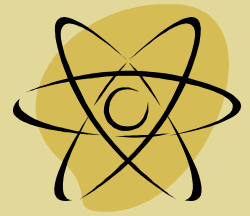




NWF Programs Support U.S. Science, Technology, Engineering and Mathematics (STEM)



Though not alone in this crowded field, the National Wildlife Federation has many programs (direct, online, and through policy reforms) that are particularly effective at advancing state and national goals to increase Science, Technology, Engineering and Mathematics (STEM) education in America.

STEM education is needed to provide our nation with intellectual capital such as scientists and engineers who will continue the research and development central to the economic growth of our country, technologically proficient workers who are capable of dealing with the demands of a high-technology workforce, and scientifically literate voters and citizens who make intelligent decisions about public policy and understand the world around them. There is no question that environmental education is a significant and useful tool for advancing STEM education in the U.S. The forward movement of green technologies and natural resource management will quickly elevate this to a national imperative.

U.S. STEM programming has three basic goals:

1. *Increase America's talent pool by improving K-12 science and mathematics education;*

Supportive NWF work:

Schoolyard Habitats (and curricula) (www.nwf.org/schoolyard) offer a rich and memorable



science learning environment for K-12 students. National Wildlife Federation has certified schoolyard wildlife habitats in more than 3,400 U.S. schools and helped create garden plots in thousands more. The use of schoolyard habitats as outdoor classrooms has been shown to improve student performance, especially among students who are from minority ethnic groups and/or under-resourced communities. Research shows that schoolyard habitats and similar outdoor classrooms support learning in three ways:

- Hands-on learning and student-led investigation leads to academic improvement and higher standardized test scores in reading, mathematics, science and problem solving.¹
- Under-resourced and struggling students find renewed support and confidence, often coming farther up the achievement ladder than better-resourced or excelling students.²
- The NWF Schoolyard Habitat program has been shown through a controlled study conducted in 2004 to have improved fourth-grade students' math scores in selected schools in Houston Independent School District (HISD).³

Today, school district-wide NWF Schoolyard Habitat Programs are underway in Houston, Texas; Chicago, Illinois; and Broward County / Fort Lauderdale, Florida. Although the NWF Schoolyard Habitat program is free-standing, it is also being integrated as a useful component of NWF's new Eco-Schools USA program.

¹ *Closing the Achievement Gap: Environment as an Integrating Context*, Lieberman & Hoody, 1998; and *Environment-based Education: Creating High Performance Schools and Students*, NEETF, 2000.

² *Effects of Outdoor Education Programs for Children in California*, American Institutes of Research, 2005; and *National Wildlife Federation's Schoolyard Habitat Program: Houston Independent School District*, Danforth, 2005.

³ Danforth, P.E., Waliczek, T.M., S.M., and Zajicek, J.M., *The Effect of the National Wildlife Federation's Schoolyard Habitat Program on Fourth Grade Students' Standardized Test Scores*. *HortTechnology*, July-September, 2008.



Eco-Schools USA (www.eco-schoolsusa.org) NWF was selected in late 2008 as the U.S. host organization for the international Eco-Schools program that has been implemented in 47 countries and over 30,000 K-12 schools over the last fifteen years. The Eco-Schools program supports K-12 integration of science, math and environmental science education into American education through a mix of practicum and curricular activities. This program advances K-12 environmental and science-based education throughout the world

by (1) encouraging children and youth to take an active role in the effective environmental management of their school, and (2) learning more about critical environmental issues and how the decisions they make today can affect their future.



K-12 schools in the United States can play an important role in fostering environmental stewardship and preparing students for the emerging green economy. As places of learning, schools are ideally positioned to serve as key “laboratories” where teachers, administrators, parents, and community members can jointly help students better

understand the impacts of human behavior on the Earth, and educate them on solutions. School buildings and the school grounds both offer under-utilized, hands-on opportunities to advance STEM learning by (a) engaging younger children’s fascination with wildlife as a way to capture and secure an enduring interest in science, and (b) using the energy, water, and carbon footprint aspects of buildings and school grounds as educational tools for older (middle and high school) students.

During the past decade, a series of peer-reviewed studies examined hands-on environment-based education to determine how it affects student behavior, motivation to learn, and actual academic achievement. The findings were extremely positive in all three areas. More specific findings showed that environment-based education:

- measurably **improves class performance** in science, math, social studies, and nonfiction reading,
- measurably **improves performance on statewide standardized tests**, particularly those of students from diverse racial and cultural backgrounds,
- is an excellent platform for **inquiry-based science** learning,
- provides science learning opportunities in a relevant, **real-world context**, and
- fosters a **lifelong connection to nature** that sustains young people mentally and spiritually.

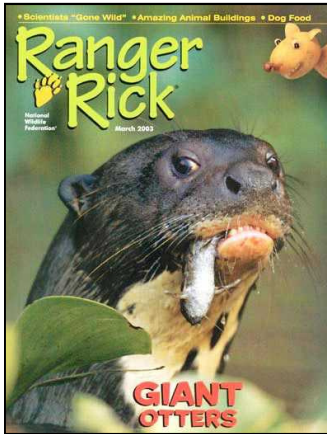
In addition, a 2007 study of Eco-Schools in the United Kingdom assessed by an independent evaluator, found that 85 percent of schools agreed that children learned new skills from this program with regards to protecting the environment.



Teachers from the Maryland Green School Program, a program similar to Eco-Schools, repeatedly reported that student interest in learning increased when they engaged in authentic environmental investigations on school grounds and in their community.

Statewide test scores rose, too. Maryland Green Schools had a 5.7% higher average number of students scoring in the excellent range on MSA 5th grade reading scores than non-green schools, and a 9.9% higher average of 8th grade students scoring in the excellent reading ranges. 8th grade Maryland Green School students had 5.1% higher averages in mathematics than non-green schools.

~ Maryland Association of Environmental Outdoor Education



Ranger Rick Magazine encourages young people to read (and enjoy) non-fiction -- an essential for future success in science and technology. There is a huge gap in non-fiction reading skill of "informational literacy" in America. *Ranger Rick* is used in many state-wide reading tests and in many classrooms to provide informational, non-narrative instruction.

Larger-scale research has suggested the value of informational reading experience for overall reading development. Nell K. Duke, assistant professor of teacher education at Michigan State University, and Linda J. Caswell, a

doctoral candidate in the Program in Language and Literacy at the Harvard Graduate School of Education found that two boys featured in their research paper both struggled with reading when they were taught with narrative texts, but as the use of expository texts were increased in their lessons, they made great improvement.

Upon further examination, the researchers found that the boys' enthusiasm was mainly for topics that are most often covered in information books, such as space, dinosaurs, and volcanoes. When given the opportunity to choose books, whether at home, at school, or in the library, they both gravitated toward non-narrative forms, even when narratives involving the same topic were available. They became more involved with their lessons through activities such as reading instructions for science experiments and searching texts for desired information.

CASE STUDY:

K. Mohr (2003) researched the book preferences of 190+ first-grade children in north Texas.

- Seven picture books to choose from: narrative, information, poetry, Spanish, Hispanic Characters, English, & English Characters.
- Over 84% of ALL children chose the informational book, *Animals Nobody Loves*.
- Mohr commented, young children seem to see books as "windows to their world rather than as mirrors of themselves."

Mohr, K. A. J. (2003). "Children's Choices: A Comparison of Book Preferences Between Hispanic and Non-Hispanic First-Graders." Reading Psychology: An International Quarterly, 24(2), 163-176.

- **86%** of texts read by adults are informational (Duke, 2000, Duke, Bennett-Armistead, & Roberts, 2002).
- **50-85%** of test items use informational text (Calkins, et. al., 1998).
- A major criticism of elementary literacy instruction is that it is much too filled with narratives. The obvious omission is expository text, with many calls for increased teaching of expository comprehension (Pressley, 2002).

Caswell, L.J. and Duke, N.K., "Non-Narrative as a Catalyst for Literacy Development," *Language Arts*, February 1998, Vol. 75, No.2, pp. 108-117.



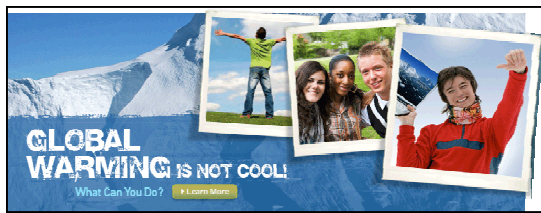


NWF's **Climate Classroom** website, www.climateclassroom.org, supports the development and growth of climate education in American schools. NWF has pioneered environ-

mental education to help connect people with nature and protect species. NWF is at the forefront of raising awareness about the threat to people, wildlife, and habitat from climate change.

With a commitment to creating age and developmentally appropriate curricula, NWF educates students about the causes of and remedies for global warming through our *Climate Classroom* website.

For elementary school students, NWF partnered with Howard Ruby, a nature photographer and Chairman of Oakwood Worldwide to create the Climate Classroom for kids (www.climateclassroomkids.org). Using nature photography as well as teacher and parent resources, this site provides education through games, quizzes, and wildlife galleries.



For middle and high school students, NWF partnered with the makers of the award-winning film, *An Inconvenient Truth* (AIT), to bring the issue of climate change from the big screen to the classroom. This curriculum and associated activities are unique because they:

- Use current environmental education materials to get compelling science instruction into classrooms;
- Offer tailored and age appropriate contents for all ages and levels of development; and
- Offer educators a way to connect with students using activity-oriented lessons and projects.

Climate Classroom educational materials follow the NWF and North American Association for Environmental Education (NAAEE) Guidelines for K-12 Climate Change Education to ensure that the materials on global climate change are:

- Fairly and accurately presented
- Developmentally appropriate
- Instructionally sound
- Easy to use in the classroom
- Action-oriented and supportive of lifelong learning.



In addition, *Climate Classroom* and the high school curriculum have a section devoted to careers oriented around the environment and the new green economy. The wide range of careers focused on the environment is due in part because the environment impacts nearly all aspects of our lives. We provide a guide designed to help students get oriented to the environment and wildlife protection in all areas of life – now and for the future. The guide also provides information on the variety of careers that are available, as well as tips on how to match skills and interests with those careers.



U.S. STEM programming has three basic goals (continued):

2. Strengthen the skills of teachers through additional training in science, math and technology;

Supportive NWF work:



- **Teacher Training:** NWF is a key supporter of federal funding for the EETAP (Environmental Education and Training) Program under EPA's National Environmental Education Act (NEEA) which is the major environmental educator training and development program in the U.S.

- **Appropriations:** NWF is a key supporter of increased climate education and educator funding at NOAA, NASA, EPA and NSF. As our nation moves towards a clean energy economy and creates new "green jobs," we must ensure that our education infrastructure keeps pace. NWF believes that we must have an environmentally literate citizenry that has the knowledge to find new and innovative solutions to protect our planet. In addition, these educational programs help to establish new partnerships that deliver educational materials to thousands of teachers and students.



- **Green Jobs Training:** NWF's new green jobs training program likewise has an educator training component. This program will help America's community colleges to become the nation's most dependable hubs for green collar job training, unemployed worker/employee re-training and green workforce development. Community colleges are well-suited to reach and educate diverse populations and provide them with opportunities to participate in the emerging green economy with well-paying jobs. NWF is also helping to lead the charge for passage of the Community College Energy Training Act to provide \$500 million over five years for green jobs education and training at community colleges.

- **Educator Professional Development:** NWF's Schoolyard Habitats and Eco-Schools USA programs both offer professional development opportunities for educators to become proficient in performing environmental assessments utilizing technology and tools, as well as increasing their own science knowledge on pertinent environmental issues such as climate change, energy efficiency, and water use.



3. Enlarge the pipeline of students prepared to enter college and graduate with STEM degrees.

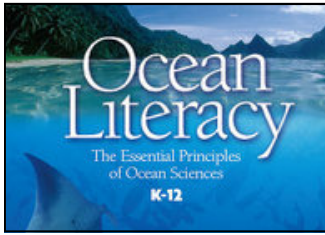
Supportive NWF work:



- **No Child Left Inside (NCLI) Act:** NWF is working to pass the NCLI Act which would expand the amount of environmental education in American schools and make it available to more students by providing \$500 million over five years to states for teacher training and expanding environmental education programs

- **Careers in Natural Resources:** NWF is supporting the Department of the Interior's Youth Office to encourage students to pursue natural resource and science careers. NWF led an organizational sign-on letter to Congress and succeeded in getting \$20 million in new funding for the Youth Careers in Nature program that was requested in the President's budget. The letter closed with the signatures of 145 conservation, youth, community service, education and hunting and angling groups.





- **Ocean Literacy:** NWF helps lead the coalition to pass the Ocean, Coastal and Watershed Education Act which enable's NOAA's Office of Education to strengthen collaboration among public and private sectors, states, and regions, scientists and educators, and the federal agencies. Additionally, NWF supports funding NOAA's Bay-Watershed Education and Training (B-WET) program which serves to improve community understanding, promote teacher competency, and enhance student interest and achievement in science.

- **NWF Campus Ecology Program:** NWF's Campus Ecology program encourages sustainability education in higher education and supports funding for the University Sustainability Program. Campus Ecology recognizes and encourages climate-smart design, technical and educational innovations through its national Chill Out competition. And, they produce and distribute high quality, best practice information and technical resources to add measurable value to student efforts to reduce their institutions' carbon footprint.



Environmental Education Sparks Interest in Science and Math as Future Career Pathways

According to the National Environmental Education and Foundation, 80% of all students decide to opt out of science and math careers before entering high school.

Environmental education is a "heuristic tool for making science more relevant and appealing," and "provides an appealing entry point for students thinking about future careers."

In one study, educators observed thousands of students in environmental education programs and found that test scores improved across the board. Science was the only subject where 100% of the students' scores improved.

Effects of Environment-Based Education on Student Learning:

NWF has taken a lead in recent years is assembling and spelling out in measurable terms many of the studies that have been done over the years to document how EE supports learning outcomes. More information can be accessed at www.ecoacademics.blogspot.com

About National Wildlife Federation:

The National Wildlife Federation (NWF) is the nation's largest nonprofit education and conservation organization. We have more than seven decades of conservation education experience and a nationwide infrastructure that includes 48 state affiliate organizations and 9 regional offices.

Through the years, the NWF's award-winning environmental education programs and publications, such as *Ranger Rick* magazine for children, the *NatureScope* series, and *Access Nature* curriculum, have earned a reputation for excellence and effectiveness. Our mission is to inspire Americans to protect wildlife for our children's future. To advance that mission, NWF focuses on bringing Americans together to confront global warming, protect and restore wildlife habitat, and reconnect people of all ages with nature.

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