). The guidelines are continually being improved upon; a recent literature review provided empirical evidence to support claims as well as uncovered lessons for improving them (Stern et al. 2013). Often there is no need to develop new environmental education materials, since a plethora already exist. While the value of many of these can be questionable (Hungerford 2001) the “Guidelines for Excellence” offer a good metric for deciding on quality.

Evaluation Methods in Education

*Develop rigorous study designs and use a variety of tools.*

Once instated, the next step in ensuring educational quality is by evaluating outcomes. The best evaluations in environmental education include rigorous study design and a variety of measurement methods. Experimental study design – pre- and post- testing for both treatment and control groups – is the only way to confidently attribute improvements to an intervention. Rigorous and well planned study designs are important, especially since pre-data can often not be obtained if evaluation is left to the last minute. Evaluators also examine outcomes by using several evaluation methods, for instance student
surveys, teacher interviews, and classroom observations. This process is called triangulation. If multiple sources agree, the proof for an outcome is strong.

Research methods may be qualitative and/or quantitative. Some research is qualitative; it observes, describes and interprets phenomena in natural settings. These might be interviews, focus group discussions, or observational techniques as a witness or participant in activities (Kuna 2006), as well as concept mapping or case studies (Zint 2012). Other methods are quantitative; they use systematic empirical methods, statistical techniques, and numerical data. These might be performance tests or questionnaires which use numeric rating scales or multiple choice questions (Thompson and Hoffman 2015). Increasingly quantitative and qualitative methods are being used in conjunction, called mixed methods, to reinforce each other (Coffman 2002; Kuna 2006).

Braus notes that “selecting an adaptive management strategy that focuses on incorporating learning into all stages of your program, and to make changes as the situation evolves, is critical because it is almost impossible to get everything right from the start” (2009). By evaluating programs once they are instated we can prove program outcomes as well as refine our understanding of what works and why. Thus, adaptive management through iterative assessment, reflection, improvements, and re-assessment uses the results of those evaluations to guide improvements in the future. As such, adaptive management should be part of any environmental education program. Moreover, through adaptive management and evaluation we continually improve our understanding of what constitute best practices, allowing the field to move forward as creative solution and new methods are constantly discovered and refined.

Evaluation Metrics for Student Learning

We need to know both outputs, like how many people we are reaching, as well as outcomes, like how successfully we are producing specific learning and conservation outcomes. That way we can measure success and adapt initiatives to maximize benefits.

Specific Metrics: While conservation programs measure environmental goals, outcomes from an environmental education project might affect people, communities, or ecosystems (Byron 2014). Metrics should be easily understood, relevant (valid and reliable), manageable, achievable but sufficiently ambitious to be meaningful, timely, measurable, and have specific targets in mind (STAC 2013). Take for instance the categories of measurable and specific. Many environmental education programs have overarching goals such as ‘increase environmental stewardship.’ These outcomes, however, are influenced by a myriad of factors. As such they are hard to measure, and even harder to attribute to one specific intervention. Therefore choosing the properly specific program goal, and metric(s) to evaluate it, is vital to finding significant outcomes. Big picture goals

MODEL RESOURCES: Evaluation

The website MEERA: My Environmental Education Evaluation Resource Assistant is an excellent resource for developing environmental education evaluations. Educators and organizations need to learn about 1) the purpose and process of evaluation and 2) the evaluation practices in the environmental education field. MEERA fills these needs. Resources MEERA provides include a step-by-step guide for planning and implementing evaluations and a searchable database of evaluation reports from real-world programs, themselves reviewed for evaluation quality and content. Unlike many internet tools, MEERA has been evaluated itself and proven to support its goals (Zint et al 2011).
may be broken down in order to be measured. For instance, just as changes in ‘water quality’ would be captured through changes in phosphorous parts per million (ppm), changes in ‘landscape stewardship’ might be captured through changes in attitudes towards gardening with native species.

**Logic Models:** Creating logic models, with specific goals and metrics to measure them, helps us overcome the challenges of overly generic goals. A logic model is a graphic tool used to design projects, which “helps us to be clear both about what our projects are doing and what they are changing,” (Thomas and Hoffman 2015). At the front of the model is the intervention, what a program does, and at the other is the outcome, what the program changes. This outcome is in the form of a specific, measurable variable. The middle shows, logically, the steps between activity and success. Using logic models in environmental education helps avoid vague, unmeasurable goals.

**Metrics for Behavior Change:** Behavior change is one of the most common goals of environmental education programs, especially when funded by conservation organizations (Heimlich, 2010). To evaluate behavior change researchers use specific variables/metrics that have been theoretically and empirically linked to changes in behavior. Historically, a simple model of behavior change predominated:

Knowledge + Attitudes = Behavior. This misconception is still pervasive (Heimlich & Ardoin 2008). However, reality is much more complex (Monroe 2003; Heimlich and Ardoin 2008). Participation in environmentally responsible behavior cannot be attributed to one motive (DeYoung 2000). Indeed, researchers believe that people’s “emotions, attitudes, beliefs, identities, knowledge, worldviews, and values,” as well as their social and cultural contexts all play a role in changing human behavior (Ardoin et al. 2013). How these variables do this, and the relative importance of each variable, is less clear. There are dozens of theoretical models proposing how various combinations of these variables contribute to behavior change. For more examples, Heimlich and Ardoin provide a review of related models (2008). One of the most widely known and cited models for behavior change is the Hungerford and Volk *Environmental Citizenship and Behavior Change Model* (Hungerford and Volk 1990). A copy of that model is available in Appendix 1.

Variables that lead to behavior change are often used as metrics for evaluating program success, because they lay the groundwork for changing stewardship behaviors. However, the single best predictor of behavior is to measure *intentions* to behave a certain way (Hungerford and Volk 1990; Zint 2002; Bamberg & Moser 2007), although this is not a perfect method (Camargo and Shavelson 2009). Of course, if behaviors themselves can be observed unobtrusively, that provides the most compelling evidence of change (Camargo and Shavelson 2009).
**Outputs:** Participation rates are a frequent form of reported output; these statistics are useful and valuable and can be calibrated with other evaluations in order to assess total program outcomes. Many programs measure outputs such as: *How many teachers participated? How many students have used the facility? How many years has the program be in operation?* While these numbers do not provide evidence of the learning or conservation outcomes, they can be calibrated with evaluations done on learning, behavior change, and/or conservation outcomes to estimate total program impacts. The NOAA B-WET program provides a good model of this.

**Scale:** Rigorous program evaluations are difficult, expensive, and take expertise to conduct. For this reason it is important to require evaluation as well as earmark resources to support it. Some programs may choose to partner with an external evaluator, others can do internal evaluation. Even so, the burden of the most rigorous evaluation may be too much for very small programs to take on. For this reason, threshold(s) should be delineated with specific levels of funding demanding certain levels of evaluation. For instance, a $10,000 grant cannot support the same type of evaluation as a $100,000 grant can.

**Evaluation Documents:**

- Appendix 1 - Hungerford and Volk’s *Environmental Citizenship and Behavior Change Model*
- Appendix 2 – A sample student questionnaire from NOAA’s B-WET program
- Appendix 3 – Audubon Tools for Engagement: Outputs & Outcomes
- Appendix 4 – 21st Century Conservation Service Corps: Examples of Data to Collect

**Metrics for Nature, Not Just Learning**

When environmental education programs have expected outcomes for restoring nature, as well as for student learning, then it is equally important to evaluate and monitor the environmental impacts of the programs. Examples of these types of programs might be citizen science monitoring plans, school yard habitats, or project-based restoration. Environmental education projects which have experiential learning conservation components should have the necessary professional partnerships to provide both ecological and educational expertise. However, ecological systems are extremely complex; restoration projects do not always result in positive outcomes (Alpert 2002) or are fully measured for ecological outcomes (Alpert 2002; Hilderbrand 2005). The National River Restoration Science Synthesis Project (NRRSS) found that of about 40,000 river restoration projects in the US only about 10% have monitoring suitable to determine project outcomes (Follstad et al. 2007). Some projects on the cutting-edge of...
restoration evaluation are beginning to include not just evidence of ecological outcomes, but quantified human gains in ecosystem services as well (Wortly et al. 2013). Evaluating and quantifying both ecological and socioeconomic outcomes, when possible, would more fully capture the positive effects of NFWF’s environmental education and restoration initiatives. Doing so will collect evidence of the conservation value of these programs.

**RECOMMENDATION:** Several things can be done to support excellent evaluation of learning, behavior change, and/or conservation outcomes.

i. *Require rigorous evaluation* and earmark resources to support it, in proportion to grant size.

ii. *Develop and require specific metrics* for evaluating program success.

iii. *Support necessary partnerships* in education programs to provide both ecological and educational expertise.

iv. *Ensure grant reviewers are knowledgeable* about research findings and practices in environmental education and conservation evaluation.

**Implementing Best-Practices and Evaluation**

Recent studies have only begun to assess the needs, challenges, and practices of educational programs in implementing environmental education (Zint 2012). However, it is clear funders, grantees, and educators must all work in concert to bring best practices to students and to evaluate program outputs and outcomes. These groups each have separate needs and abilities. They interact in different ways as evaluation and best practices are passed down from granting organizations, to grantee organizations, to educators, and finally to students.
**MODEL PROGRAM: Evaluation**

Again NOAA’s B-WET provides a model for implementing evaluation on many levels. NOAA surveys B-WET grantees on the programs they run, those programs survey teachers after professional development and post instruction, and finally instruments are provided for teachers to test learning outcomes for their students (NOAA). For instance a Student Questionnaire Item Bank provides an extensive list of measures that might be used to evaluate student progress towards the programs goal, Meaningful Watershed Educational Experiences (MWEEs). Educators can pick and choose items from this bank to easily develop their own revenant and tailored evaluation questionnaire. Examples of these resources are available on NOAA’s website: www.oesd.noaa.gov/grants/bwet_eval.php.

**RECOMMENDATION:** Several things will help support best practices in the field.

- **Encourage best practices** when developing or selecting curriculum materials, and when selecting, designing, or implementing education programs.
- **Support professional development** to aid educators in implementing best-practices.
- **Continually improve programs and best practices,** using experience, insights, and evaluation results to continually adapt management and improve our understanding of what works best.

**“Professional development is critical to share the latest research, give educators experience and confidence at using best practices, and enhance educator’s evaluation competencies.”**

— Michaela Zint

**Achieving Significant, Measurable Change**

*If NFWF decides gathering evidence of significant change in behavior and conservation is the goal of their grant programs, then it will be necessary to focus at least a portion of available resources into concentrated efforts: ones that are long-term, geographically targeted, and support collaborative community-wide strategies.*

**Long-Term**

Relationships take time. People’s relationships with nature are no different. Students need repeated experiences in nature in order to develop an enduring connection. Long-term approaches link environmental literacy to environmental action (Volk and Cheak 2003). In the same vein, partnerships between agencies, schools, and programs take time for trust, mutual understanding, and joint ventures to develop (Kania and Kramer 2011). As such, there needs to be significant investment in a region to achieve enduring and community-wide stewardship that supports broad conservation outcomes.

Long-term data on program outcomes is valuable, but since it is more costly in resources and time to collect it is quite rare. The challenges to long-term studies are the impacts of intervening experiences on participant behaviors, the difficulty of reaching participants, the delay in seeing results, and the associated higher costs. As such long-term studies often require partnerships with an outside
evaluator to bring in required expertise. Most evaluations of environmental education programs are short-term, less than a year or two, post intervention. However these types of outcomes cannot capture the durability of behavior changes. In contrast, long-term outcomes can be linked to impacts beyond the individual such as community, ecological, or political impacts. If long-term impacts can be proven, it is easier to persuade participants, partners, or funders of program value (Bryon 2014).

**RECOMMENDATION:** NFWF should allocate a portion of funding to supporting long-term investments in educational programs, communities, and research projects to increase the likelihood of robust enduring programs and understand the long-term impacts of environmental education projects.

**Focus on a Few Targeted Areas**

*It is tempting to invest broadly in many important issues and regions, however this tends to spread efforts so thinly that it is impossible to measure any significant change to conservation issues. Instead, by investing deeply in targeted communities we can produce measurable outcomes, which proves the value of invested inputs and demonstrates the possibility of catalyzing significant change.*

Funders have to make very tough decisions when allocating resources. With limited money there is always a trade-off between investing broadly or deeply (Kania and Kramer 2011). The incentive to invest broadly is to distribute funds to many areas of legitimate need. This may seem equitable, since a variety of places and issues receive support. It may also seem rational, since the few most exceptional programs are rewarded. Since there are so many legitimate and pressing environmental issues, and so many excellent organizations vying for support, the typical result has been funders spread limited resources across many issues and communities. This creates incremental changes everywhere, but rarely significant change. With efforts isolated, it is hard to measure success. Moreover, even if conservation outcomes are resolved successfully it is hard to attribute responsibility.

The problem is that even local environmental issues are complex, adaptive, entrenched in many systems, and involve numerous stakeholders. These problems do not have clear solutions. They are not likely to be solved by a sudden technological innovation, or social breakthrough, and instead require adaptive systems changes (Kania and Kramer 2011). Consider the issue of water availability in the US Southwest. Climate change, agricultural practices, consumer use, and natural weather cycles all play a role. Technological innovations such as drought resistant crops help us adapt to changes, but do not resolve them. The issue will necessitate that many stakeholders contribute to solutions while adapting to new realities. Even the most successful environmental or educational organization is only one of numerous groups which play a role in deciding the fate of an issue. As such investing in a scattering of organizations across the landscape is not likely to produce measurable outcomes.

Another approach is to invest deeply in a few places to generate broad cross-sector coordination. This effect leverages limited capital so that overall impact ends up much larger than the sum of its parts. This generates significant change, though focused in only one area or topic. In the interviews conducted for this white paper there was clear consensus from the environmental education research community to avoid the temptation to invest too broadly, where community stewardship becomes more difficult or impossible to achieve. If funders need to prove their impacts, they will need to focus their efforts (Monroe 2015). Playing off of the synergy of many programs, NFWF can have
uniquely strong and measurable conservation impacts in these communities. These successes will validate NFWF efforts, lead the field in innovate programing, and demonstrate the possibilities for catalyzing measurable change.

**RECOMMENDATION:** Earmark a portion of the grant portfolios to invest deeply in a few targeted communities in order to leverage existing capital and thereby achieve uniquely strong and measurable outcomes for education and conservation.

“If funders need to prove their impacts, they will need to focus their efforts.”
— Martha Monroe

**Lessons from Collective Impact**

*Collective Impact aligns with NFWF’s mission and goals and provides an opportunity for NFWF to consider a novel and powerful role as a grant making agency.*

Kania and Kramer (2011) created a new framework for collaborative, community-wide efforts to generate social change called Collective Impact. The power of collaborations is not a new idea. The problem is coordination takes time and resources that no individual organization can afford to spare, and so with time collaborations usually dwindle rather than thrive. What is distinctive about Collective Impact is collaborations have a centralized infrastructure and staff, as well as a structured process to ensure that partnerships remain strong.

Collective Impact is built on five guiding tenants. The first is a *common agenda* (Kania and Kramer 2011). This uniting vision organizes and guides partners, a role similar to that Environmental Literacy Plans (ELPs) are designed to play. The authors explain that the second tenant is a *shared systems of metrics* to measure performance. This allows evaluation, monitoring, and adaptive management strategies, as well as meaningful comparison between organizations when discussing goals and outcomes. The philosophy emphasizes smart, effective, synergetic partnerships through *continuous communication* and *mutually reinforcing activities*. Finally, a *backbone support organization* and staff facilitates logistics and partnerships. This lithe organization manages projects and data, resolves conflicts, applies appropriate pressure to stakeholders, focuses attention, and presents opportunities (Kania and Kramer 2011). NFWF is uniquely suited to facilitate or play this role.

Collective impact provides a cutting-edge opportunity for NFWF to consider a fundamental change in how they see their role. Funders can bring together organizations to act in concert. By supporting backbone organizations to facilitate these partnerships NFWF could generate cross-sector coalitions that thrive. If change comes from gradual improvement of the system over time, not from a single breakthrough by an individual organization, the philosophy of collective impact makes sense. If this role seems too large and costly to be feasible, consider that by focusing and leading a Collective Impact initiative funders leverage existing investments, magnifying the impacts of millions or even billions of dollars of existing funding. Communities are united, engaged, and empowered to take ownership of their own initiatives. This produces local investment, creative problem solving, and long-term stability. The Collective Impact philosophy embodies the “engage and empower” spirit of environmental education. It also aligns with NFWF’s mission for community stewardship. Moreover, it is
a cutting-edge theory with a small, but impressive track record and the potential to generate significant, measured change.

**RECOMMENDATION:** Promote the five lessons of Collective Impact within their current and future grant making. Encourage grant applications from communities which have:

i. An Environmental Literacy Plan or other common goals
ii. Commitment to evaluation based on a shared performance metrics (for learning and conservation outcomes)
iii. Means for continuous communication
iv. Thoughtfully designed mutually reinforcing activities
v. A local backbone support organization to facilitate the Collective Impact process
IV) NFWF’s Existing Programs

Program Mission Statements

Ensure that environmental education is fully incorporated into NFWF’s conservation stewardship portfolio and that potential grantees are aware of the opportunities and priorities for environmental education. To do this, we suggest that NFWF consider developing a mission statement for its conservation stewardship portfolio as follows:

*The mission of NFWF’s environmental education and community stewardship portfolio is to support environmental education for stewardship on the individual and communities levels. Our initiatives aim to engage and empower participation in environmental stewardship, prepare the next generation of stewards, and enable citizens of all ages and communities of all types to make informed and responsible decisions on environmental issues.*

**RECOMMENDATION:** Implement a modified mission statement, which continues to support all of previous objectives, but with new emphasis on environmental education: engaging and empowering ownership and participation on an individual and community level.

Expanded Programs

As it stands, the majority of grant applications funded under NFWF’s three community stewardship programs, Five Star, Urban Waters, and Wells Fargo do not have a specific environmental education component, goals, or outcomes. As such, NFWF should establish a priority consideration and goal in NFWF’s community stewardship grant programs’ RFPs for environmental education. These programs should serve the needs of a broad range of community-wide audiences, but focus on transforming existing leaders, reaching K-12 classrooms, and supporting out-of-school and career building experiences.

There are several avenues to strengthen existing NFWF programs. Provide additional support to increase the number and variety of opportunities for high school, college and graduate students to pursue career building experiences in conservation fields. Promote increasingly diverse program participation by providing funded and branded opportunities to underserved areas. Encourage linkages between scientific research teams, natural resource agencies, and conservation practitioners to providing efficacy-building real-world opportunities for participants, and meaningful conservation outcomes for the environment. Expand the NFWF Community Stewardship Team and their resources to allow for the implementation of White Paper and Advisory Committee recommendations.

**RECOMMENDATION:** Increase resources for existing programs and community stewardship team to expand the reach of existing programs, to offer more career building experiences, emphasize opportunities with conservation outputs, and promote participation from people of diverse backgrounds.
Advisory Committee

NFWF should form an advisory committee of internal and external partners to help implement the recommendations of this report. The committee should include:

1) **NFWF staff:** Include NFWF senior leadership in the advisory committee, including leaders of, and experts on, existing community stewardship initiatives.

2) **Agency Partners:** Include external partners from other prominent environmental education and conservation agencies such as the Environmental Protection Agency (EPA), the National Environmental Education Foundation (NEEF), the North American Association for Environmental Education (NAAEE), Pisces Foundation, National Oceanographic and Atmospheric Administration (NOAA), and the Howard Hughes Medical Institute (HHMI).

3) **Environmental Education Researchers:** Include experts on the environmental education research and program evaluation such as Martha Monroe of the University of Florida, Nicole Ardoin of the Stanford’s Graduate School of Education, Marianne Krasny of Cornell University’s Department of Natural Resources, and Michaela Zint of the University of Michigan’s School of Natural Resources and Environment.

4) **Practitioners:** Include practitioners for on-the-ground expertise such as NatureBridge’s Executive Vice President Jason Morris, and the Chesapeake Bay Foundation’s Education Outreach Director Sarah Bodor.

5) **Formal Education Partners:** Include representatives of progressive school systems, such as Lateefah Durant, Academic Officer of the Prince George County Public Schools, and Dwayne Young, Principal, Fairfax County’s (Virginia) Centerville Elementary School.

6) **Non-traditional Partners:** Include organizations that can broaden the discussion and impact, whose missions include, but are broader than, the environment, such as the American Association of Pediatrics and Achieve, Inc.

**RECOMMENDATION:** Include NFWF Senior Leadership and experts on existing programs, external partners from prominent environmental education and conservation agencies, experts on environmental education research and program evaluation, practitioners from the field of environmental education, representatives of progressive school systems, and non-traditional partners, whose missions include, but are broader than, the environment.
Landscape Conservation Business Plans

Community-oriented conservation programs are effective. The U.S. Environmental Protection Agency recognizes that “managing the environment requires investment in the community for two powerful reasons: 1) local activities affect the quality of the local environment and 2) community members have a common interest in protecting and improving their community’s quality of life,” (Stevens 2002). Said another way, the community impacts its environment and the environment affects the community. Projects can be bolstered or swiftly undermined depending on community support. In fact, some of the most robust and creative environmental solutions are born out of community projects.

Each of NFWF’s conservation programs takes place in a landscape with people in or near it. The outcome of conservation programs is influences by local communities, just as the outcomes of the conservation projects impact these communities as well. By incorporating an environmental education aspect into conservation programs, NFWF can reach out to and capitalize on these communities. This community connection will decrease the likelihood that citizens will undermine conservation efforts. More importantly, this will increase the likelihood that locals will be an asset to projects and provide support for conservation initiatives. For example individuals might provide political or volunteer support to existing programs.

Each landscape conservation program has a business plan which provide a clear strategy for program success. The plans outline the project’s goals, highlight priority actions for program success, report on necessary resources, as well as define specific metrics for evaluating program outcomes. As such, business plans represent a logical way to incorporate environmental education into NFWF’s landscape conservation programs. These plans are already made in consultation with experts from federal and state organizations as well as academic specialists, so consultation with educational experts is advised. Integrate environmental education and community stewardship aspects into business plans by developing or refining business plan conceptual frameworks. Add justification for these changes into the “Funding and Resource Needs” sections of business plans. Develop metrics that measure community participation and changes in learning, behavior and/or conservation outcomes. Additionally, other NFWF projects provide a logical extension for inclusion of environmental education and community stewardship. For example these themes might be integrated into competitive grants for capacity building, mentoring and training sessions for new landscape conservation coalitions, and fostering coordination between local communities and federal natural resource agencies.

RECOMMENDATION: Integrate environmental education and community stewardship dimensions into every NFWF conservation business plan in order to reach out to local communities to increase the likelihood that locals will provide support for conservation initiatives.
V) Recommendations

Key Recommendations: Based on interviews, round table, and our research, recommendations highlighted in grey are the most significant opportunities for NFWF.

“Few organizations have the ability, as does NFWF, to give money with a stipulation of systemic change for the field.”

– Jason Morris, Acting CEO, NatureBridge

Future NFWF Investments

Establish new grant portfolio specifically targeted toward environmental education and community stewardship. Design this portfolio for deep, long-term, cross-community engagement in a few targeted communities where multiple educational initiatives can collaborate collectively to produce significant, measurable change in learning and conservation outcomes.

Cross-Community Opportunities:

LEADERSHIP DEVELOPMENT

1) Develop New Leaders: Create or invest in existing conservation leadership development programs that foster and empower environmental leaders, providing guidance, skills, and support for these passionate individuals to generate change in their communities.

2) Transform Existing Leaders: Create or support programs for existing leaders to bring them the inspiration, attitudes, and/or skills to become environmental champions. This will result in expanded decision-maker support for environmental education and conservation initiatives.

GUIDING DOCUMENTS

Environmental Literacy Plans: Make Environmental Literacy Plans (ELPs), or similar guiding documents, a requirement for NFWF funding at the community, state or landscape scales. This would ensure a thoughtful and committed plan for programs to collaborate and mutually reinforce one another’s programming.

FORMAL EDUCATION

1) Reach K-12 Classrooms: Support NGSS, or similar standards, and Green Schools to enhance environmental education in K-12 classrooms and build environmental literacy.
2) **Include Higher Education:** Support interdisciplinary courses and active-learning curriculum development, as well as professional development to integrate conservation themes into higher education.

**NON-FORMAL EDUCATION**

1) **Support Youth Out-of-School Programs, Internships, and Employment:** Provide or support opportunities for youth to engage in out-of-school environmental education and conservation-based internships and employment opportunities.

2) **Educate the General Public:** Support non-formal environmental education programs by organizations such as nature centers, parks, zoos, aquariums, museums, boys and girls clubs, and churches to reach diverse audiences and people of all ages.

**Strategies for Success:**

**HIGHLY EFFECTIVE PROGRAMS**

1) **Evaluation:** Several things can be done to support excellent evaluation of learning, behavior change, and/or conservation outcomes.
   i. *Require rigorous evaluation* and earmark resources to support it, in proportion to grant size.
   ii. *Develop and require specific metrics* for evaluating program success.
   iii. *Support necessary partnerships* in education programs to provide both ecological and educational expertise.
   iv. *Ensure grant reviewers are knowledgeable* about research findings and practices in environmental education and conservation evaluation.

2) **Research-based Best Practices:** Several things will help support best practices in the field.
   i. *Encourage best practices* when developing or selecting curriculum materials, and when selecting, designing, or implementing education programs.
   iii. *Continually improve programs and best practices*, using experience, insights, and evaluation results to continually adapt management and improve our understanding of what works best.

**ACHIEVING SIGNIFICANT, MEASURABLE CHANGE**

1) **Commit to the Long-Term:** NFWF should allocate a portion of funding to supporting long-term investments in educational programs, communities, and research projects to increase the likelihood of robust enduring programs and understand the long-term impacts of environmental education projects.

2) **Focus on a Few Targeted Areas:** Earmark a portion of the grant portfolios to invest deeply in a few targeted communities in order to leverage existing capital and thereby achieve uniquely strong and measurable outcomes for education and conservation.
3) **Implement the Lessons of Collective Impact:** Promote the five lessons of Collective Impact within their current and future grant making. Encourage grant applications from communities which have:
   
   i. An Environmental Literacy Plan or other common goals
   ii. Commitment to evaluation based on a shared performance metrics (for learning and conservation outcomes)
   iii. Means for continuous communication
   iv. Thoughtfully designed mutually reinforcing activities
   v. A local backbone support organization to facilitate the Collective Impact process

**Existing NFWF Programs**

Expand the Existing NFWF Grant Programs. Integrate environmental education and community stewardship into NFWF’s existing program’s mission statements, grant portfolio, and landscape conservation business plans to advance meaningful conservation outcomes.

**Build on Existing Programs**

**PROGRAM IMPROVEMENTS**

1) **Refine Mission Statements:** Implement a modified mission statement, which continues to support all of previous objectives, but with new emphasis on environmental education: engaging and empowering ownership and participation on an individual and community level.

2) **Expand Existing Programs:** Increase resources for existing programs and community stewardship team to expand the reach of existing programs, to offer more career building experiences, emphasize opportunities with conservation outputs, and promote participation from people of diverse backgrounds.

3) **Form an Advisory Committee:** Include NFWF Senior Leadership and experts on existing programs, external partners from prominent environmental education and conservation agencies, experts on environmental education research and program evaluation, practitioners from the field of environmental education, representatives of progressive school systems, and non-traditional partners, whose missions include, but are broader than, the environment.

4) **Connect to Landscape Conservation Business Plans:** Integrate environmental education and community stewardship dimensions into every NFWF conservation business plan in order to reach out to local communities to increase the likelihood that locals will provide support for conservation initiatives.
Conclusion

By aligning human priorities with ecological needs we can create conservation projects that not only endure, but thrive. The case for environmental education and community stewardship was aptly captured by conservationist Aldo Leopold when he wrote “It is inconceivable to me that an ethical relation to land can exist without love, respect, and admiration for land, and a high regard for its value” (1977). Love, respect, and admiration for the land come from understanding it. This includes understanding the economic and cultural value of natural resources and how ecosystems support all life, human and otherwise. Such a positive relationship with nature is often fostered by experiencing natural wonders first-hand, but also developed through participation in experiential learning. When people understand and care for their environment they are more likely to make choices which protect and restore it. By creating knowledgeable, passionate citizen stewards we increase the capacity for environmental problem solving. Furthermore, by using conservation projects as natural classrooms we create “a high regard for nature’s value” among the community and the next generation of citizens. Generating a community-wide ethical relationship with the land will rally public support for meaningful and significant investments in landscape stewardship.
Acknowledgements

This white paper is the result of consultation with many national experts in environmental education and leadership development. In this paper, the views expressed are of the three principals who worked together interviewing experts, soliciting their advice in a national roundtable discussion, following up with select individuals for further consultation, and then synthesizing the comments. Charlie Stek and Don Baugh were the primary interviewing and research team. Genevieve Leet was the primary author, and as a graduate student of Michaela Zint, University of Michigan environmental education professor, was able to add additional evidence to the recommendations.

We would like to thank the National Fish and Wildlife Foundation for their commitment to rigorous third party review, openness to our inquiries, and assistance getting to know their core programs. In particular, NFWF staff Carrie Clingan, Manager, Community Based Conservation Programs; Sarah McIntosh, Coordinator, Community Based Conservation Programs; and John Lamoreux, Biodiversity Analyst, have been most helpful at the staff level, and David O’Neill, Vice President Conservation Programs; and Claude Gascon, Executive Vice President.

A special thank you goes to environmental education professors and researchers Martha Monroe, University of Florida, Nicole Ardoin, Stanford University, and Michaela Zint, University of Michigan, for contributing consistently throughout the project. With their help we were able, to the best of our abilities, to provide insight into the current state of research and to make evidence based recommendations consistent with NFWF’s research underpinnings. Their input was outstanding.

We would like to thank the other participants in the national roundtable discussion: Kevin Maxwell, CEO Prince Georges County Schools; Lateefah Durant, Academic Officer, Prince Georges County Schools; Judy Braus, Executive Director, North American Association of Environmental Education; Sarah Bodor, Education Outreach Director, Chesapeake Bay Foundation; Jaime Matyas, President, Student Conservation Association; Errol Mazursky, Executive Director, Environmental Leadership Program; Mark Nielsen, Education Specialist, Howard Hughes Medical Institute; Angie Chen, Director, Blue Sky Funders Forum; Jason Morris, Acting CEO, NatureBridge; Shayla Beebe, Senior Director, Tennessee Wildlife Federation; Mike Butler, CEO Tennessee Wildlife Federation; Christina Kakoyannis, Director, Strategic Planning and Evaluation, NFWF; Courtney McGeachy, Coordinator, Marine and Costal Conservation, NFWF.

The following experts were interviewed or contributed, but did not participate in the round table: Sarah Schoedinger, NOAA; Louisa Koch, NOAA; Dave Campbell, NSF; Lillian Lowery, Maryland Superintendent of Schools; Gerald Lieberman, State Environment and Education Roundtable; Kathy McLaughlin, Project Learning Tree; Michelle Jones, Hawaii Environmental Education Association; Peter Clark, Tampa BayWatch; Donna Ball, Save San Francisco Bay Foundation; Rob Brumbaugh, The Nature Conservancy; Brian DeAngelis, The Nature Conservancy; Tom Hudspeth, University of Vermont; Bora Simmons, Northern Illinois University; Michaela Zint, University of Michigan; Mamie Parker, National Conservation Training Center; John Reynolds, Student Conservation Association; Suzanne Etgen, Watershed Stewards Academy; Peter Lane, Institute for Conservation Leadership; Mike Foreman, Virginia Department of Conservation and Recreation; Bob Stokes, Galveston Bay Foundation; Kimberly Reyher, Coalition to Restore Coastal Louisiana; Ira Greg, Florida Department of Environmental Education; Kevin Coyle, National Wildlife Federation; and Dennis Liu, Howard Hughes Medical Institute.
About Environmental Leadership Strategies

Environmental Leadership Strategies is a private environmental education and leadership consulting firm whose mission is to connect students and key individuals, teams, organizations, schools, businesses and government agencies to the environment.
Works Cited


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UNESCO Tsibilit slti agreement


Appendix 1 – Hungerford and Volk’s *Environmental Citizenship and Behavior Change Model*
Appendix 2 –
A Sample Student Questionnaire from NOAA’s B-WET Program

Sample Secondary Student Questionnaire

Thank you for filling out this questionnaire! By doing this, you are helping to make education projects better for you and other students.

In this questionnaire, you will be asked what you know about your local watershed and what you can do help protect it.

Please be completely honest when you answer the questions. Your answers to these questions will be kept anonymous (we don’t ask for your name) and your answers will not affect your grade. Your teacher and your parents will not read your answers to these questions.

If you do not understand a question, do not mark a response. Leave that question blank and move on to the next one.

Your teacher can help you if you do not understand certain words or any of the directions for completing this questionnaire.

So that your answers on this questionnaire can be matched to response you provide later, please create an ID number.

Your ID number is the two digits that represent your birth month, the two digits that represent your birth day, and the last four digits of the phone number most people call to reach you. If you birthday is March 5 (03/05) and your phone number is 555-555-1212, then your ID number would be 03051212.

Please enter your ID number here: ______________________________________

[It is possible to use the student’s name instead of an ID number as long as any results reported publicly do not identify the student. In any case, the pre-ID and the post-ID need to be identical to match responses.]
What grade are you in?

- Grade 6
- Grade 7
- Grade 8
- Grade 9
- Grade 10
- Grade 11
- Grade 12

[These types of demographic data can help you make sense of your data. Do older students have different results than younger ones?]

Are you ....

- Male
- Female
- I prefer not to answer

[Demographic data like this also help you describe who your participants and respondents are!]

How sure are you that you know what a watershed is?

- Not at all sure
- A little sure
- Very sure
- I'm positive

Which of these is the best definition of a watershed?

- A building at a water treatment plant
- An area of land that drains into a specific body of water [correct answer]
- A significant pollution event
- Another name for a river or stream
- Don't know

[For subsequent analyses, treat “Don’t know” as a wrong answer. You can assign wrong answers the value of 0 and correct answers the value of 1 to make it easy to calculate an overall mean of correct responses.]

How sure are you that you know what groundwater is?

- Not at all sure
- A little sure
- Very Sure
- I'm positive

Watersheds contain groundwater.

- No
- Yes [correct answer]
- Don't know
Look at the picture above. Which of the following is in this river’s watershed?

<table>
<thead>
<tr>
<th></th>
<th>No</th>
<th>Yes</th>
<th>Don’t know</th>
</tr>
</thead>
<tbody>
<tr>
<td>The red school building</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>The farm</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>The city</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>The small creek on the right</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

Now you’re going to answer some questions about local bodies of water. Examples of local bodies of water are streams, rivers, lakes, bays, and the ocean.

How much do you agree or disagree with these statements?

<table>
<thead>
<tr>
<th></th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neither agree nor disagree</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I like to learn about a local body of water</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I search for information to learn about a local body of water</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I want to explore a local body of water</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I care about a local body of water</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

[This set of items is considered to be a scale for measuring the outcome Caring about Water, so you want to be sure to include them all to measure that outcome.]
For each statement, mark a response to “I know how to...” and a response to “Within the next year, I plan to...”

<table>
<thead>
<tr>
<th></th>
<th>I know how to...</th>
<th>Within the next year, I plan to...</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Strongly disagree</td>
<td>Disagree</td>
</tr>
<tr>
<td>Help clean up or take care of a local stream, river, or beach</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Participate in a restoration activity such as planting trees or removing invasive plants</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Tell others about ways they can protect a local body of water</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Create a schoolyard or backyard habitat</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Conserve water at home or school</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Install a rain barrel at home</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Give a presentation about a local body of water</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

[When you use a Likert-type response scale like this, assign the response values as 1-5 where 1=strongly disagree, 2=disagree, etc. to subsequently calculate an overall pre- and post-MWEE mean (i.e., the mean of the means of the measures in the scale)]

[add post-test-only items here when creating the post-test]

Thank you for completing this questionnaire!
APPENDIX 3 – Audubon Tools of Engagement: Outputs & Outcomes

Outputs (for both ecological and behavioral outcomes)

People:
- Number of participants/volunteers involved*
- Person hours (hours worked by volunteers/participants)*
- Number of work days*
- Diversity of participants (number breakdowns and estimates ideal)*
- Number of underserved and new populations reached*
- Number of organization’s members involved*

*Input or output depending on goals of project

Media/Communication:
- Number of press releases
- Type of press outlet (television, newspaper, journal, national magazine, or newsletter)
- Distribution level of press outlet (size of distribution area such as national, regional, state, metropolitan area, city, or town)
- Number of interviews
- Website (number of unique visitors)

Ecological:

Habitat
- Acres restored
- Acres improved
- Vegetation planted
  - Number of trees
  - Native grasses (square feet, acres)
  - Ground cover, shrubs, woody vegetation
- Invasive species removed
  - Species
  - Volume
  - Percentage of coverage (reduction)
- Number of erosion sites removed
  - Size (acres)
  - Other specific improvements
- Monitoring
  - Size of area monitored
  - Number of species monitored
  - Number of GIS maps generated
  - Reports completed

Water
- Gallons captured or saved
- Number of cisterns
- Surface area converted from impervious surface
- Surface area of converted landscaping (square feet, square meters)
- Number of low-water landscapes/gardens installed
- Other quantifiable accomplishments

Energy
- Number of low-energy light bulbs installed
- Other quantifiable accomplishments
Outcomes

People:
- Number of people who perform the targeted behavior
- Behavior measure (standardized instrument that assesses intention to act)
- Increased knowledge of XX issue
- More positive attitude toward XX species

Ecological:

Habitat
- See outputs (outputs list may serve as outcomes depending on scale of project and goals)
- Population trends in target species
- Threat assessment (post-program)
- Development impacts reduced (directly measured or qualitatively described)
- Threat impacts reduced (directly measured or qualitatively described)
- Number of species protected
- Diversity of species protected
- Survival rates improved
- Increased productivity (specific ecosystem services protected)
- Population sizes of target species observed
- Decrease in nest abandonment

Water
- See outputs
- Water quality improvements
- Water availability
- Policy changes

Energy
- Reduction in kilowatts used (quantified)
- Reduction in carbon emissions (quantified)
- Pounds of material recycled
- Carbon/ecological footprint
- Policy changes
APPENDIX 4 –
21st Century Conservation Service Corps: Examples of Data to Collect

Participant Information:
- Number of program participants
- Population served (demographics: gender; race; age; number receiving public assistance; number transitioning from foster care, felony/misdemeanor records, unemployment rates and per capita income through participant zip code)
- Education levels: TABE testing scores, if appropriate; less than high school; some high school; high school diploma; GED; some college/vocational (no degree attained); Vocational; Associate’s; Bachelor’s; Post Graduate degree; unreported).

Participant Outcomes:
Number of...
- Participants that completed the program/who resigned/who were terminated
- Hours of service completed by each member
- Students who demonstrate increased academic engagement
- Employment skills/special certifications (CDL, chainsaw, etc.), GED and/or High School diplomas earned, post-secondary education completed
- Internship/job placements/college enrollments

Post Program:
- Qualitative success stories (e.g. graduates enter jobs and/or education because of the program)
- Quantitative tracking (e.g. length of time members were retained in internships, jobs and/or post-secondary education)

Qualitative Data:
Changes in...
- Attitude towards personal health, self-responsibility, teamwork, leadership, environmental activism
- Attitude towards public lands and waters
- Community engagement
- Life aspirations
- Interest in natural resources education and work, etc.