

## EXECUTIVE SUMMARY AND KEY FINDINGS

# Stanford Analysis of More Than 100 Studies Finds Environmental Education Supports Conservation Results

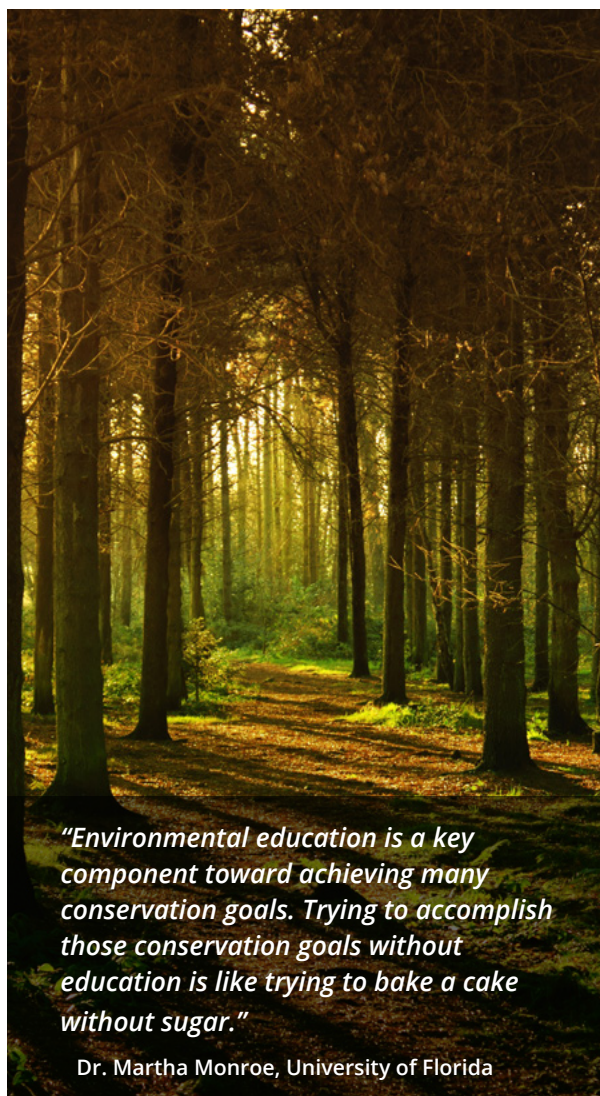
## Researchers Discover Increases in Pro-Environmental Behavior, Positive Environmental Impacts, and Community Capacity to Address Environmental Issues

Researchers at Stanford University analyzed 105 peer-reviewed studies to assess environmental education's effects on conservation outcomes. The findings suggest that environmental education helps support and sustain a range of conservation efforts, including community conservation work. It engages key audiences and helps people understand, care about, and take effective action on environmental issues.

Stanford's research review offers compelling evidence that **environmental education contributes to conservation and environmental quality in five key ways:** (1) building **knowledge, skills, and intentions** to adopt environmental behaviors; (2) adopting **pro-environmental behaviors in participants' personal lives**;<sup>1</sup> (3) taking **direct environmental actions during the educational programs**;<sup>2</sup> (4) building **community conservation capacity**;<sup>3</sup> and (5) **measurably improving the environment**.<sup>4</sup>

Environmental education programming is often core to the work of conservation nonprofits, government agencies, zoos, aquariums, museums, nature centers, and other organizations focused on addressing environmental issues. This research review found documented evidence that many of these programs successfully support conservation work, including improving environmental quality and partnering with community members, scientists, environmental professionals, and others.

The Stanford team conducted an additional analysis to identify just what kinds of environmental education strategies and programs had the most effect on conservation outcomes specifically. They found that environmental education programs reporting direct conservation outcomes shared key characteristics, including (1) a focus on local environmental issues, (2) partnerships with scientists and resource managers from local agencies and organizations, (3) incorporation of action projects aimed at solving at least part of a conservation issue or problem, and (4) creative and thorough approaches to measurement and reporting of program outcomes. Please refer to [Key Environmental Education Strategies That Lead to Conservation Results](#) for additional information.



*"Environmental education is a key component toward achieving many conservation goals. Trying to accomplish those conservation goals without education is like trying to bake a cake without sugar."*

Dr. Martha Monroe, University of Florida

## Environmental education contributes to conservation and environmental quality in five ways:

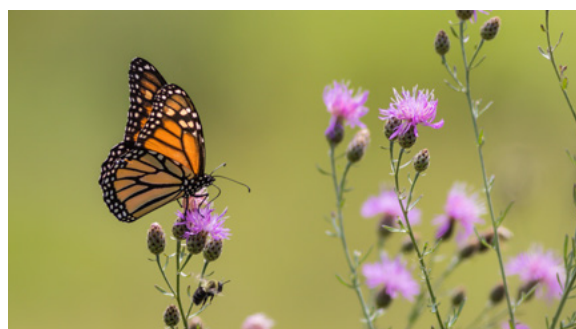


1

### Environmental education builds knowledge, skills, and intentions to adopt environmental behaviors.

Eighty-seven percent of the reviewed environmental education studies reported outcomes such as awareness, knowledge, intentions, or skills that may support personal environmental behavioral changes, such as buying local foods or increasing participants' efforts to save water or energy at home. Research shows that actions such as these may indicate the start of long-term personal pro-environmental behavior change. Please refer to [Influencing Conservation Action: What Research Says About Environmental Literacy, Behavior, and Conservation Results](#) for additional information.

- Researchers in Minnesota integrated an environmental education program about invasive species into a series of workshops for farmers and agricultural professionals interested in pesticide use. Following the program, participants felt more knowledgeable about invasive species and said they would be more likely to reduce their pesticide use.<sup>5</sup>
- A yearlong conservation program with students (ages 11 to 16) in six Russian villages aimed to improve attitudes about the endangered Amur tiger. Environmental education efforts included seminars for students, teacher trainings, and the implementation of several different local projects to raise awareness about the Amur tiger. Students reported their intention to pursue efforts to protect tigers immediately after the program and six months later.<sup>6</sup>







2

**Environmental education can increase people's pro-environmental behaviors. In some of the reviewed studies, individuals were directly observed changing their behavior, while in others, participants reported that they had changed their behaviors.**

EXPERT INSIGHT

"Environmental education's ability to create changes in student pro-environmental behaviors and attitudes is what society . . . will find to be necessary to create the next generation of environmental advocates and stewards."

– Dr. Andrew Schneller, Assistant Professor of Environmental Studies and Sciences, Skidmore College

- After participating in a multi-day environmental education program at a national park, students (ages 9 to 13) reported that they began turning off lights and making efforts to reduce food waste or water consumption at home. Many of the students said that they were still engaging in these behaviors three months after their experience.<sup>7</sup>
- An Australian primary school implemented an environmental education program to reduce 10 tons of greenhouse carbon emissions in one year. Students learned how to monitor changes in the school community's energy use and participated in behaviors to reduce it, successfully achieving their yearlong goal.<sup>8</sup>
- A SCUBA diving course added an environmental education program to discuss conservation issues on coral reefs. After completing the course, researchers measured fewer contacts by the student divers with the reef and consequently reduced reef damage.<sup>9</sup>





### 3

**Environmental education programs often include hands-on actions for the environment. While engaging in environmental education, participants undertake activities to benefit the environment, such as planting trees, cleaning up schoolyards, streams, or beaches, or monitoring species or habitats to assess environmental quality.**

- A beach clean-up event involving four coastal villages in Ambon Bay (eastern Indonesia) was effective not only in removing litter from beaches but also in changing the behavior of villagers, who continued to keep shores clean for a period of at least six months afterwards.<sup>10</sup>
- High school students in New York State identified several sources of pollution in their local waterways and reported their findings and recommendations to local authorities. As a direct result of the students' work, local leaders authorized the construction of a salt storage shed to reduce salt runoff into the surface water.<sup>11</sup>







4

**Environmental education programs can increase a community's capacity to address conservation issues. The programs help create an informed citizenry, increase community participation in conservation projects, and inspire the creation of local environmental groups.**

EXPERT INSIGHT

"Capacity building means strengthening a community's ability to become self-reliant by increasing social cohesion and social capital. Environmental education uses strategies to do just that—promoting connections between students and their communities, fostering community participation in conservation programs, building relationships between organizations working toward a common community goal, and more."

– Tracey Ritchie, Director of Education, [EARTHDAY.ORG](https://www.earthday.org)

- A university-based program designed to rehabilitate a nearby nature reserve helped create a partnership among a university, government agencies, and a community group. The partnership built the community's capacity to work collaboratively to mitigate biodiversity loss, a problem that many stakeholders viewed as too big for any one group to tackle alone.<sup>12</sup>







- Following reports that pollution affected the viability of the local shellfish industry, the New Zealand Landcare Trust implemented a program to facilitate discussions among stakeholders. The program helped develop understanding and trust among dairy farmers, the local shellfish industry, and local government groups, ultimately increasing community leadership to work toward sustainable natural resource management and community ownership of their waterways' health. As a result of the program, farmers built new fencing, bridges, and plant barriers to limit livestock access to waterways. Water monitoring results indicated a reduction in disease-causing organisms and fewer shellfish farm closures caused by water contamination.<sup>13</sup>







5

## Environmental education can directly improve the environment.

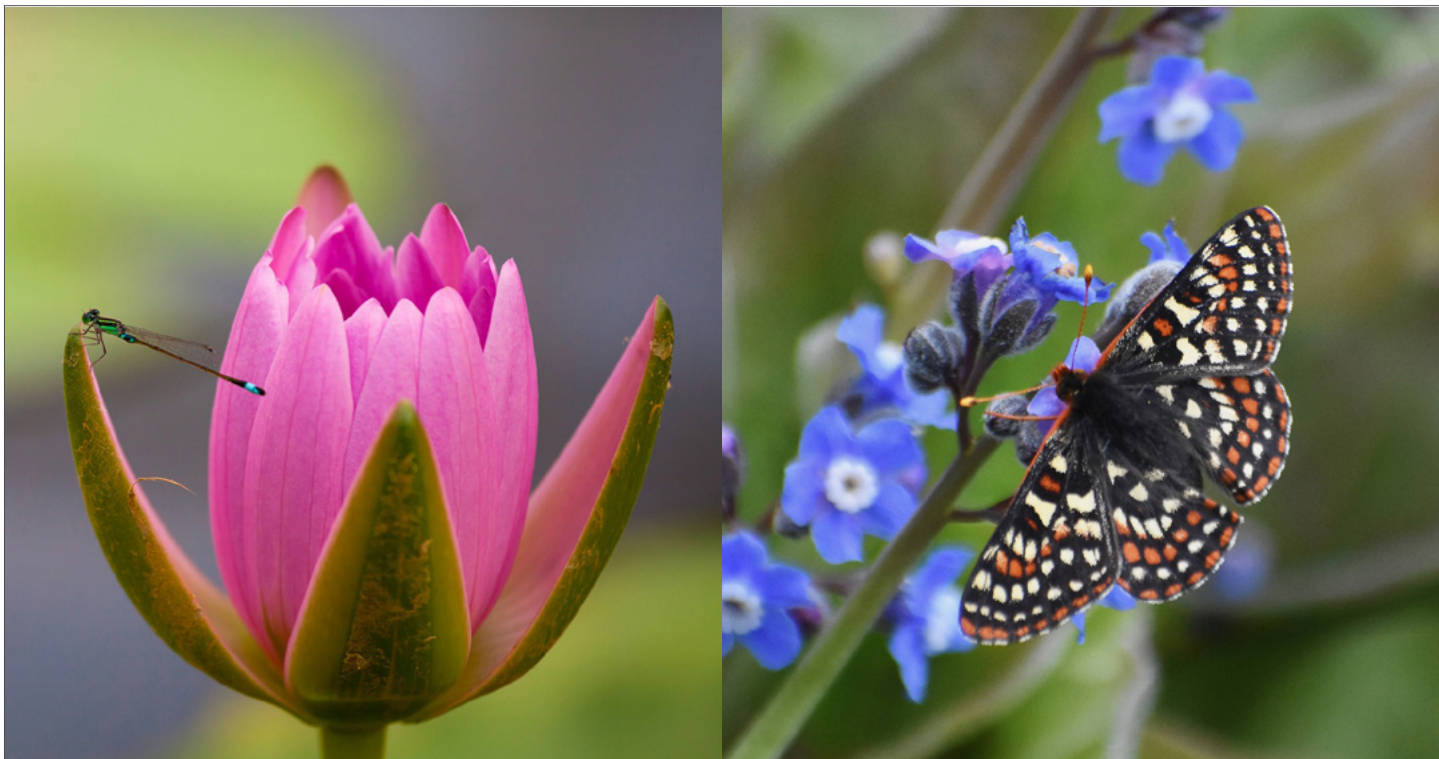
Some environmental education programs measure changes in environmental indicators, such as water or air quality changes. Assessing how a program has specifically improved environmental quality is an explicit, integral part of its success.

### EXPERT INSIGHT

“To help bring about the societal changes needed to reverse [society’s unsustainable exploitation of nature], conservation biologists need to be more proactive, provocative, and purposeful in increasing environmental literacy.”<sup>14</sup>

– David Bickford, National University of Singapore, et al.

- A group of researchers conducted a yearlong study of air quality education programs in the United States to understand if and how education programs can contribute to measurable improvements in air quality. Their findings illustrate that most of these programs involved taking some sort of action to improve air quality. Those programs employing environmental education practices (such as place-based learning, service learning, and community partnerships) were more likely to report air quality improvements. For example, a Washington State middle school program guided students to investigate mold, odors, airflow, and airborne particulates in their classrooms. After discovering that several of these air quality indicators were at unhealthy levels, the students worked with school administrators and maintenance staff to address the problems. Their efforts ultimately led to measurable improvements to all of the air quality indicators they tested.<sup>15</sup>
- In Panama, habitat loss and hunting have led to drastic population declines for the Harpy Eagle, which plays a crucial role in maintaining healthy rainforest ecosystems. An environmental education program developed to support the restoration of the threatened Harpy Eagle inspired the community to take action. The program, which was designed to minimize or eliminate human-caused eagle deaths, helped to dispel misconceptions and encourage community members to protect the species, resulting in the successful release of more than 40 eagles in human-inhabited areas and the community’s ongoing participation in reporting Harpy Eagle sightings to conservation organizations to help protect them.<sup>16</sup>



- Two education programs in Japan, one focused on restoring a natural wetland adjacent to rice fields and the other on restoring dragonfly ponds to promote habitat conservation, documented improved biodiversity due to the program. Researchers also reported increased populations of indicator species, such as waterfowl and butterflies.<sup>17</sup>

#### EXPERT INSIGHT

“I see the role of our commission as advancing our collective capacity to use the tools, ideas and creative approaches of education and communication to help create the social norms, values, organizations and behaviors that will help us realize the vision of IUCN and the United Nations Sustainable Development Goals.”<sup>19</sup>

– Sean Southey, Chair, Commission on Education and Communication International Union for the Conservation of Nature (IUCN)

- The Sustainability in Prisons Project Network invites prison inmates to learn about habitat conservation. Projects in Washington and Oregon include building and maintaining nurseries of more than 60 plant species for restoring native prairies and participating in captive rearing programs to raise and release frogs and butterflies to restore endangered species populations. As a result of one of these programs, more than 100 incarcerated individuals raised and released approximately 550 frogs and 4,000 butterflies, and planted 1 million plants.<sup>18</sup>





#### EXPERT INSIGHT

"Now more than ever, education must cut across all facets of conservation biology."<sup>20</sup>

### Conclusion

– Carol Brewer, The University of Montana

Stanford's analysis suggests that environmental education is an important strategy to develop individual pro-environmental behaviors, build community capacity, support conservation action projects, and ultimately, contribute to addressing long-term environmental and conservation goals. Based on this analysis, the Stanford team identified successful strategies for conservation practitioners, resource managers, and educators interested in designing and implementing environmental education programs to achieve conservation outcomes.

While the studies in this review revealed the many benefits of environmental education as a strategy for enhancing conservation efforts, they also demonstrated the challenges of documenting and measuring environmental outcomes connected to conservation. First, it takes a substantial amount of time to achieve conservation outcomes and evaluate education's impact. Second, many environmental education programs are part of a suite of strategies intended to address a conservation issue, and it can be challenging to isolate the effects of environmental education. Despite these challenges, numerous environmental education programs that successfully contribute to conservation goals are documented in this analysis and can serve as inspiring models to continue this vital work.

## References

<sup>1</sup> Environmental behaviors were either self-reported (29% of the studies), such as participants reporting that they reduced their water waste after returning home from a program, or observed directly (10% of the studies), such as researchers monitoring changes in energy use and transportation behaviors at a school throughout the program.

<sup>2</sup> Most actions related to improving degraded environmental conditions, such as planting trees for habitat restoration; cleaning up beaches, streams, or schoolyards; removing invasive plant species; and/or monitoring environmental conditions to collect data.

<sup>3</sup> Capacity building includes outcomes such as improved relationships and communication within a community, increased participation in conservation projects, establishing local environmental groups, and building formal or nonformal educators' professional skills and knowledge.

<sup>4</sup> Direct improvements include physical impacts to environmental indicators, such as improved water quality or enhanced levels of biodiversity.

<sup>5</sup> Wyatt, G. J., D. Herzfeld, and T. Haugen-Brown. 2015. "Teaching farmers and commercial pesticide applicators about invasive species in pesticide training workshops." *Journal of Extension* 53. Article 5IAW7

<sup>6</sup> Mukhacheva, A. S., V. V. Derugina, G. D. Maksimova, and S. V. Soutyrina. 2015. "Amur tiger conservation education program: A pilot study on program effectiveness." *Integrative Zoology* 10, 403–407. <https://doi.org/10.1111/1749-4877.12145>.

<sup>7</sup> Stern, M. J., R. B. Powell, and N. M. Ardoin. 2008. "What difference does it make? Assessing outcomes from participation in a residential environmental education program." *Journal of Environmental Education* 39, 31–43.

<sup>8</sup> Lewis, E., C. Mansfield, and C. Baudains. 2014. "Ten tonne plan: Education for sustainability from a whole systems thinking perspective." *Applied Environmental Education and Communication* 13, 128–141.

<sup>9</sup> Camp, E. and D. Fraser. 2012. "Influence of conservation education dive briefings as a management tool on the timing and nature of recreational SCUBA diving impacts on coral reefs." *Ocean & Coastal Management* 61, 30–37.

<sup>10</sup> Uneputti, P., S. M. Evans, and E. Suyoso. 1998. "The effectiveness of a community education programme in reducing litter pollution on shores of Ambon Bay (eastern Indonesia)." *Journal of Biological Education* 32, 143–147. <https://doi.org/10.1080/00219266.1998.9655611>

<sup>11</sup> Mordock, K. and M. E. Krasny. 2001. "Participatory action research: A theoretical and practical framework for EE." *Journal of Environmental Education* 32, 15–20.

<sup>12</sup> Gladstone, W., R. Stanger, and L. Phelps. 2006. "A participatory approach to university teaching about partnerships for biodiversity conservation." *Australian Journal of Environmental Education* 22, 21–31.

<sup>13</sup> Robertson, J., N. Edgar, and B. Tyson. 2013. "Engaging dairy farmers to improve water quality in the Aorere Catchment of New Zealand." *Applied Environmental Education & Communication* 12, 235–243.

<sup>14</sup> Bickford, D., M. R. C. Posa, L. Qie, A. Campos-Arceiz, and E. P. Kudavidanage. 2012. "Science communication for biodiversity conservation." *Biological Conservation* 151, 74–76.

<sup>15</sup> Johnson, B., M. Duffin, and M. Murphy. 2012. "Quantifying a relationship between place-based learning and environmental quality." *Environmental Education Research* 18, 609–624.

<sup>16</sup> Curti, M., and U. Valdez. 2009. "Incorporating community education in the strategy for Harpy Eagle conservation in Panama." *Journal of Environmental Education* 40, 3–15.

<sup>17</sup> Kobori, H. 2009. "Current trends in conservation education in Japan." *Biological Conservation* 142, 1950–1957. <https://doi.org/10.1016/j.biocon.2009.04.017>

<sup>18</sup> Kaye, T. N., K. Bush, C. Naugle, and C. J. LeRoy. 2015. "Conservation projects in prison: The case for engaging incarcerated populations in conservation and science." *Natural Areas Journal* 35, 90–97. <https://doi.org/10.3375/043.035.0113>

<sup>19</sup> International Union for Conservation of Nature. n.d. "About the Commission on Education and Communication." Accessed March 8, 2021. <https://www.iucn.org/commissions/commission-education-and-communication/about>

<sup>20</sup> Brewer C. 2006. "Translating data into meaning: Education in conservation biology." *Conservation Biology* 20, 689–691.