

Educating Our Communities and Ourselves about Conservation of Aquatic Resources through Environmental Outreach

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Educating the public about the importance of healthy ecosystems is vital to the protection of the environment, yet the accelerating pace of scientific discovery, the rapidly expanding role of information technology, and the increasing complexity of modern society tax traditional forms of environmental education. While there is a growing public awareness about environmental concerns, environmental illiteracy is still a major impediment to protecting our life support base.

Improving environmental education is a global concern. An international environment and school initiative (CERI 1995), produced under the auspices of the Organization for Economic Co-operation and Development, outlines measures to address environmental illiteracy; among those measures are educational policy reforms, professional development of educators and research materials, revision of the core curriculum of academic programs to embody environmental perspectives, stronger partnerships between the community and educational institutions, and teaching methodologies to improve the quality and relevance of education. Former political leader Mikhail Gorbachev (CEO 1990) also emphasized the importance of environmental education, as well as its linkage to global politics. He noted that “the ecologization of politics requires us to acknowledge the priority of universal human values and make ecology part of education and instruction from an early age, molding a new modern approach to nature and, at the same time, giving back to man a sense of being a part of nature. No moral improvement of society is possible without that.” Likewise, a social contract for scientists, proposed in 1997 to the American Association for the Advancement of Science (Lubchenco 1998), is predicated in part on the assumption that scientists will communicate their knowledge and understanding widely in order to inform decisions of individuals and institutions.

The inadequacy of current environmental education in the United States is obvious when examining the public’s understanding of aquatic ecosystems. Despite more than 20 years of river conservation efforts, public knowledge of the degradation of the nation’s riverine ecosystems and biodiversity is still extremely limited (Doppelt 1993). Within academia, limnology research and teaching is inadequate to meet current and projected needs for safeguarding aquatic resources (Wetzel 1991). The need for effective environmental education is set against a backdrop of aquatic resource degradation on a global level (e.g., Gleick 1998, 2000, Postel 1999, Pringle forthcoming), and problems of water scarcity and pollution are likely to become more severe in the near future as the human population grows and changes in lifestyle necessitate more water resources (Postel 1992, 1998).

The economic and cultural attributes valued by society are increasingly placed at risk by the degradation of freshwater resources and the ecosystems that contribute to their resilience. Firth (1998) stresses three points: Science and academia have pivotal roles in the development of the knowledge base about human–environment interactions; scientific information is the basis of wise decisionmaking, and this information must be made available to everyone in our society; and it is critical for citizens to understand scientific information—that is, how best to use that information and how it benefits society. Because public concern is often the impetus for formulating policy, scientists need to

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communicate technical information to the public more frequently and effectively (Bernabo 1995). Pringle (2000) notes that scientists can play an important role in the development and implementation of public policy, training of resource managers, and communication of different management scenarios to the public at large. Moreover, because most research is publicly funded, how well the research is supported depends on how well the public is informed (Miller 1980). Additionally, many public funding agencies (e.g., National Aeronautics and Space Administration) now expect large research grants to have an educational outreach component (Powers 2000).

A report by the National Research Council (1996) stresses the importance of education in addressing environmental problems in freshwater ecosystems. The report recommends administrative and curriculum reforms that focus on educating responsible citizens and future policymakers about stewardship of aquatic resources; the reforms also address the training of the next generation of scientists, who will help supply the knowledge necessary to reverse the damage already done to the world's lakes, streams, and wetlands, so that their usefulness may be preserved for the future. In a comprehensive list of requirements for science-based ecosystem management, Christensen and colleagues (1996) also note the critical need for effective education. This list includes creative ways of providing the types of education needed at every level of society, from schoolchildren to government officials. Likewise, Naiman and colleagues (1995) identify broad-based training beyond traditional educational efforts as central to improving water quality in the United States.

Firth (1998) contended that scientific discovery can be most rewarding when coupled to education, and, conversely, education is most effective when coupled to discovery. Also, effective communication and education about environmental issues can be equally important as—and no less challenging than—basic scientific research. As Pringle (1999) noted, “While environmental outreach and education has been traditionally characterized as ‘soft’ by the scientific community, our global future depends on effective communication of multiple and complex environmental issues.” The challenge in communicating environmental information lies in part with the very dynamic and complex nature of environmental issues. Research results may go unrecognized or underused because they are “often expressed in language that suggests no clear connection between scientific assessments and identifiable social values” (Norton 1998).

Most citizens, including those in charge of policy, are not well informed or concerned about the relationship between the health of aquatic resources and the economic and social institutions the citizenry enjoys. The ways in which science has traditionally interfaced with society must be reexamined and modified to address current environmental and social needs, and the scientific community must communicate effectively with policy officials about environmental

information and the meaning of relevant research data if public policies are to reflect conservation principles (Karr 1993, 1999, Clark 1999). Rep. George Brown (D-CA) clearly noted this need when he observed that

we are on the cusp of a number of changes in the way we conduct our research and education activities. As exciting and challenging as it is to be in the midst of all of this change, however, our research and academic enterprise is anticipating little of it, provides little leadership in setting goals for change, and thus may even project a public attitude of being resistant to it.... Having risen to a new level of accomplishment, we are hindered in our progress by the system we have outgrown.... Given the transcendent nature of the knowledge that has emerged, we can ill afford to let ego or convenience cloud our vision on what we need to do next. (Brown 1998)

The will to communicate and educate effectively must be matched with programs and leadership that will result in meaningful changes in policy and resource management. Partnership efforts among different entities, such as educational institutions and government agencies, or private businesses and nongovernmental environmental organizations, are mechanisms that can spearhead effective environmental education. There are many excellent examples of such collaborative efforts (e.g., Bjorkland et al. 1997, 1998, Brown et al. 1999, Clarke 1999, NRCS 1999, Pringle 1999, Pringle et al. 1999, Allen 2001, Hudson 2001, Middleton 2001, Newton 2001), but they must be expanded, given the magnitude of environmental challenges.

In the last decade, the imperative of educating ourselves and our communities about conservation of aquatic resources through environmental education and outreach has been well articulated among scientists (Pringle et al. 1993, Dewberry and Pringle 1994, Aumen and Havens 1997, Pringle 1997, Firth 1998). In June 1998 we convened an interdisciplinary workshop to provide a forum for exchanging information on effective strategies for environmental education about aquatic resources. We had four objectives:

- to cultivate an open forum on effective environmental education and outreach programs
- to highlight philosophical and administrative issues that impede meaningful progress in improving public environmental education
- to provide examples of successful education and outreach programs
- to draw attention to the need for better, more innovative, and responsive systems of education and outreach

The workshop, “Environmental Education Outreach: Aquatic Resources,” was held in St. Louis during the joint meeting of the American Society of Limnology and Oceanography and the Ecological Society of America. The

workshop examined three critical themes within the framework of environmental education: effective communication styles, the ethical responsibility to help shape management and policy decisions, and the need to be more proactive in environmental problem resolution. In the articles in this issue of *BioScience*, the authors address the topic of environmental education and outreach from the perspective of their professions—namely, science, government, and nongovernmental organizations. These papers reflect the enthusiasm and concern of the panelists for better community environmental education, and we hope that they will inspire and provide models for future education and outreach programs.

Stewart Hudson, president of the Emily Hall Tremain Foundation and former executive director of the Jane Goodall Institute, as well as former vice president for educational outreach at the National Wildlife Federation, discusses how a national environmental group, a nongovernmental organization, adapts educational programs to meet changing social needs and perspectives. He notes that social changes and other “megatrends” influence the nature of the environmental message and the manner in which it is communicated to the public. Factors that will continue to challenge environmental education (and to serve as catalysts for change) include changes in demographics and in the awareness level of the public, and the need for (1) measurable results in outreach education efforts, (2) effective ways to utilize science and communicate complex aspects of the natural world, and (3) avoidance of the psychology of despair. Numerous examples of successful educational programs and initiatives are cited throughout his paper.

William Allen, science writer for the *St. Louis Post Dispatch*, gives the perspective of the news media on environmental communication. He discusses the culture of newsrooms, the mindsets of news reporters, and the many ways in which scientists can communicate their work to the public, stressing that scientists should cultivate skills to communicate effectively through the media. His paper illustrates the many challenges that the print media face in addressing environmental issues and offers tips on how the aquatic scientist can successfully tap media resources, from local science reporters to public information officers at various institutions.

Julie Middleton, former national director of the Save Our Streams (SOS) program of the Izaak Walton League of America (IWLA), discusses the role of SOS as an intermediary between the general public and the scientific community. Through the SOS program, the IWLA works to increase public awareness of water pollution issues and to build an active network of stream stewards in communities throughout the United States. SOS has developed a number of tools for the general public, based on the latest research in stream monitoring and restoration. One of SOS's recently developed and successful programs, the Stream Doctor project, educates the citizenry by getting them involved directly in all key components of stream restoration: goal

setting, partnership building, development of restoration plans, funding support, and implementation.

Bruce Newton, senior scientist with the National Water and Climate Center of the Natural Resources Conservation Service (NRCS), a nonregulatory agency of the US Department of Agriculture, illustrates that public education and outreach are central components of the NRCS mission. (The NRCS works with private landholders, agricultural producers, and local communities.) He examines the effectiveness of some of the agency's environmental outreach and education techniques, which include national documents, national advertising campaigns, demonstration projects, primary and secondary education input, and local community outreach. The lessons learned from broad-based programs, which Newton summarizes, can serve as starting points for other environmental education efforts.

The overall message conveyed in the workshop presentations was simple and straightforward: Conservation of our aquatic resources depends on education of the public, and educational strategies need to be broad-based and incorporate citizen participation to be effective. Scientists and academic institutions are critical links in the discovery process, but the general public must embrace the application of sustainable and ecologically sound policies. This requires a commitment by professional communities to public education. Professional scientific societies, such as the Ecological Society of America, the American Society of Limnology and Oceanography, and the North American Benthological Society, are in a unique position to influence public perception and knowledge of our aquatic resources. By aggressively working with other institutions and organizations, both governmental and nongovernmental, these scientific societies can influence and shape policies and on-the-ground activities that will help ensure that aquatic ecosystems are protected. The articles in this issue of *BioScience* demonstrate how professionals and societies can contribute to environmental education and outreach.

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