2015

Environmental Education and Community Stewardship

STRENGTHENING AND EXPANDING THE NATIONAL FISH AND WILDLIFE FOUNDATION'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, and travel in ways that can either cause environmental harm or benefit. Therefore, investment in citizen stewards is vital to the 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. Environmental education and community stewardship programs actively engage people and empower them to become stewards of their landscapes.

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 efforts 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 a 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.*

I) Introduction

Purpose

Human stewardship is vital to the success of any conservation initiative; as such this white paper outlines what the National Fish and Wildlife Foundation (NFWF) can do to foster environmental education and conservation stewardship programs that will advance NFWF's conservation mission. The Foundation currently runs four separate programs that support primarily outreach and community stewardship activities and seeks recommendations on strategies to strengthen and expand its portfolio. By developing a more integrated, comprehensive, and outcome-focused strategy to guide NFWF's future investments in this area, the Foundation can impact national conservation and stewardship objectives.

To guide an integrated, comprehensive, and outcome-focused strategy, the white paper aims to be contextualized, thorough, and evidence-based. To show how the field of environmental education and concept of community stewardship integrate with conservation outcomes, the first goal of the report is to introduce these topics and give evidence of their power and alignment with NFWF's mission. Next, we aim to show how environmental education can be implemented in a wide variety of ways; we use a framework to organize various program types, delve into an explanation of each approach, and include model programs of each variety. This thorough examination produces a comprehensive set of recommended approaches. Since our intent is to proffer the most exceptional strategies for fostering stewardship, we summarize the evidence-based best practices in the environmental education field and point to key resources, such as model metrics for evaluation. This supports NFWF's outcome-focused values. Finally the paper makes specific recommendations for how NFWF can enhance and expand their existing environmental education and community stewardship programs. The recommendations guide the next steps to promote stewardship in achievable, efficient, and meaningful ways.
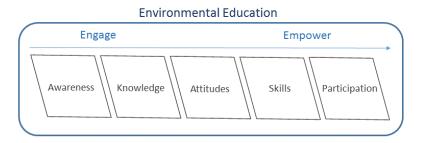
Methodology

 To write this report we identified opportunities and strategies to maximize NFWF's program success through a compilation of expert opinion, examination of model programs, and a synthesis of the literature. First the authors met with NFWF staff to review current programs, metrics, and objectives in order to understand existing efforts and identify opportunities for enhancement. Research continued with 34 interviews of academic and practitioner experts in the field of environmental education. In aggregate these interviews drew on centuries of collective experience. From them we identified model programs and key characteristics of successful initiatives. Moreover, we selected potential levers or "push points" that NFWF could use to accelerate and advance conservation. The second part of the research phase included a forum with NFWF, conservation, and environmental education specialists. Thirteen experts discussed the above topics and explored creative ideas to strengthen NFWF programs, investments, and partnerships. Third, by researching the literature we were able to develop an evidence-based survey and synthesis of the field. The literature provides background on environmental education and community stewardship and gives evidence of program effectiveness in advancing conservation outcomes. From this we compiled best practices and relevant resources for maximizing and measuring success. In all, the white paper compiles the findings of these research methods to outline what the Foundation can do to strengthen and expand its conservation stewardship portfolio.

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," (North American Association for Environmental Education [NAAEE] 2015). In 1977 at a United Nations 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 (United Nations Educational, Scientific, and Cultural Organization [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.

Environmental Education

Engage   Empower

Awareness | Knowledge | Attitudes | Skills | Participation

What is Community Stewardship?

For the purposes of this report "community stewardship" is used to refer to the collective actions of a community to care for the natural areas that exist in and around that community. For instance, these actions might include organized participation in restoration activities, volunteer help in maintenance and monitoring of natural areas, or independent community-directed sustainability initiatives. The term implies that there is diverse and sustained participation in these activities, which arise out of a sense of ownership and empowerment to steward natural resources connected to community wellbeing.

Organizations and educators are increasingly recognizing the value of community stewardship. Environmental education programs historically focused on nature studies and explaining environmental problems. When stewardship was addressed, it was usually on an individual level, for instance, increasing recycling, planting trees, and energy conservation. 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.

Strong communities are more able and likely to manage their natural resources well. Scholars are increasingly discovering how communities with more social capital, strong social norms, community-wide trust, and broad engagement are "more likely to act for the collective good around issues related to environmental management and sustainability and to be resilient, i.e. have the capacity to learn and adapt to environmental chance," (Krasny et al. 2012, p. 4). In pioneering research Ahn and Ostrom (2008) found that under the right conditions communities sustainably manage their common property to create public good. This offers a counterpoint to Hardin's (1968) tragedy of the commons, a classic environmental theory, which assumes that without regulation or privatization individuals will always act in their self-interest, leading to environmental degradation.

The growing 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 2015).

The Landscape of Environmental Education in the U.S.

After four decades of sporadic growth, environmental education and conservation 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:

- Funding for environmental education by American foundations grew about four times as quickly as funding for the environment overall between 2003 and 2007.
- In 2010, for the first time since the 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 in 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 health and wellness, 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). Through these plans, 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 a 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.
- 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.
- Many organizations are adding support explicitly for community stewardship projects. For instance, the National Forest Foundation funds a Community Capacity and Land Stewardship Program to support collaborative efforts around watershed and landscape scale restoration. The New Jersey Department of Environmental Protection offers a Community Stewardship Incentive Program to municipalities and counties to support forestry projects.
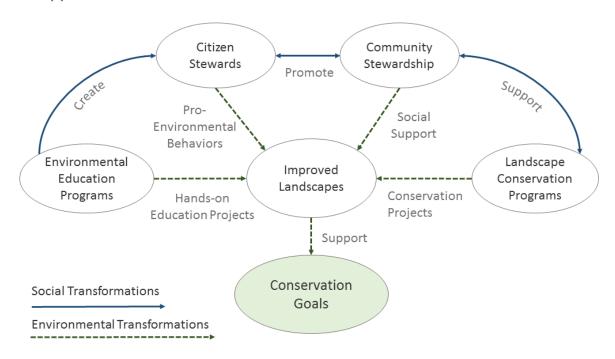
Factors fueling this resurgence include:

- o Starting in the mid-1990s, the North American Association of Environmental Education (NAAEE 2015) began to develop of 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 2015).
- o 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.
- o 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).
- o Environmental education 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. Environmental Education is rarely a priority for foundation funders, as shown by an empirical study across the United States which found environmental education received less than 5% of foundations' overall environment funding (Ardoin and Bower 2012). 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).

Support for NFWF's Mission

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) Community Collaboration** surveys the diversity of environmental education programs and how each contributes to community-wide stewardship.
- **Section III) Best Practices** provides methods for evaluating outcomes, designing environmental education programs, and choosing funding strategies, using research-based evidence.
- **Section IV) Existing Programs** analyzes NFWFs existing community stewardship programs to identify areas for growth.
- **Section V) Recommendations** provides a set of priority suggestions for enhancing and expanding NFWF's existing efforts; these recommendations will direct NFWF towards a cogent strategy to deliver ambitious, measureable, and durable outcomes.

Support for NFWF's Conservation Goals

Creating 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.

Environmental Education creates Citizen Stewards

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 (Cheng and Monroe 2010; Zint 2002). With meaningful experiences in nature children show more interest in studying the environment and related careers (James et al. 2010; Nature Conservancy 2011). By spending time outdoors, 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.
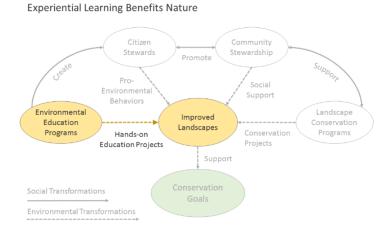
Experiential learning: Experiential programs increase awareness of issues, environmental consciousness, and pro-environmental behaviors. Action-oriented approaches, grounded in community, service-learning, and place-based methods, are particularly effective at developing environmental literacy into pro-environmental behavior (Zint 2012; Volk and Cheak 2003). 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 (Dillon et al. 2006; 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 direct conservation outcomes as well. Experiential learning curricula, including issue investigation, citizen science, service-learning, and place- or community-based learning are well suited to this (Braus 2009). Monroe et al. (2013) explain these activities are "meaningful and real to the participants, and they involve reflecting on one's experiences to enhance learning," (p. 33). These service projects link youth with the community. They promote cooperation, complex problem solving, and citizenship skills. As a result, they are more likely to support social, emotional, and cognitive learning and development (Monroe et al. 2013). Examples of these activities are contributions to shoreline 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).

Experiential Learning Benefits Nature

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

Environmental Education, Citizen Stewards, and Community Stewardship

As more citizens identify and act as environmental stewards in an area, the potential for environmental stewardship at a community level grows. 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.

Additionally, environmental education itself contributes to community stewardship in some cases. Krasny et al. (2012) explain that this is true of environmental education programs which "incorporate collective opportunities for volunteer and associational involvement around stewardship (e.g., community gardening and tree planting)," or include "intergenerational learning and collective decision-making," (p. 7). These activities build trust in the community and strengthen social networks, strengthening the community's capacity for joint stewardship.

The combined impact of community stewardship, individual pro-environmental behaviors, and conservation contributions from educational initiatives is to produce 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.
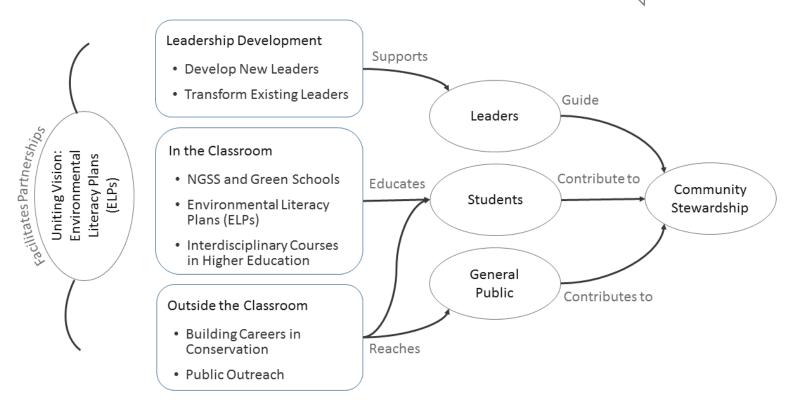
II) Community Collaboration

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." 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.

Environmental Education Programs lead to Community Stewardship

Who makes up a community?

Different types of environmental education programs – leadership development programs, formal education in the classroom, and non-formal education outside it – can be used in concert to reach an entire community. Using a guiding framework to facilitate collaboration maximizes learning and conservation outcomes by providing a common vision and encouraging partnerships.

How Environmental Education Supports Community Stewardship

Facilitates Partnerships

Uniting Vision: Environmental Literacy Plans (ELPs)

Leadership Development
- Develop New Leaders
- Transform Existing Leaders

In the Classroom
- NGSS and Green Schools
- Environmental Literacy Plans (ELPs)
- Interdisciplinary Courses in Higher Education

Outside the Classroom
- Building Careers in Conservation
- Public Outreach

Supports → Leaders → Guide

Educates → Students → Contribute to

Reaches → General Public → Contributes to

Community Stewardship

Environmental education does more than educate children in hopes of long-term benefits; it reaches adults and leaders as well, allowing for short-term environmental impacts and immediate outcomes. One reason foundations have historically put a low priority on environmental education is because of a misconception about the scope of the field, with many believing it only applies to educating children in a broad sense (Ardoin and Bower 2012). Pressure to show immediate results of funding often disincentivizes teaching children because of the presumed delay in conservation benefits. However, even setting aside examples of K-12 programs which have tangible conservation benefits, environmental education can and does have short-term impacts by educating adults and leaders of today. Indeed, it reaches people of all ages, impacting communities and leaders in the short term. Therefore, this section surveys the broad scope of environmental education strategies, highlighting how programs target not only children, but leaders and the general public as well.

By reaching and deeply engaging many diverse groups environmental education fosters 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 and 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.

A. Leadership Development

Environmental Education Supports Community Stewardship

In a 2005 report supported 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.

There are many different types of people to target through leadership development programs. Some programs might focus on youth or young adults, preparing to one day move into politics, business, academia or another management area. Others may be structured towards young or mid-career professionals from local conservation organizations, businesses or governments seeking to build their capacities to make change. Still others might as easily cater to retired community members looking for ways to stay active and meaningfully engaged in their neighborhoods. It can be important to aim leadership development at school system administrators and community leaders (STAC 2013). Supporting people in making changes in their own communities helps foster leaders who are tuned in to local values, needs,

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 to connect their work to larger environmental and social concerns through fellowships, multi-day training retreats, coaching, and 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 2015).

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 2015).

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 2015).

and opportunities. 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.

SUMMARY: 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 programing 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, educating existing leaders leverages existing power structures. They can then support top-down 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

Chesapeake Bay Expeditions: 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).

Organization for Tropical Studies: The Organization for Tropical Studies (OTS) offers programs to bring together U.S. and international decision makers in the governmental and private sectors whose choices impact tropical ecosystems. Headquartered at Duke University, OTS is a nonprofit consortium of sixty universities, colleges, and research institutions. For over twenty years, by combining lectures, hands-on field experiences, group work, and discussions, OTS built and educated a large network of leaders who are in positions to devise and implement policies affecting tropical resource issues including biodiversity, forest ecology, and ecosystem services (OTS 2015).
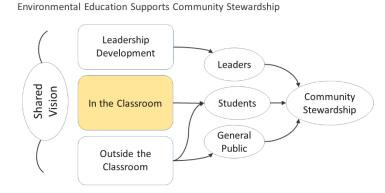

There is no dearth of leadership development programs; however each serves different audiences and teaches using a unique recipe of techniques. Which programs are most effective? In consultation with leadership experts such as Deborah Meehan, Executive Director of the Leadership Learning Community (personal communication), this report recommends specific audiences and types of

training programs that will best serve NFWF's goals. The top transformative leadership programs build connectivity and collaborative capacity of community leaders, environmental professionals, and those in formal education systems.

One priority audience is existing environmental professionals, such as outreach and extension officers at state natural resource agencies. Established community leaders are another important group, since these individuals are able to build upon existing relationships, rapport, and local-expertise in the communities where they work. Finally leaders within the formal education systems are vital to supporting environmental education in schools. These leaders might include school system administrators, superintendents, principals, and board members. In communities where NFWF is focusing several projects, other cross-community leaders could be brought on-board too, including non-profit directors, eco-tourism managers, and environmental journalists.

From a meta-analysis of conservation leadership programs, Shirberg and McDonald (2013) recommend certain features for effective leadership training. The best programs include experiential-learning, such as outdoor expeditions or issue investigations, integrate disciplines, and build peer networks with a focus on involving under-represented groups. These programs should teach skills including systems thinking, coalition building, and positive-future envisioning, as well as emphasize collaborative abilities, like negotiation and mediation.

SUMMARY: Create or support programs for existing leaders such as environmental professionals, community leaders, and school administrators. These programs will help luminaries develop the inspiration, attitudes, and/or skills to become environmental champions, resulting in expanded decision-maker support for environmental education and conservation initiatives.

B. In the Classroom

Environmental Education Supports Community Stewardship

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 (U.S. Department of Education [ED] 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) **ELPs:** *Prioritize funding for states with Environmental Literacy Plans (ELPs) to create a shared vision to guide formal education and support cross-community partnerships.*
3) **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 (NGSS 2015). So far 25 states have adopted NGSS or similar standards, such as the National Research Council's Framework. 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 is 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 practice of environmental education. The focus on inquiry-based real-world science in NGSS fits well

NGSS Alignment

Science & Engineering Practices: Practices emphasize 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.

Core Disciplinary Ideas: 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."

Cross-cutting Concepts: 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.

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.

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 habitat. 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 install solar arrays. Importantly, the NGSS emphasize teaching via multi-dimensional, 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 school 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). Teacher 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.

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.

Green Schools: The national green schools movement has become a significant force to support school sustainability, both inside and out. Green schools, which include public and private schools alike, 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
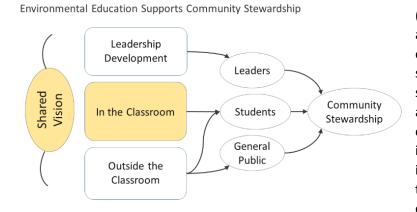
nation's green schools. It defines a green school as having three pillars: 1) reducing environmental impacts and costs, 2) improving the health and wellness of students and staff, and 3) providing effective sustainability education (USDE 2015b). The advantage of sustainable schools is that they are part of student learning experiences each and every school day. Students can help to create, learn from, and engage in technology projects, such as energy audits or alternative energy models (e.g., solar panels on campus), as well as nature opportunities on school grounds, including gardens, trails, and natural habitats. Some green schools expand the classroom's reach by adopting nearby nature areas, including streams, pastures, woods, and wetlands.

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 public, private, and charter K-12 school to become green in the next decade.

SUMMARY: Support NGSS, or similar standards, and Green Schools to enhance environmental education in K-12 classrooms and build environmental literacy by focusing investments in these schools or programs utilizing the standards.

Environmental Literacy Plans (ELPs)

Environmental Literacy Plans create a shared vision to guide formal educational activities and support cross-community partnerships around stewardship of natural resources. By leveraging existing organizations, ELPs promote mutually reinforcing and collaborative partnerships which make individual efforts more efficient and effective.

Environmental Education Supports Community Stewardship

Environmental Literacy Plans (ELPs) create a shared vision and action plan for coordinating environmental education at the state and local level. Firstly, they support school systems in expanding and improving environmental education. This might include integrating environmental education into the formal school system through graduation requirements or ensuring relevant professional development for educators. Secondly, ELPs facilitate partnerships and collaboration across the community in pursuit of shared educational goals. Non-formal educators, natural resource agencies, and community organizations partner with schools to offer meaningful and varied educational activities. Additionally, ELPs engage with underserved communities in an inclusive process to ensure all stakeholders benefit from environmental education initiatives (State Environmental Literacy Plans

2013). Working in schools and across communities, ELPs are comprehensive education plans to achieve environmental literacy for K-12 students.

Many states and a broad base of stakeholders began to develop ELPs in response to the introduction of the national No Child Left Inside Act, introduced to Congress in 2007. The legislation required these plans as a condition for receiving federal environmental education funds from the U.S. Department of Education and called for environmental literacy content standards, teacher training, assessments, as well as planning for future funding and support. While the legislation has yet to be enacted and federal funding is not available to support plan implementation at this time, their creation in various states have helped to develop robust partnerships, and in many cases, progress towards implementation. By promoting unifying goals and themes ELPs ensure that environmental education efforts are integrated and leveraged. As of October 2014, 29 states have completed ELPs and another 18 state plans are in drafting stages. Only three states have not begun the process. ELPs have also been implemented at the local level. In Virginia, for instance, a governor's recent executive order promotes ELPs for local education agencies.

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.

These plans ensure a thoughtful and committed pathway for programs to collaborate and mutually reinforce one another's programing. Most state environmental literacy plans promote a lifelong learning approach by weaving together in and after school experiences with opportunities for all ages, such as class curriculum requirements, master naturalist programs, and programs for seniors. Having specific roles for partners who are involved in the development of the plan allows organizations to focus on issues where they are experts. For instance one partner might engage the grass roots community activities, 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. They are a cost-effective way to encourage collaboration, filling the need for creating a shared vision and coordination of efforts between educational organizations state-wide. Prioritizing funding for states with adopted plans would encourage states to move forward and ensure partnerships with schools. Not only have ELPs been effective in states like Maryland, but continuing the work started with No Child Left Inside would utilize existing institutional frameworks. Many states would 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.

SUMMARY: Make completed Environmental Literacy Plans (ELPs), or similar guiding documents, a priority for NFWF funding or require that the work proposed in an application be consistent with existing ELPs.

Sustainability Programs in Higher Education

Higher education reaches older students and, as such, can foster 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 demonstrate 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 and Smith 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 and Smith 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 scientific 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; economics, sociology and psychology, for instance, might examine how to prompt pro-environmental behavior change.

MODEL PROGRAM: Higher Education

A model program for integrating environmental education in higher education is the service-learning Land Stewardship Program (LANDS), a partnership between the University of Vermont (UVM) and the Student Conservation Association (SCA). Through LANDS undergraduates partake in on-the-ground conservation service with land management agencies. Projects focus on natural and cultural resource inventory, mapping, report writing, public presentations, and engaging in place-based events with the local community. "*LANDS interns clearly respect the service they offer to the communities they serve. Through their knowledge, they inform us of the natural resources around us, and through this awareness, our community is better able to assess how to live more respectfully and sustainably amid these resources*." Christine Barnes, Vermont's Northfield Conservation Commission.

There are various ways environmental education could be integrated into college and university classrooms. These include:

o   Support for schools to enhance or develop environmental courses and majors in sustainability
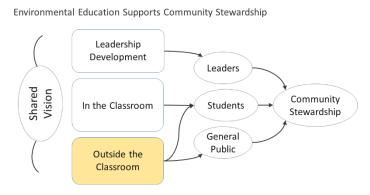
- Promote active-learning curriculum materials for bringing deep and systems-based interdisciplinary environmental education into existing science and social science classrooms
- Provide professional development for educators to give them the skills and confidence to implement new pedagogical approaches
- Offer conferences and symposia on environmental and conservation themes in 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. This approach is inherently broad and interdisciplinary.

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

C. Outside the Classroom

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 that impact the environment. As such citizens will be mostly responsible for addressing imminent environmental threats of today, and they learn about these issues through non-formal education.

Environmental Education Supports Community Stewardship

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 a 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) **Build Careers in Conservation**: *Out-of-school programs, internships, employment opportunities, and service-learning/conservation programs benefit participants by providing career-building experiences.*
2) **Educate the General Public:** *Non-formal education reaches diverse audiences of all ages, and often reinforce classroom learning for students.*

Build Careers in Conservation

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

Environmental internships and employment opportunities give interested youth a chance to explore the environmental field and develop a foundational interest in conservation professions. Young people can contribute meaningfully to a conservation cause. This not only benefits the environment, but builds young people's confidence in their own abilities to make a positive difference. Moreover, this type of experience provides skills and training to prepare the next generation of conservation professionals. For instance, students are exposed to career types, they get mentoring and networking opportunities, and they gain basic employment skills. Increasing the abundance and accessibility of these programs will increase the number and diversity of young people excited and prepared to enter environmental professions. Considering the participants who do not formally move into conservation careers, this type of work experience also increases the qualified volunteer-base of citizens with relevant skills and interests for contributing to conservation projects.

 SUMMARY: 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 base of learners of all ages.

Distinct from formal education (education in schools) and informal education (information communication), non-formal environmental education is both voluntary and organized. These programs can reach broad and unusual audiences, for instance bringing exciting natural experiences to urban settings (Bruni et al. 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 problems of the present.

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.

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 museum reach a wide and diverse range of audiences. Non-formal education can also be provided by community-based groups such as boys and girls clubs or churches. Finally, it may appear in the form of public radio shows,

MODEL PROGRAM:

Non-formal education programs can 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).

television programs, or be distributed through the internet (e.g., resources such as TED talks or YouTube channels). Many groups outside of the formal education system put environmental education as a central goal. 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 Falk et al. (2007) found that visitors strengthened environmental attitudes and values, reconsidered their role in environmental problems (gaining more personal responsibility), and experienced a stronger connection to nature (gain environmental sensitivity). Personal responsibility and environmental sensitivity, in particular, are variables which influence a person's conservation behavior.

These types of non-formal educational settings often partner with formal education to increase its effectiveness, for instance to serve as venues for field trips. Learning is most effective when lessons are supported multiple times and from multiple sources. Networks of out-of-school and in-school educators can reinforce each others' efforts to enhance student learning. For instance, activities outside the classroom can extend topics covered in a cursory fashion in school. Community educators often offer activities which are designed to align skills and content knowledge with formal education's curriculum standards and academic achievement tests (Monroe et al. 2013). In this way non-formal education can support formal education, and can be driven indirectly by curriculum standards.

SUMMARY: 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.
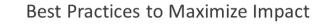
III) Best Practices

Environmental education and community stewardship programs impact people, communities, and ecology. Common metrics for measuring the diverse program outcomes include: learning gains (knowledge of issues and skills), emotional changes (increased sensitivity to the environment, positive attitudes, feelings of self-efficacy, and personal responsibility), and changes to people's context (developing social capital or changing social norms). Finally, these programs might change a person's intentions or behaviors. Evaluators measure both outputs and outcomes for a complete understanding of net program impact. Key to successful environmental education is promoting research-based best practices through professional development while building knowledge of what works and why through educational innovation and adaptive management. 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.
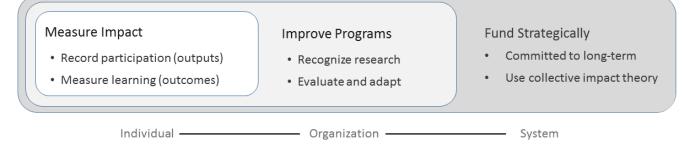
In this report, section I) Introduction examined how environmental education and community stewardship can contribute to NFWF's conservation goals. Section II) Community Collaboration focused more narrowly and explored the variety of environmental education programs which help support community stewardship. This section, Section III) Best Practices, is devoted to measuring and maximizing outcomes. We drill even more deeply into best practices for environmental education and community stewardship programing, from selecting evaluation metrics to designing funding strategies. To develop a strong environmental education and community stewardship program NFWF must select appropriate metrics for measuring program effects, support excellent education programs and educators, and develop an effective strategy for creating high-impact efforts. Therefore, Section III) Best Practices investigates best practices to A) measure impact, B) improve programs, and C) fund strategically, all towards maximizing program success.

Best Practices for Environmental Education and Community Stewardship

Best Practices to Maximize Impact

Measure Impact	Improve Programs	Fund Strategically
• Record participation (outputs) • Measure learning (outcomes)	• Recognize research • Evaluate and adapt	• Committed to long-term • Use collective impact theory

Individual ———————— Organization ———————— System

A. Measure Impact

How do we know if an educational program is working? A major factor that impedes funding of environmental education by foundations is the difficulty of measuring educational outcomes (Ardoin and Bower 2012). The methods for quantifying impacts from environmental education are still developing. However, a substantial and growing body of literature provides evidence of short term outcomes. For instance, research has shown how education programs can impact things such as individuals' stewardship skills (procedural knowledge) and belief that they can make a difference (self-efficacy). In turn, these variables impact peoples' stewardship behaviors. To measure these changes requires asking the right questions and implementing the correct assessment instruments. Moreover, overall impacts are quantified by combining measures of program participation (outputs) with evidence of individual learning or behavior change (outcomes). Programs may be interested in measuring learning outcomes, ecological impacts, and/or socioeconomic effects. Finally, funding agencies may consider evaluating all grantees with a common metric to synthesize portfolio impacts and compare grantee programs.

Evaluation in Environmental Education

Setting concrete and specific goals for program outcomes is vital to designing effective programs and proving an organization's impacts. In environmental education this is often done by reverse designing education programs from a desired outcome backwards to the necessary interventions using logic models.

Concrete Goals and Tailored Assessment Measures

"Saving the world" is a noble ambition, but it is also a cliché; as a goal it is both absurdly ambitious and so vague as to be meaningless. In contrast, environmental education programs are credible and effective if they state specific and achievable goals. Choosing the properly specific program aim(s), and metric(s) to evaluate it, is vital to finding significant outcomes. Big picture goals 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 'urban stewardship' might be captured through changes in participants' knowledge of how to landscape using native species. Some things to keep in mind when choosing goals is that they should be easily understood, valid and reliable, manageable, achievable but sufficiently ambitious to be meaningful, timely, measurable, and have specific targets in mind (STAC 2013). Depending on the targeted outcome, appropriate research methods must be selected.

In environmental education qualitative and quantitative research methods are diverse. The best evaluations in environmental education include rigorous study design and a variety of measurement methods. Experimental study design – baseline and post-intervention 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 only be obtained prior to intervention.

Qualitative research observes, describes, and interprets phenomena in natural settings. In environmental education common qualitative methods are useful for generating 'rich descriptions' to use in publicity materials (Denzin, 2011) or for early steps of evaluation, for instance in choosing research questions (Focht and Segovia 2014). Qualitative methods often include interviews, focus group discussions, and observational techniques as a witness or participant in activities (Kuna 2006), as well as concept mapping or examining case studies (Zint 2012). There is even an emergence of novel methods like analyzing children's drawings or social media posts as an assessment tool (Dentzau et al. 2014, Bowker 2007).

Quantitative methods require larger sample sizes and use systematic empirical measures, statistical techniques, and numerical data. In environmental education these might be skill- or knowledge-based performance tests or questionnaires which use numeric rating scales or multiple choice questions (Thompson and Hoffman 2015). Quantitative measurement methods could also include observations of changed behavior such as a decrease in a neighborhood's total energy use.

Increasingly quantitative and qualitative methods are being used in conjunction, called mixed methods, to reinforce each other (Coffman 2002; Kuna 2006). In environmental education evaluation with mixed methods, evaluators might examine outcomes using student surveys, teacher interviews, and classroom observations. This process is called *triangulation*. If multiple sources agree, the proof for an outcome is strong.

Adaptive Management Using Logic Models

Funders are now examining not only what education programs *do* but what changes those programs *make* in the world (National Council of Nonprofits 2013). Falk et al. (2009) explain 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," (p. 88). By evaluating programs we prove program outcomes to garner support, as well as learn what works and why (Paul and Byron 2014). Adaptive management through iterative assessment, reflection, improvements, and re-assessment uses evaluation results to guide improvements. In environmental education a vital part of adaptive evaluation is the *logic model*.

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 compilation of the best resources available on evaluation in the field, a step-by-step guide for planning and implementing evaluations, and a searchable database of evaluation reports from real-world programs. These reports are 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).

These models help in planning programs and are continually referenced, refined, and improved as programs develop.

Logic models are a graphic used to show relationships between a program's resources and the program's intended goal (Paul and Byron 2014). Thomas and Hoffman (2015) describe a logic model as 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*," (p. 15). Creating logic models with specific goals and metrics to measure them helps us overcome the challenges of overly generic goals. At the front of the model is the intervention, what a program *does*, and at the end is the outcome, what the program *changes.* This outcome is in the form of a specific goal with metrics to measure it. The middle shows, logically, the steps between the educational activity and a successful outcome. These models are developed by choosing a desired outcome, and then reverse engineering a series of steps to reach that goal.

Outputs verses Outcomes

There are two ways of looking at the final products of an environmental education program. The first is to measure immediate and tangible results such as participation. Many programs measure their success by answering questions such as: *How many professional development workshops were run? How many students have used the facility? How many years has the program been in operation?* Here we refer to these types of participation statistics as program *outputs*. Measuring outputs is certainly good record keeping and can show a program's scale and reach. On the other hand, outputs do not provide evidence that a program works at *teaching* or *changing* something.

MODEL PROGRAM: Evaluation

One model program for evaluation is the **National Oceanic and Atmospheric Administration (NOAA) Bay Watershed Education and Training (B-WET) program.** B-WET has excellent metrics for measuring learning and behavior outcomes. Through pre- and post-surveys the program measures changes in specific variables such as teachers' confidence in implementing watershed activities in the classroom and changes in students' attitudes towards watershed resources. Outputs, such as number of teachers and student reached, are also recorded. NOAA staff sample a subset of B-WET participants and then calibrate estimates of total program outcomes using participant counts to estimate total program impacts. A sample NOAA B-WET student questionnaire is available in Appendix 2 (NOAA). Rigorous outside evaluation of B-WET's program was positive, for instance, post intervention students scored significantly higher in five of eight characteristics linked to behavior change (Zint et al. 2014).

To assess how well a program is working we must gather evidence of how participants changed as a result. Paul and Byron (2014) explain that "outputs specifically show us how programs make a difference and whether things are better as a result of the environmental education program," (p. 6). On the other hand, programs might measure changes to participants by answering questions such as: *What did students learn about watersheds on this field trip? After a leadership workshop how confident are participating leaders in running public meetings? How do aquarium visitors intend to conserve water at home?* Here we call these measures of learning or behavior change *outcomes*. For an excellent model of

an assessment tool that measures student learning outcomes and changes in student attitudes see the NOAA B-WET questionnaire in Appendix 2.

Measures of outputs and outcomes are both vital to program evaluation because together they give a complete picture of program effects. Outputs tell us how many people participated. Outcomes tell us what, on average, participants learned. By calibrating both measures programs can make an informed estimate of their net impact, of which the NOAA B-Wet model, seen in the pull box above, provides a great example. For more examples of outputs verses outcomes see the Audubon Tools for Engagement: Outputs & Outcomes document in Appendix 3.

Metrics for Student Learning

To evaluate education we need to know both outputs, like how many people we are reaching, as well as outcomes, like how successfully we are changing attitudes. When relevant, assessment of learning should be complemented by evaluation of ecological and socioeconomic outcomes too.

What to Measure

What sorts of outcomes are expected for environmental education and community stewardship programs? In the report "Measuring Environmental Education Outcomes," Russ (2014) explains, "we define environmental education outcomes as any desired changes that result from environmental education programs and are intended to improve aspects of social-ecological systems, including human well-being," (p. 3). While conservation programs measure environmental goals, outcomes from an environmental education project might affect people, communities, organizations, or ecosystems. In the literature, outcomes have been oriented primarily around awareness, knowledge, attitudes, skills, and pro-environmental behaviors (Russ 2014). This ties closely to the Tbilisi definition of environmental education, which includes the same measures (UNESCO 1978) but describes pro-environmental behaviors as "participation." In both cases one might understand the first four outcomes as contributing factors towards an ultimate goal that learners will participate knowledgably in stewardship behaviors (Thomson et al. 2005). If the motivation behind environmental education programs is to prepare citizens for action on environmental issues, how can progress towards this goal be evaluated?

Changing Behavior

Behavior change is one of the most common goals of environmental education programs, especially when funded by conservation organizations (Heimlich 2010). Behavior change "refers to altering the voluntary actions of an individual or a community," (Meyers et al. 2014). Behavior change goals can be context-specific, such as a workshop for fisherman on how to adopt a new type of turtle-safe net, or these behaviors might be global skills, for instance, professional development on issue investigation. Proving an educational program helped to change behavior is challenging because the motivations and context of human behavior are so complex. Moreover, resulting behaviors may be greatly removed in time or space from the educational intervention. Sometimes it is possible to

physically measure the changes in behavior that result from an educational program. However, other times scholars measure changes to variables that have been theoretically and empirically linked to changes in behavior. For instance, instead of measuring the number of turtle-safe nets each fisherman installs over the next decade, at the end of the workshop a survey could be used to measure increases in knowledge of how to use turtle safe nets and of intentions to use them. Instead of measuring how many teachers implement issue investigation units in their classrooms, the organizers of the professional development seminar might measure teachers' confidence in implementing such programs.

There are a suite of variables that are linked to changes in human behavior. Participation in environmentally responsible behavior cannot be attributed to just 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. Historically, a simple model of behavior change predominated: Knowledge + Attitudes = Behavior. It is now known in the literature that reality is much more complex and that this is an overly simple and poor performing model (Monroe 2003, Heimlich and Ardoin 2008). However it's mentioned here because this misconception is still pervasive (Heimlich and Ardoin 2008).

Today, there are dozens of theoretical models proposing how various variables contribute to behavior change. 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). This model, available in Appendix 1, organizes these variables by defining a progression from entry-level variables, to ownership-developing variables, to variables which empower people to act, and finally to behavior change itself (Hungerford and Volk 1990). Other models group behavior change variables into cognitive (thinking), affective (feeling), or contextual categories (Hines et al 1987). While many concepts have different names in various publications, here we group and describe the most broadly recognized behavior change variables. These variables are all possible metrics to use in measuring environmental education and community stewardship outcomes.

Behavior Change Variables

Cognitive (knowledge)

Knowledge about Issues: *Knowledge about issues ranges from basic awareness that an environmental problem exists to a nuanced understanding of the physical, biological, and human systems involved.* An example of this type of knowledge would be a farmer's awareness that excess fertilizers cause nutrient pollution in nearby waters and thereby decrease fisheries. Knowledge about issues is perhaps the first thing that people associate with an environmental education program. While this type of knowledge is an important first step, simply understanding that there is a problem is not sufficient to cause people to act to change it.

Skills/Procedural Knowledge: *Procedural knowledge is understanding <u>how</u> to do something about a problem. This includes a person's understanding of alternatives, as well as their skill at performing stewardship behaviors.* An example of this is a farmer's knowledge of how to reduce nutrient pollution by rotationally planting or intercropping nitrogen-enhancing species, or how to test soil for limiting nutrients so as to apply only the needed type and amount of fertilizer. Sometimes called action skills, competency, or knowledge of action strategies, these types of practical how-to skills have been shown as predictive in differentiating stewards from non-stewards (DeYoung, 2000). Moreover, while learning about environmental problems can often be demoralizing, learning skills to help is often positive experience. As such, programs which teach skills should be a priority for funding.

Affective (feelings)

Environmental Sensitivity: *Environmental sensitivity is a measure of a person's empathetic perspective towards the environment, including the caring and concern felt for the natural world.* An example of this would be a participant's feelings of appreciation and connection to their watershed. Sometimes environmental *awareness* is used to describe this concept. Environmental sensitivity is often targeted by providing positive, extended, and first-hand nature exposure. In particular, it is a common goal of early elementary student programs since it is not developmentally appropriate to teach very young children about environmental tragedies (Sobel 1995). However, environmental sensitivity could be supported in learners of any age. For instance, environmental leaders often credit their stewardship interest to a perceived relationship with the environment built on significant nature experiences (Chawla 1998). Measuring the amount of nature exposure a program offers would be an important output, but an outcome from that program would be how it changed participants perception of, or relationship to, nature. Environmental sensitivity may manifest as concern for nature overall, or may be linked to investment in a particular landscape or issue. Programs which build environmental sensitivity should be a priority for funding, particularly if they link a community with local natural resources or develop a relationship between stakeholders and natural areas affected by NFWF conservation programs.

Attitudes: *An attitude refers to a person's general and enduring positive or negative feeling about an issue.* An example of a pro-environmental attitude would be a positive association with certified energy-efficient appliances. In environmental education attitudes are frequently targeted as an outcome; however, their strength to change behavior is questioned. There is a strong correlation between stewardship and pro-environmental attitudes, but that attitudes cause behavior change is contended (Heimlich and Ardoin 2008). Indeed, interventions which change attitudes about energy efficiency have resulted in no behavior change (Geller 1981), and groups which do and don't recycle have equally positive attitudes about it (DeYoung 1989). While attitudes may contribute as part of a suite of factors,

Skills/Procedural Knowledge: How comfortable would you feel facilitating a community meeting?

Code participant journals from a field research program for evidence of "designing solutions to a problem or issue," and note if participant noticed, analyzed, evaluated, develop action plans, or reflected on the theme.

Environmental Sensitivity: "When I'm outside I pay close attention to plants and animals," (rate level of agreement.)

Have students draw themselves in a wetland before and after a field trip to one, analyze drawings for changes in how the environment is depicted.

Attitudes: "It's important to pick up your trash," (rate level of agreement).

in general, attitudes alone are insufficient to change behavior (Monroe 2003). Overall, to insure effectiveness of investments, attitudes should not be the principle focus of a NFWF-funded behavior change program.

Locus of Control/Self-Efficacy: *Locus of control describes the degree to which individuals believe their personal actions can make a difference.* For example, people with an internal locus of control would believe in their ability to impact the climate through minimizing their carbon footprint. People with an external locus of control generally believe their efforts will not have an impact, that instead climate patterns are in the hands of nature, fate/chance, or powerful others such as corporations or government. Related is the idea of self-efficacy, which refers to confidence in one's abilities. Those with high self-efficacy believe they can motivate themselves, learn, and perform skills correctly, persist despite challenges, and accomplish their goals. Programs that target locus-of-control and self-efficacy, particularly by practicing stewardship skills or showing participants the positive outcomes of their actions, should be a high priority for funding.

Personal Responsibility*: Personal responsibility measures the sense of duty an individual feels towards stewardship.* Those who feel strong personal responsibility are generally aware of the consequences of their actions, and they often identify with an issue and develop a personal interest in solving it. However, since people have an inherent distaste for being controlled, this variable should be treated cautiously. If leaners feel pressured to think or believe a certain thing, they may emotionally disengage or even creatively misbehave, called *psychological reactance*, in order to maintain a sense of liberty (DeYoung 2000). Therefore for the highest likelihood of success, personal responsibility should be encouraged by developing a person's investment in, and showing an individual's impact on, a specific problem in a specific place.

Contextual (situation)

Situation: *Contextual factors can encourage stewardship or inhibit people from doing what they might otherwise do.* Common barriers to action include insufficient infrastructure, high costs, and limited time. Many contextual barriers are out of the control of environmental education programs. However understanding the perceived barriers to action (whether contextual, cognitive, or affective) is a fundamental first step to designing an effective behavior change strategy. Funding studies to identify barriers in a community where NFWF funds multiple projects could help to identify how to guide projects. For instance consider an educational goal of increased back-yard wildlife habitat in a community where the major perceived barrier to action is limited time. In this case convenient access to appropriate plants and providing skill-based workshops on low-maintenance yard care would be useful interventions.

Locus of Control: Select one of two answers for a series of questions like the one below: "a. One of the major reasons why the climate is changing is because people don't take enough interest in their carbon footprint.
b. The climate is going to keep changing, no matter how hard individual people try to prevent it."

Personal Responsibility: "Everyone should make time to learn about environmental issues and how to help solve them," (rate level of agreement.)

Situation: "Reasons I don't ride the bus are
a. It is too expensive
b. I don't know how
c. It takes too long
d. There is no bus route where I'm going
e. I own a car, so I don't need to take the bus"

Social Capital/Social Norms: Social context, including social capital and social norms, are specific contextual factors at the community-level that impact stewardship behavior.

Social capital is a term with many definitions, one of which is offered by Putnam (1995) as 'features of a social organization such as social networks… and social trust that facilitate coordination and cooperation for mutual benefit' (p. 67). Although in environmental education relevant assessment instruments are preliminary, Krasny et al. (2013) found an environmental education program affected students' social capital. Further research may look at environmental education and community stewardship program impacts on community-level social capital and from there explore how this could foster collective action to manage natural resources (Krasny et al. 2013). See Appendix 4 for examples of the assessment instrument Krasny et al. (2013) used to measure changes in social capital.

Social norms also influence people's stewardship behaviors. It is intrinsically motivating to participate as part of a group and contribute to a cause larger than one's self (DeYoung 2000). Cialdini (2003) found behavior is influenced by both ideas of what is socially expected (injunctive norms) and beliefs about what is commonplace (descriptive norms). Interestingly, descriptive norms can work in favor of an environmental behavior or against it; if people believe everyone else is recycling, they will be more likely to recycle too, but the same is true if people believe littering is commonplace (Cialdini 2003). Peoples' sensitivity to social norms is part of why community stewardship is such a key factor to conservation outcomes. By targeting cross-community engagement educational programs can contribute to a social norm for stewardship.

> **Social Capital:** "I would feel comfortable asking my neighbors for a favor," (rate level of agreement).
>
> **Social Norms:** Many people in my neighborhood litter," (rate level of agreement).
>
> **Intentions:** "I pledge to ride my bike instead of driving on ___ trips this week."
>
> **Behavior Change:** "In the last month I've used fertilizer on my lawn ___ times," (compare pre-post surveys).
>
> Observe composition of trash/recycling pre and post-recycling workshop at school.

Behavior Change Itself

Intentions: *Intentions describe a person's decision to engage in a future behavior.* Outside of observing the behavior directly, intentions are the single best predictor of whether a person will behave in a certain way; however, they do not always correlate with changed behavior when the time comes (Hungerford and Volk 1990; Zint 2002; Bamberg and Moser 2007). Despite imperfections as a predictor measuring intentions are often used as a proxy for behavior change in environmental education (Camargo and Shavelson 2009). This is mostly due to the difficulty in measuring behaviors, including costs, logistics, and time. Intentions are measured through self-reports and observations. Ways to collect self-reported data include surveys, interviews, and action pledges. Intentions can also be observed, for instance quantifying intentions to compost at home could be done by counting the number of home-composters purchased after a public workshop.

Behavior Change: *Behavior change describes the alterations to an individual's or a community's voluntary actions.* Ideally, if behaviors themselves can be observed unobtrusively, that provides the most compelling evidence of change (Camargo and Shavelson 2009). Meyer et al. (2014) explain that behavior change is measured either through observation or self-reports. An observation of behavior change could be measuring increases in the volume of curb side recycling, while measuring recycling

behavior through self-report would involve surveying residents about recycling habits (Meyers et al. 2014). While self-reports are often easier to collect, they are not entirely reliable.

Metrics for Nature, Not Just Learning

When environmental education or community stewardship programs expect to have direct environmental impacts, it is important to measure these ecological outcomes. Examples of hands-on programs likely to fit into this category are citizen science monitoring plans, school yard habitats, or service-learning restoration projects. Environmental education projects that include experiential learning components should include professional partnerships that provide both ecological and educational expertise. This is particularly important because ecological systems are extremely complex; restoration projects do not always result in positive changes (Alpert 2002) or are not fully measured for ecological outcomes (Alpert 2002; Hilderbrand et al. 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 (Wortley et al. 2013). When relevant, evaluating and quantifying both learning outcomes and ecological/socioeconomic outcomes would more fully capture the positive effects of NFWF's initiatives. Doing so will also collect evidence of the conservation value of these programs.

MODEL ASSESSMENT METHODS:
Ecological and Socioeconomic Outcomes

Invertebrate Indicators of Water Quality: Suppose an environmental education center teaches about river ecosystems by involving students in a riverbank vegetation restoration project. Evaluators could use aquatic invertebrate sampling as an assessment method to measure changes in ecological integrity. Healthy rivers support abundant and diverse insect communities, and certain insect species can only survive in high quality waters. By comparing the abundance, diversity, and environmental sensitivity of insects found both prior to and post restoration, and at a control site, researchers can ascertain changes in river health. Examining insect communities is a rapid, inexpensive, and easy method of assessing streams. Moreover, invertebrate sampling does not require extensive training or specialized equipment. Community members and students can meaningfully contribute to these monitoring efforts with only a small investment in training, tools, and professional guidance.

Travel Costs Analysis of Social Benefits: Suppose a class improves a local park as part of an environmental education unit. Travel cost analysis of park visitation is an assessment method that could measure the socioeconomic outcome of park improvements. Recreation is one of the most straightforward ecosystem services that natural areas provide. Travel cost analysis quantifies the value visitors place on a natural area by calculating the amount of money people spend in order to visit it. Travel costs might include transportation costs, park fees, money spent on activities, and includes a measure of opportunity costs (the cost of one's time that could be spent doing other things) by multiplying a wage rate by visit duration. This type of data is collected through surveys. The increase in park visitors following a park-improvement project multiplied by the average travel costs per capita allows for an estimate of the social benefits gained by the project.

Long- versus Short-Term Outcomes

What is a long time? When measuring program outcomes, the views on this question are extremely varied. McReynolds et al. (2014) explain that long-term outcomes "range from six months post-experience to forty-five years post-experience and everything in between" (p. 16). The line McReynolds et al. draw to partition the two is at one year post-experience. Short-term outcomes are generally used to quantify knowledge and skills gained. Short-term outcomes are less difficult and less expensive to acquire but are also less likely to relate to real behavior change. In contrast, long-term outcomes are often used to measure environmental literacy, environmental sensitivity, and behaviors. The largest challenge to long-term measurement is the problem of intervening experiences clouding validity of the data (McReynolds et al. 2014). For more examples of possible outcomes and assessment measures for short- and long-term studies, see Appendix 5. Leddicoat and Krasny (2013) analyzed long-term data from many environmental education studies and found that 'significant life experiences' and 'retrospective program evaluations' are two long-term evaluation methods that are increasingly supported by empirical research.

Portfolio-Wide Assessments

Rigorous program evaluations are difficult, expensive, and take expertise to conduct. For this reason some programs may choose to partner with an external evaluator, others can do internal evaluation. There are no hard and fast rules about what to measure, how much to evaluate or who evaluators should be. However NOAA has developed a pioneering system for evaluating their B-WET program grantees that might serve as an interesting model for the NFWF environmental education and community stewardship portfolio.

All NOAA's B-WET grantee organizations participate in data collection for NOAA's national B-WET evaluation. This allows NOAA to generate a large data set which is valuable for environmental education research broadly and for comparison across grantee programs. NOAA uses this data to adjust funding opportunities, improve programs, and document B-WET's value. An individual from each grantee organization completes a questionnaire one year post-award. Additionally, teachers who participate in NOAA B-WET related professional development complete online questionnaires both after the workshop, on *what* they learned, and after they teach their own students, on how they *applied* what they learned.

The B-WET national evaluation is meant to supplement evaluation on the project level, but not replace it. Grantees have access to their teachers' data, but they are still encouraged to supplement this with their own data tailored to their program's interests. For an anchor of appropriate expectations for evaluation costs, NOAA recommends that 10% of the grantees' budgets are allocated to evaluation. One thing the Administration does to lighten the burden on grantees is to provide a question bank for B-WET teachers to easily build their own assessments for testing their students' learning outcomes.

The national NOAA B-WET assessment collects data on grant implementation, as well as program outcomes. For implementation, NOAA evaluators consider how and to what extent grantees organizations implement programs that are in line with the B-WET portfolio's goal of meaningful watershed educational experiences. For outcomes, NOAA investigates both teachers' and students'

learning. They ask to what extent B-WET funded professional development increases teachers' knowledge of watershed issues, their confidence integrating what they learned in the classroom, and the likelihood that they will implement watershed activities in future classes. They also look at student outcomes such as knowledge gains, attitude changes, inquiry and stewardship skills (procedural knowledge), and aspirations to protect watersheds (environmental sensitivity). For more information on NOAA's B-WET evaluation model visit www.oesd.noaa.gov/grants/bwet_eval.php (NOAA 2015).

NFWF could develop a national evaluation model based on the B-WET example. The Foundation could group similar grantees and use common evaluation instruments to conduct consistent measurement across the country. This would allow estimates of net portfolio impacts and make possible comparison across grantee organizations' outcomes. As NOAA does, a national evaluation project might use a broad survey instrument to assess implementation and learning outcomes for educators/project leaders as well as students/participants. Divergent from NOAA's model, instead of investigating changes to attitudes, which are doubted to cause behavior change, NFWF might explore changes in participant behavior change intentions or in perception of community social norms. Moreover, NFWF might include metric(s) to quantify ecological/socioeconomic outcomes as well as learning outcomes.

Impact Measurement Appendices:

- Appendix 1 – A "Environmental Citizenship and Behavior Change Model" by Hungerford and Volk (1990)
- Appendix 2 – A sample student questionnaire from NOAA's B-WET program
- Appendix 3 – "Tools for Engagement: Outputs & Outcomes" from Audubon
- Appendix 4 – A sample questionnaire to measure a program's impact on students' social capital by Krasny et al. (2013)
- Appendix 5 - Tables showing short- and long-term educational outcomes with recommended measurement methods by McReynolds et al. (2014)

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

i. ***Develop and require specific metrics*** for evaluating program success.
ii. ***Support necessary partnerships*** in education programs to provide educational, ecological, and even socioeconomic expertise.
iii. ***Require evaluation*** and create a national assessment instrument to measure outcomes consistently across grantees organizations.
iv. ***Ensure that grant reviewers are knowledgeable*** about research findings and evaluation practices.

B. Improve Programs

By taking into account the literature on effective environmental education strategies, NFWF can select programs with the greatest chance for success to include in a funding portfolio, as well as improve their existing

Best Practices to Maximize Impact

Measure Impact | Improve Programs | Fund Strategically

Individual → Organization → System

projects. Professional development facilitates the transfer of knowledge from academia to on-the-ground instructors and program leaders, while experimentation and evaluation of innovative educational strategies grows our understanding of what works and why.

Features of Effective Programs

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. Best practices for other types of programs could be found by reviewing relevant research syntheses such as Smith (2012) on place-based education, Minner et al. (2010) on inquiry-based science education, or Fishman and Davis (2006) on professional development for science teachers (Zint et al. 2011).

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 the guidelines' claims, as well as proffered ideas 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 et al. 2001), the "Guidelines for Excellence" offer a good set of criteria for deciding on quality.

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. Stern (2014) conducted another synthesis review of 66 research articles on the same topic, from which he identifies lessons about promising approaches. Both reviews found similar themes, including an emphasis on experiential learning. Below, their conclusions are synthesized into a research-validated summary of best practices.

Best Practices for Student Learning and Behavior Change

- o **Clearly defined behavior change goals**: Design programs with clear goals (Zint 2012; Stern 2014), and base these goals on behavioral theories and models (Zint 2012).

- o **Experiential approaches:** Programs should implement "active experiential engagement in real-world environmental problems," including project-based approaches, active discussion, or issue-based investigation, preferably including participation by communities facing environmental issues (Stern 2014), or involving service-learning and field trips (Zint 2012). Students often make emotional connections to conservation through experiences outdoors or in the community (Stern 2014).

- o **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).

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

- o **Address student needs, context, and background:** Programs should take into account the unique characteristics of their audience, including students' 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).

Outdoor Education

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

Best Practices for Outdoor Education

- o **Offer frequent experiences**: Start in early childhood and continue through grade-school (Dillon et al. 2007). Starting young may be important since one study suggests younger (secondary) students are more likely to change their behaviors (Powers 2004).

- o **Prioritize extended experiences:** Longer programs have greater impacts (Dillon 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 outdoor experiences (Ballantyne and Packer 2002) and follow-up work solidifies learning (Orion and Hofstein 1994).

- o **Encourage role models:** When students develop role models, programs are effective (Dillon 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 strong (Stern et al. 2008).

- o **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 (Dillon et al. 2007).

- o **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). In particular, exposing children to environmental tragedies too young, before about fourth grade, is damaging rather than helpful (Sobel 1995).

Conservation Leadership

Shirberg and MacDonald (2013) analyzed publications on conservation leadership programs. They compiled materials from 50 organizations and interviews with 20 program directors. Several familiar trends emerged, including the benefits of 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 list of the best practices the authors recommend is given below.

Best practices for Leadership Development

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

Innovative Methods

While recognizing literature-based best practices, it is also important to continue to test novel strategies in order to expand our understanding of effective programing. NFWF is "dedicated to achieving maximum conservation impact by developing and applying best practices and innovative methods for measurable outcomes," (NFWF 2015). In the spirit of this goal, it is important to incorporate experimental and innovative program designs to diversity the conservation portfolio. In doing so, it is important to make sure pilot programs are not repeating ineffective strategies due to ignorance of the research. Through adaptive management and evaluation we continually improve our understanding of what constitute best practices, allowing the field to move forward as creative solutions and new methods are constantly discovered and refined.

Professional Development

Research papers filed into academic archives do little to change education on the ground. The way to implement best practices is through professional development. 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

"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, University of Michigan

students and to evaluate program outputs and outcomes. A large part of doing this is training educators about best practices and helping instructors practice applying them, while also providing assistance designing evaluation strategies. The best way to do this is through professional development workshops.

SUMMARY: Several things will maximize the effectiveness of environmental education programs.

i. ***Understand and prioritize best practices*** when selecting environmental education programs for funding or when improving NFWF's own programs, while also allowing space for experimentation with innovative methods.
ii. ***Support professional development*** to aid educators in implementing best practices.

C. Fund Strategically

Best Practices to Maximize Impact

Measure Impact | Improve Programs | Fund Strategically

Individual → Organization → System

How do funders have the greatest impact? If NFWF decides gathering evidence *of significant change in human behavior and ecological 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; a person's relationships with nature and collaborator's relationships with each other are no different. Students need repeated experiences in nature in order to develop an enduring connection, and 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 an educational program or community over time 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 rare compared to short-term data. Most evaluations of environmental education programs are short-term, less than one year, post intervention. However short-term 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). The challenges to long-term studies are the impacts of intervening experiences on participant behaviors, difficulty of reaching participants, delay in seeing results, and associated higher costs. As such long-term studies often require partnerships with an outside evaluator to bring in required expertise.

SUMMARY: NFWF should allocate a portion of funding to support 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 spreads efforts so thinly that it is impossible to measure significant outcomes. Instead, by investing deeply in targeted communities we can produce measurable outcomes, which proves the value of invested inputs and demonstrates that environmental education and community stewardship programs can catalyze 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 projects 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.

"If funders need to prove *their impacts, they will need to* focus *their efforts."*

– Martha Monroe, University of Florida

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). These issues 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. Afterall, repeated experiences lead to greater impacts. These successes will validate NFWF efforts, lead the field in innovative programing, and demonstrate the possibilities for catalyzing measurable change.

SUMMARY: 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.

Lessons from Collective Impact

Collective impact offers NFWF an opportunity to play a novel and powerful role as a grant maker by supporting or providing backbone support-organizations to leverage and adaptively lead collaborations.

Kania and Kramer (2011) explain a new framework for collaborative, community-wide efforts to generate social change called collective impact. Collective impact is built on several guiding tenants. The first is a *common agenda*. This uniting vision organizes and guides partners, a role similar to that which

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. Moreover, the philosophy emphasizes smart, effective, synergetic partnerships through *continuous communication* and *mutually reinforcing activities*.

The most unique and important aspect of collective impact is the inclusion of a *backbone support organization*. Kania and Kramer (2011) explain "collaboration takes time, and none of the participating organizations has any to spare. The expectation that collaboration can occur without supporting infrastructure is one of the most frequent reasons why it fails," (p. 40). Thus, the backbone support organization provides the infrastructure for adaptive leadership. For instance, it frames opportunities and challenges, collects and reports data, focuses attention and creates a sense of urgency towards a shared vision, and at times mediates conflicts among stakeholders.

Backbone support organizations provide 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, or providing, backbone organizations to facilitate these partnerships NFWF could generate cross-sector coalitions that thrive. This is a unique opportunity for NFWF as a funder to provide a badly needed service that would leverage incredible amounts of existing effort. 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 the case of Strive, highlighted in the pull box to the right. Strive is a collective impact effort for improved education in Cincinnati, where over 300 local organizations' efforts were facilitated by a backbone organization of only three staff members, a project manager, a data manager, and a facilitator. By supporting backbone organizations, which enable collective impact efforts, NFWF would leverage millions or even billions of dollars of existing investments.

MODEL PROGRAM: Strive

The power of collective impact is evident in the unprecedented success of Strive, a Cincinnati nonprofit with the aim of improving every stage of public education from "cradle to career." The program brought together community leaders, who set-aside individual agendas to support a collective approach. Together these leaders unified the city, soliciting participation from leaders of 300 local organizations from heads of corporate foundations to city officials. Using the collective impact philosophy, Strive partners have produced unprecedented advances for education. Despite the recession and budget cuts, in just four years student success improved in 34 of 53 success indicators, including graduation rates as well as fourth grade reading and math scores (Kania and Kramer 2001).

SUMMARY: Promote the five lessons of collective impact within NFWF current and future grant making, in particular, support or provide a backbone support organization to facilitate community-wide collaborations.

IV) NFWF's Existing Programs

Expanded Programs

As it stands, the majority of grant applications funded under NFWF's two community stewardship programs, Five Star & Urban Waters and Wells Fargo, do not have a specific environmental education component, goals, or outcomes. NFWF should establish environmental education a priority consideration and goal in the community stewardship grant portfolio. These programs should serve the needs of a broad range of community-wide audiences, but also 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 provide efficacy-building, real-world opportunities for participants, and meaningful conservation outcomes for the environment. Finally, expand the NFWF Community Stewardship Team and their resources to allow for the implementation of White Paper and Advisory Committee recommendations.

SUMMARY: Increase resources for existing programs and the 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 organizations, 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 environmental education research and program evaluation.
4) **Practitioners:** Include practitioners for on-the-ground expertise.
5) **Formal Education Partners:** Include representatives of progressive school systems, academic officers or principals.

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.

SUMMARY: 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, p. 162). 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. Local communities influence the outcome of conservation projects, just as the conservation projects directly impact these communities. By incorporating an environmental education aspect or targeted outreach strategy into conservation programs, NFWF can reach out to and capitalize on these programs to bolster community support for landscape-scale conservation. This community connection will decrease the likelihood that citizens will undermine conservation efforts.

More importantly, this will increase the probability that locals will be an asset to projects and provide support for future conservation initiatives. In particular, educational programs that are integrated into conservation business plans should target audiences whose behavior has the greatest impact on the species or resource of interest. For instance, when dealing with issues of sand dune shoreline erosion, directing educational initiatives towards beachgoers and waterfront property owners is efficient. By supporting conservation activities, the local community can help ensure the long-term sustainability of a conservation outcome, even after a conservation program has formally ended.

Each landscape conservation program has a business plan which provides a clear strategy for program success. The plans outline the program's goals, highlight priority actions for 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 or targeted outreach strategies into NFWF's landscape conservation programs. 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. 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 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.

SUMMARY: 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 support conservation initiatives.

V) Recommendations

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

<div align="right">

– Jason Morris, Acting CEO, NatureBridge

</div>

There are a plethora of worthy and important environmental education and community stewardship strategies, yet funding is always limited. We have considered the connections between education, community, and conservation, surveyed the variety of program designs, and provided guidance on the best practices for achieving results. Based on all of this research, and in light of the advice of experts across the field, here are the most effective strategies NFWF can pursue to strengthen and expand their environmental education and community stewardship investments.

Recommendations for Future NFWF Investments

1) **Establish a People Engaged in Conservation Portfolio:** Compose a portfolio of environmental education and community stewardship grant programs that complement and reinforce one another to support the Foundation's mission. In addition to existing NFWF grant programs, include new additions which reflect the portfolio recommendations on page 42.

2) **Increase Funding:** NFWF should seek to raise funding for the People Engaged in Conservation Portfolio from the current $3 million per year to $10 million per year by fiscal year 2019. With this funding NFWF can provide the resources necessary to implement programs successfully, and the Foundation can also steer existing funders to support more impactful programs in these areas. With this financial infusion, NFWF will be one the largest funders of environmental education and community stewardship in the nation. This will help to direct and drive the agenda nationally and will also generate new partnerships.

3) **Evaluate Impacts:** Apply best practices to set program goals and measure progress towards them. Using appropriate metrics, evaluate behavior change outcomes and ecological impacts, then combine these with measures of participation to assess net program effects, as done by NOAA's B-Wet program. Support professional development to aid instructor adoption of research-based best practices. Use best practices when selecting proposals for funding support and when improving existing NFWF programs.

4) **Focus Investments:** Design the portfolio for long-term, cross-community engagement in a few targeted communities or landscapes where multiple educational initiatives can collaborate collectively to produce significant, measurable change in learning and conservation outcomes. NFWF should either fund, or themselves provide, a backbone support organization to facilitate these collective efforts.

5) **Expand Existing Programs:** Increase resources for existing programs and for a community stewardship team to expand existing programs' reach. Offer more career-building experiences, emphasize opportunities with conservation outputs, and increase participant diversity.

6) **Form an Advisory Committee:** Include on the committee 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.

7) **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 local support for conservation initiatives.

People Engaged in Conservation Portfolio Recommendations

LEADERSHIP

> **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.

> **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.

IN THE CLASSROOM

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

> **Connect with Higher Education:** Support interdisciplinary sustainability courses and active-learning curriculum development, partner with higher education institutions for evaluation assistance, and increase professional development to support educators.

OUTSIDE THE CLASSROOM

> **Provide Career-Building Experiences:** Support internship and conservation corps opportunities for young adults to participate meaningfully in conservation work, gain relevant job skills and experience, as well as benefit from mentorship and networking with field professionals.

> **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.

FACILITATION

> **Prioritize Environmental Literacy Plans:** Make Environmental Literacy Plans (ELPs), or similar guiding documents, a priority for NFWF funding at the community, state or landscape scales.

> **Support Backbone Organizations:** Support or provide backbone organizations to coordinate efforts on a local scale and provide the consistent support collaborations need to thrive.

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 and leaders 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

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.

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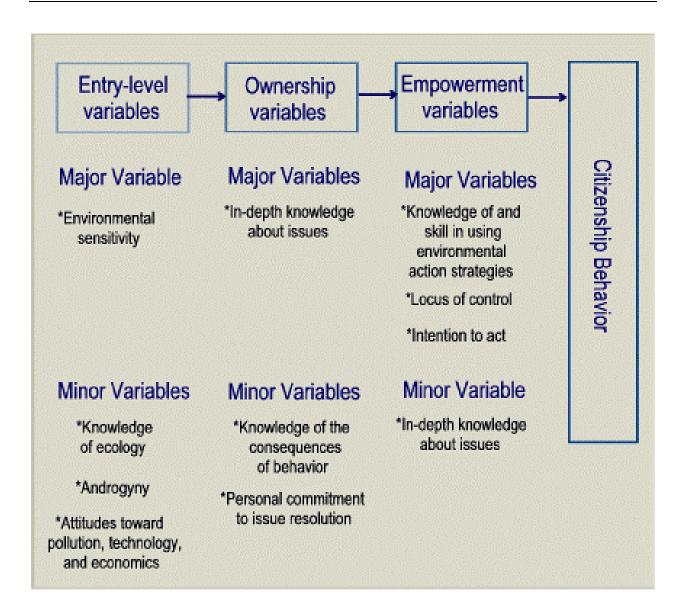
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Appendices

Appendix 1 –
Hungerford and Volk's *Environmental Citizenship and Behavior Change Model*

Appendix 2 –
A Sample Student Questionnaire from NOAA's B-WET Program

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?

	No	Yes	Don't know
The red school building	○	○ [correct answer]	○
The farm	○	○ [correct answer]	○
The city	○	○ [correct answer]	○
The small creek on the right	○	○ [correct answer]	○

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?

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
I like to learn about a local body of water	○	○	○	○	○
I search for information to learn about a local body of water	○	○	○	○	○
I want to explore a local body of water	○	○	○	○	○
I care about a local body of water	○	○	○	○	○

[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…"

	I know how to…					Within the next year, I plan to …		
	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	No	Yes	Not sure
Help clean up or take care of a local stream, river, or beach	○	○	○	○	○	○	○	○
Participate in a restoration activity such as planting trees or removing invasive plants	○	○	○	○	○	○	○	○
Tell others about ways they can protect a local body of water	○	○	○	○	○	○	○	○
Create a schoolyard or backyard habitat	○	○	○	○	○	○	○	○
Conserve water at home or school	○	○	○	○	○	○	○	○
Install a rain barrel at home	○	○	○	○	○	○	○	○
Give a presentation about a local body of water	○	○	○	○	○	○	○	○

[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 – Krasny et al. (2012) Social Capital Survey Questions (Adapted for Youth and Environmental Education from the National Benchmark Survey)

Social capital constructs, and survey items

Social Trust
Please indicate the level of your agreement with these statements about your relationships with other people in your community: (from 1 = strongly disagree to 5 = strongly agree)
   (1) In general, I can trust most people.
   (2) I do not trust people in my neighborhood. [reverse coded]
   (3) I trust people I go to school with.
   (4) I trust people I hang out with.
   (5) I do not trust the police in my neighborhood. [reverse coded]

Informal Socializing
How often do you… (from 1 = never to 5 = very often)
   (1) Have friends over to your home?
   (2) Attend a celebration, parade, or art event in your community?
   (3) Attend a local sports event in your community?
   (4) Visit relatives in person or have them come visit you?
   (5) Hang out with friends at a park, shopping mall, or other public place?

Diversity of Friendship
Please check all that apply to you: (1 = yes, 0 = no)
   (1) I have close friends that are all ages, not just my age
   (2) I have close friends who are other races than me
   (3) I have close friends who have other favorite interests than me
   (4) I have other close friends who go to other schools than me
   (5) I have close friends who are from other countries
   (6) I have close friends whose families have more money or less money than my family

Associational Involvement
In what kinds of education programs do you currently participate? (Check all that apply to you) (1 = yes, 0 = no)
   (1) An after-school program
   (2) A youth club such as a Boys and Girls Club, Scouts, or a 4-H club
   (3) A community service club

   (4) A band, orchestra, or choir
   (5) A sports team
   (6) Another club or organization

Civic Leadership
Check all that apply to you: (1 = yes, 0 = no)
   (1) I am on student council or student government
   (2) I am on a planning team for a school organization
   (3) I am a class officer
   (4) I am an officer of a club
   (5) I am a team captain of a sports team

Appendix 5 – McReynolds et al. (2014) Short- and Long-Term Educational Outcomes with Possible Measurement Methods

Table 1. Selected short-term environmental education outcomes with possible measurement methods.

Component of environmental literacy	Example short-term environmental education outcomes	Possible measurement methods
Knowledge	Local ecological community	• Pre/post-test, using the same questions
	Where food comes from	• Verbal quiz, using show of hands or thumbs-up, thumbs down
	Criteria for determining stream health	• Ticket out the door—participants answer a prompt on a slip of paper and hand it in as they leave
Skills	Think critically	• Mind mapping—participants individually complete a mind map; can edit with the group to delete misinformation or add new information
	Identify and remove invasive plants	
Attitudes	Interest in science class	• Surveys • Participant interviews
	Enthusiasm for a field trip	• "Voting" by putting a token in a box
Behaviors	Help with a citizen science program	• Social media, such as Facebook or Instagram (unstructured, but can have unexpected results)
	Recycling or composting	• Snapshot assessment (see the case study below)
	Stop using plastic bottled water	• Participant observation

Table 2. Selected long-term environmental education outcomes with possible measurement methods.

Component of environmental literacy	Example long-term environmental education outcomes	Possible measurement methods
Knowledge	Natural resource issues	• Surveys • Participant interviews • Snapshot assessment (see the case study) • Significant Life Experience studies • Retrospective interviews about specific events • Participant memory studies • Mapping general trends such as numbers of science major graduates/career choices
	Naturalist skills	
	Criteria for determining stream health	
Skills	Responsible voting	
	Ecosystem restoration	
	Ability to analyze information	
Attitudes	Pursue a science career	
	Nurture enjoyment of public land in others	
Behaviors	Become a citizen scientist	
	Lead recycling or composting program	
	Minimize dependence on fossil fuels	

*case study is available in McReynolds et al (2014). "Short-term versus long-term outcome measurement:" Measuring environmental education outcomes. Russ A. (Ed.) (2014). Ithaca, NY and Washington, DC: EE Capacity project, Cornell University.