Environmental Literacy IN AMERICA

What Ten Years of NEETF/Roper Research and Related Studies Say About Environmental Literacy in the U.S.

THE NATIONAL ENVIRONMENTAL EDUCATION & TRAINING FOUNDATION

Kevin Coyle

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Preface

In 1944, noted conservationist Aldo Leopold wrote: "Acts of conservation without the requisite desires and skill are futile. To create these desires and skills, and the community motive, is the task of education." Almost sixty years later, in January 2003, the National Science Foundation released a report of its Advisory Committee for Environmental Research and Education. The Committee found that "in the coming decades, the public will more frequently be called upon to understand complex environmental issues, assess risk, evaluate proposed environmental plans and understand how individual decisions affect the environment at local and global scales." The Committee called for the creation of a scientifically informed citizenry and pointed out that this will require a "concerted and systematic approach to environmental education grounded in a broad and deep research base that offers a compelling invitation to lifelong learning."

Now in 2005, Environmental Literacy in America offers an assessment of environmental literacy in America that is both sobering and hopeful. This summary of almost a decade of NEETF collaboration with Roper Reports provides a loud wake-up call to the environmental education community, to community leaders, and to influential specialists ranging from physicians to weathercasters. At a time when Americans are confronted with increasingly challenging environmental choices, we learn that our citizenry is by and large both uninformed and misinformed.

This is worrisome. Yet, here at NEETF we are a community of "glass half-full" thinkers. True, we have a confused public that performs poorly on basic environmental literacy questionnaires. But 95% of this public supports environmental education in our schools. And most Americans want environmental education to continue into their adult lives. Over 85% agree that government agencies should support environmental education programs. A large majority (80%) believe that private companies should train their employees to help solve environmental problems. People want to understand environmental issues and how they apply to their daily lives. Environmental education can and must respond.

NEETF is committed to fostering environmental literacy in ways that spur critical thinking skills and creativity on the part of individuals and institutions. We also emphasize practical, pragmatic, workable solutions – not more rhetoric. For example, this report explains how focused environmental education can guide the public to simple actions that could save at least $75 billion annually. Imagine the trillions of dollars to be saved with a coordinated, mobilized environmental education network fully supported by private and public institutions!

Read this report. It offers a wealth of data and analysis accompanied by recommendations intended for environmental educators, NGO leaders, funders, public decision makers, and professionals who are daily affected by environmental issues. As you will see, this report raises the bar for environmental education. It emphasizes the need for more research, clearer benchmarks to demonstrate impact, and far greater coordination. We do not have the luxury of duplicating efforts; instead, we must find ways to collaborate effectively within and between the public and private sectors. Fortunately, a wealth of programs and experts are already available to help meet the urgent need of educating Americans in their essential environmental ABCs.

We welcome this opportunity to recognize the invaluable role that Kevin Coyle has played, both in authoring this report and in furthering the cause of environmental literacy in America.

For nine years Kevin served as President of NEETF and worked with colleagues at Roper and elsewhere, as he analyzed the data, developed our groundbreaking NEETF/Roper reports, and formed expert opinions on every facet of environmental education. His contributions to environmental education are unparalleled, and his new position at the National Wildlife Federation will make excellent use of his enormous insights and commitment to this field.

NEETF will be using the findings of this report and recommendations as the basis of our work for the rest of this decade. We invite readers to do the same. With the full support of our Board of Directors, we renew our commitment to environmental literacy: environmental education in our classrooms, in our homes, in our professions and workplaces -- environmental education that instills a love of land and nature. Our mission dictates that we commit ourselves to more research, more listening, and more openness to collaboration with all sectors of this nation. Please join us in this effort.

Richard Bartlett
Chairman, NEETF

Diane Wood
President, NEETF

Most Americans

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Foreword

In the course of a lifetime, an individual will accumulate environmental knowledge from a combination of school, the media, personal reading, family members and friends, outdoor activities, entertainment outlets, and a wide range of other professional and personal experiences. For a few motivated individuals, this can eventually add up to an accomplished environmental literacy. But for most Americans, it falls far short. Most people accumulate a diverse and unconnected smattering of factoids, a few (sometimes incorrect) principles, numerous opinions, and very little real understanding. Research shows that most Americans believe they know more about the environment than they actually do.

That is why 45 million Americans think the ocean is a source of fresh water; 120 million think spray cans still have CFCs in them even though CFCs were banned in 1978; another 120 million people think disposable diapers are the leading problem with landfills when they actually represent about 1% of the problem; and 130 million believe that hydropower is America's top energy source, when it accounts for just 10% of the total. It is also why very few people understand the leading causes of air and water pollution or how they should be addressed. Our years of data from Roper surveys show a persistent pattern of environmental ignorance even among the most educated and influential members of society.

A more recent and disturbing phenomenon also warrants our careful attention. It is perhaps best described in a book by family expert and author Richard Louv (2005) as widespread "nature-deficit disorder." Louv is among a growing number of analysts who see unprecedented pattern changes in how young people relate to nature and the outdoors. As kids become more "wired" than ever before, they are drawn away from healthful, often soul-soothing, outdoor play. The age-old pattern of children spending hours roaming about and playing outside is becoming close to extinct due to a combination of electronics, cyberspace, and parental efforts to keep their children indoors and, in their minds, safer.

Without being alarmist, these conditions are becoming less acceptable and more perilous to society. We are moving past the time when we can rely on a cadre of environmental experts to fix our environmental problems. With most environmental issues becoming more complex and difficult to manage, and with the preponderance of pollution shifting toward problems caused by individuals and small entities, a stronger and wider public understanding of environmental science and related issues is a growing necessity. We are also moving into a time when direct contact with the natural world is being markedly scaled back. Comprehensive environmental education is the only real answer. But can we get there?

Our leaders need to comprehend far more about what works and what does not. The public needs true education on the environment. We need to improve the quality and delivery of lifelong education on the environment – to grasp its original promise and make it work. We need to build more support for resource stewardship through education and use an informed public to mitigate some of the adverse effects of our actions on the environment. This report will help sort out this complexity in a way the non-expert can readily see and do something about.

Kevin J. Coyle
Former President, NEETF

Acknowledgments

This report started as a cursory effort to recap some key findings of ten years of NEETF/Roper research. From there, it grew and grew. Along the way there are several people to thank for their help.

David Lintern of Roper Public Affairs at GfK NOP deserves much credit for this report. NEETF could not have asked for a better partner at Roper than David. In addition to helping design and test the survey instruments, over the course of ten years David often wrote and edited drafts of our National Report Cards and has worked with us consistently to maintain research and editorial quality. David's boss, Ed Keller, and his partner, Jon Berry, also made a significant amount of their research available to this effort, particularly with regard to their work on Influential Americans.

We also wish to acknowledge the important design work that Dr. Lynn Musser provided in 1997 when we converted the ongoing NEETF/Roper survey of *attitudes* to a report card on environmental *knowledge*. It was her expertise, hard work, and patient encouragement that made the Report Card program a reality. Francis Pandolfi, former NEETF chair, deserves acknowledgement and thanks for starting this survey research effort while at *Times Mirror Magazines*, and for assisting in conveying the survey from Times Mirror to NEETF in 1996. Our chair, Dick Bartlett, has also made the writing of this report more possible with his own unique combination of unbounded enthusiasm and sharp critique.

In the summer of 2003, Jennifer Bland, a wonderful student intern from Stanford University, ably collected some critical supplemental research used throughout this report to help corroborate (and challenge) Roper findings.

Several reviewers went above and beyond in helping with this report, including Michael Rains, a NEETF board member and research director at the USDA Forest Service; Jim Elder who recently wrote an important "field guide" to the environmental education movement; and Dr. Tom Marcinkowski of Florida Tech who strongly and effectively challenged us to use more existing research, get basic models and definitions down more accurately, and think harder about what is needed in new research, assessment, and evaluation. Tom also provided some very helpful bibliographic reviews of the research that are incorporated in appendices to this report.

Our outstanding editor, Gilah Langner, spent long and patient hours with this manuscript to make it presentable, consistent, and more professionally rigorous. We thank Gerry Bishop, editor of *Ranger Rick*, for the cover photo of the two boys.

Finally, we are extremely grateful to the Peter Sharp Foundation for its generous support of this work and for the ongoing support of NEETF Advisor and friend, Dan Lufkin.

The National Environmental Education & Training Foundation is a Congressionally-chartered, private nonprofit organization that supports the development of environmental literacy in its many forms.

NOP World, publisher of Roper Reports, is a full-service international research and marketing firm.

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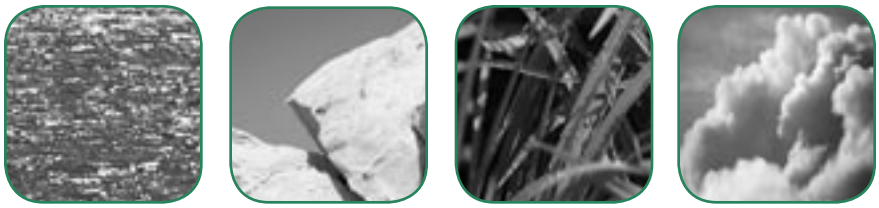

Summary

Environmental Literacy in America

Aware? Yes, But Hardly In-the-Know

This report finds that overall awareness of simple environmental topics is reasonably high nationwide. That is certainly good news and we should not lose track of it. The study also finds a very strong nationwide belief in the value of environmental education. This also offers an encouraging point of departure for a closer examination of the somewhat disappointing state of American environmental knowledge and literacy.

While the simplest forms of environmental knowledge are widespread, public comprehension of more complex environmental subjects is very limited. The average American adult, regardless of age, income, or level of education, mostly fails to grasp essential aspects of environmental science, important cause/effect relationships, or even basic concepts such as runoff pollution, power generation and fuel use, or water flow patterns. For example:

- About 80% of Americans are heavily influenced by incorrect or outdated environmental myths.
- Just 12% of Americans can pass a basic quiz on awareness of energy topics.

There is little difference in environmental knowledge levels between the average American and those who sit on governing bodies, town councils, and in corporate board rooms, and whose decisions often have wider ramifications on the environment. There is encouraging evidence that the public *can* learn about the environment and complex ecological relationships. That we are far from succeeding in making this a reality is due to the absence of a comprehensive coordinated approach to environmental education.

We also consider low levels of knowledge about the environment as a signal that members of the public will be unprepared for increasing environmental responsibilities in the coming years. As environmental topics and problems become more complex and pervasive, our decades of reliance on trained experts within the private and public sectors to handle our needs are nearing an end. In the future, many leading environmental problems, ranging from water quality to ecosystem management, will require the efforts of more skilled non-experts acting as individuals, through small business, or as community leaders.

Media Magic, Myths, and Misapprehensions

Professional environmental educators often give short shrift to the media. But children get more environmental information (83%) from the media than from any other source. For most adults, the media is the *only* steady source of environmental information. In this report we conclude that environmental educators face two significant impediments in trying to create more widespread environmental literacy. The first, and most obvious, is how to bring enough sound environmental education programming into the general education realm to make a real difference. After 35 years of effort, the environment has yet to achieve "core subject" status in the schools.

The second, and less understood, impediment is how to channel the powerful influence of the media to achieve not just public environmental awareness but environmental literacy. The key problem with the media is one of depth rather than accuracy. The media is well positioned to provide widespread but superficial information on environmental subjects; it is poorly positioned to offer in-depth education. This means it provides a steady, even ubiquitous, flow of awareness-building information but it seldom educates on complex matters or builds skills. Sometimes the misapprehensions it fosters can grow into persistent and incorrect myths. Educators need a better understanding of how to provide meaningful environmental instruction even when the media is working against them through oversimplification and sometimes uninformed mischaracterizations. Educators also need to better align media coverage with principles of education and to channel it so it does not disrupt environmental literacy.

Environment's Chances in Education's Mainstream

As the environmental education field has pursued educational acceptance and mainstream positioning, it has developed and institutionalized well thought-out educational approaches, and gathered considerable evidence of academic efficacy. Conclusive studies offering ultimate proof are still needed, but the overall weight of the evidence today is impressive. Environmental education (EE) is producing higher-performing students, improved test scores, and quality character education; it even contributes to later career success. In fact, there is so much good news coming out about EE's educational efficacy that environmental educators and researchers can hardly agree on what strategies to adopt first.

The EE field has worked diligently to become a "core" educational subject mostly by infusion of environmental topics into related subjects and disciplines. There is no conclusive study on how far EE has gone in achieving core subject status, but it is fairly clear it has not yet reached the critical mass needed to adequately support nationwide environmental literacy. There is also evidence that, as the nation's education system has increased its focus on statewide education standards and related testing, the amount of environmental education occurring in schools has leveled off and may even be in decline for the first time in three decades.

Ironically, a number of newer studies have shown that environment-based learning programs with suitable depth, duration, and rigor can boost standardized test scores. This argues for more EE infusion, not less. Despite the average educator's temptation to stay safely within the syllabus and to "teach to the test," other trends in American education are opening a number of promising new doors to environmental education. Examples include a growing emphasis on community service, after school programming, the school-community resource connection, comprehensive school reform, and schoolyard habitat and garden programs. With only a few exceptions, the larger EE field has yet to adequately organize itself to seize upon these opportunities in any comprehensive way.

Aiming for Environmental Stewardship

Does environmental education "pay off" in terms of encouraging measurable environmental stewardship? This report finds compelling evidence that it does. Here it is important to understand the distinction between how environmental *knowledge* affects behavior and how environmental *literacy* affects behavior.

This study finds that a higher level of environmental *knowledge* correlates significantly with a higher degree of pro-environment behavior. But increased knowledge, by itself, has real limitations. Increased environmental knowledge works best for simple, easy information and behaviors such as consumer decisions or saving water and electricity. These are vitally important and can be measured. In Chapter 5, we describe a new environmental literacy index that values even minimal pro-environment efforts at over $75 billion annually. We note that such actions are a response to environmental knowledge but only because they require a minimal disruption of one's life and do not require in-depth understanding or skills. This knowledge/behavior correlation, though significant, is not fully compelling and probably does not offer lasting environmental stewardship. Still, we find environmentally knowledgeable people are:

- 10% more likely to save energy in the home
- 50% more likely to recycle
- 10% more likely to purchase environmentally safe products
- 50% more likely to avoid using chemicals in yard care.

Other quantified examples of knowledge correlations come from a Minnesota study modeled after the NEETF/Roper report. It found that the high-knowledge group was:

- 31% more likely to conserve water
- twice as likely to donate funds to conservation.

Real change usually emerges from educational strategies that give the learner a sense of involvement and ownership. Hallmarks of effective EE programs include hands-on activities, investigational approaches, out-of-the-classroom experiences, and student-directed learning. Too few of our schools make use of these approaches, relegating EE to a traditional lecture-style, "information only" format. Teachers need to be trained in these more sophisticated forms of student-directed instruction.

Good EE programs produce remarkable results on a variety of dimensions. An evaluation of the Investigating Environmental Education Issues and Actions Program (see Chapter 6) found that 38% of the IEEIA students achieved a score of 80% or higher on actual environmental knowledge, and 76% scored 60% or higher. Just 25% of the non-IEEIA students scored 60% or higher. Some 75% of the IEEIA student reported they had taken a recent environmental action, as compared to 43% of non-IEEIA students.

The environmental education field clearly could benefit by focusing concerted attention on bringing EE up to critical mass in our schools. It needs to insist that students receive an adequate base of environmental knowledge, and it needs to more comprehensively deploy its well-developed strategies, curricula, and texts, large numbers of learning facilities, natural acres, field experts, and non-formal institutions in this effort. Some of this will involve supporting the formal educational establishment and some of it will require optimizing the vast array of outdoor and indoor environmental education resources. In the interface between

True environmental

literacy takes time. It can't be placed in an "educational microwave."

the formal school-based education systems and the environmental system of informal, hands-on learning centers lies EE's best hope for the future.

Understanding Environmental Literacy – Three Levels of Learning

In examining the various ways that environmental experts and educators think about and position public environmental education and information activities, a framework emerges with three basic levels of learning: 1) environmental awareness, 2) personal conduct knowledge, and 3) true environmental literacy.

The first level is **environmental awareness**. NEETF/Roper research finds that about 50% to 70% of adults have "heard of" most major environmental subjects such as water and air pollution, energy efficiency, solid waste, habitat loss, and climate change. Awareness is best characterized by simple familiarity with an environmental subject with little real understanding of its deeper causes and implications. The research demonstrates that environmental awareness by itself has limited lasting effect on environmental stewardship attitudes (although it can reinforce existing sentiments) and by itself has little effect on "environmentally-friendly" behavior. The main advantage of widespread environmental awareness is its contribution to public support for government action in environmental policy and management. The main tool for creating such awareness is, by far, the public media.

A second, slightly deeper, level of environmental knowledge involves a limited combination of awareness and action that encourages people to engage in immediate personal conduct that contributes to environmental improvements such as saving electricity, gasoline, and water, buying "green" products (including seafood choices), reducing solid waste, and reducing individually-caused run-off pollution. **Personal conduct knowledge** does not require detailed knowledge of causal sequences because most of the connections are fairly simple and usually require just one step. We refer to this level as "personal conduct" knowledge because, unlike general environmental awareness, people willingly go a step farther to take personal action and make the connection between an environmental issue and their own individual conduct.

The research finds that a person who is well-versed in this level of environmental knowledge is anywhere from 5% to 50% more likely to engage in personal environmental actions. Even when using the lower end of this range, the impact of bringing a sizable majority of Americans up-to-speed on personal conduct knowledge would mean an immediate $75 billion improvement in saved energy, water, and reduced healthcare costs.

The third and final level is "**environmental literacy**" and it is distinct from simple awareness or immediate personal conduct instruction because of its depth of information and the actual skills (thinking and doing) that are imparted. True environmental literacy takes time. It can't be placed in an educational "microwave." It starts out with framed information but also involves imparting the subject's underlying principles, the skills needed to investigate the subject, and an understanding of how to apply that information. Most real environmental education involves actual hands-on experience with a subject either in a lab or the field. The research indicates that very few people have sufficient environmental knowledge and skill to be considered environmentally literate. While there are no "hard" numbers on the subject, an estimate of 1% to 2% of adults in America seems supportable.

- Building a foundation in youth – Recent examinations of the state of environmental literacy find that a small percentage of the public is prepared for the complex environmental issues and decisions of the future. At least part of this shortfall is due to the status of

environmental education in school. Although EE is a popular elective and supplemental effort in more than half of our schools, too little of it actually gets delivered and then it is poorly sequenced so that environmental learning does not effectively accumulate. We need to offer students a sufficient amount of sequenced environmental education to let them absorb and retain the basic definitions and principles of environmental science and systems, and to learn how to actually apply those principles. It would be a major breakthrough if a majority of students could reach this level by the time they complete high school. It also appears we will need to counteract a newer phenomenon best described by family expert and author Richard Louv (2005) as widespread "nature-deficit disorder." Louv is among a growing number of analysts who see unprecedented pattern changes in how young people relate to nature and the outdoors. Not only are children more electronically "wired" than ever before, but the long-standing practice of children spending hours roaming about and playing outside is becoming close to extinct. The implications for environmental literacy are not yet known.

- **Adult leadership literacy** – All people impact the environment in their homes, workplaces, and communities. Research shows, however, that leaders in business, government, and civic affairs lack basic environmental literacy and often either ignore environmental impacts and opportunities or address them solely through intuition. Community leaders, in particular, need to be environmentally literate. They number in the tens of millions and are constantly making decisions on every aspect of community life, from land development policy to education to waste removal. It is vitally important for adults in key positions and professions such as business, health, and education to make sound decisions about the environmental impacts of their decisions. We need mature and well-developed environmental literacy for a majority of those 30 million adults who comprise America's community and professional leaders – what our research partner Roper Public Affairs refers to as community "Influentials."

Influencing Influential Americans

In addition to seeking measurable impacts on a *majority* of the adult public, certain segments of the adult population offer the brightest hope of all. This report examines the stewardship potential of aiming environmental education programs more effectively at sizable and highly influential groups of U.S. community leaders. The largest of these groups (20% of American adults) are called "Environmental Information Seekers" by Roper Public Affairs. Some 35% of this group are likely to perform pro-environment behaviors, compared to 23% of the general public. Another, smaller group (10%), called "True Blue Greens" by Roper, is a committed group that "walks" the environmental "talk." As would be expected, this group shows the highest levels of pro-environment behaviors. Importantly, this group has a nearly one-half overlap with the Influential Americans group (also 10%). But it may have even more in common when it comes to environmental education and stewardship.

The 2002 Green Gauge, for example, indicates that while 52% of Americans report that they have "heard of" ozone action days or code orange/code red air quality days, 73% of Influentials say they have heard of them and 71% of True Blue Greens say likewise. According to the 2003 Green Gauge report, 26% of Americans purchased an environmentally safe product within the past two months; True Blue Greens were at 53%. A similar percentage of Environmental Information Seekers (51%) and Influentials (46%) recently purchased such products.

With regard to environmental attitudes, Influentials have many of the same characteristics of the True Blue Greens. Roper finds that the environment matters to the Influentials. Some

78% of them, for example, think that businesses should also consider what is good for society and not just what is good for profit. Influentials have in fact been pushing government and business hardest to improve the environment. An impressive 92% of Influentials are moderately or very interested in the environment. A majority (52%) believes that laws to protect the environment have not gone far enough and many of them seem ready to do more than recycle their trash. They say they would pay more for green products such as autos, gasoline and electricity.

Roper feels these Influentials have enormous potential as change agents on many public issues including the environment. They are early-adopters of many environmentally considerate products and practices, and exhibit a true openness to learning about the environment. They are curious and deliberate seekers of information and, with a stronger base of environmental literacy, could have an exponential effect on the stewardship of our communities, ecosystems, air, and water. If environmental literacy must target segments of the population, the groups identified by Roper are surely among the top priorities.

Recommendations and Conclusion

Specific strategies for bringing the field of environmental education to new levels of public acceptance and its fullest potential are detailed in the report. Recommendations touch on:

- **Achieving a wider and stronger base of environmental knowledge,** by: assembling and distributing EE models, research, and outcomes; stronger EE quality assurance for teachers; better alignment of EE with state standards of learning; wider use of EE to integrate disparate subject matter; application of EE to after-school and home school programs; and capturing high public interest in the environment.
- **Organized delivery of EE content** so that there is a logical progression of student knowledge from one year to the next.
- **Extending EE to professionals,** including expanded training on the environment for K-12 teachers, doctors and nurses, community leaders, business managers, and weathercasters.
- **More effective deployment of off-site centers, people, and places,** including zoos, aquariums, museums, arboreta, and botanical gardens; nature centers and natural parks and refuges and field study areas; school yard habitats and gardens; green campuses; and more.
- **Maximized use of information technology for EE delivery,** including a central EE presence on the Internet; better deployment of forecast meteorology; and more effective use of media tools.

In conclusion, the pursuit of environmental literacy in America is widespread and popular, but it still has much room for improvement. True environmental literacy arises from a deft weaving of an intricate education fabric. Knowledge must be deep, skill developing and experiences real for EE to work best. But the tools are all there for those who need them.

Environmental education is much more practical than most people think. The many hands-on learning experiences that EE offers ultimately translate into job, career, and people skills. On a broader scale, environmentally literate community leaders have a deep understanding of environmental issues – with often complex causes and effects – enabling them to make sound decisions in stewarding our air, land, and water. Effective environmental education is not a panacea for all of society's problems, but it is a responsibility that we owe both ourselves and future generations.

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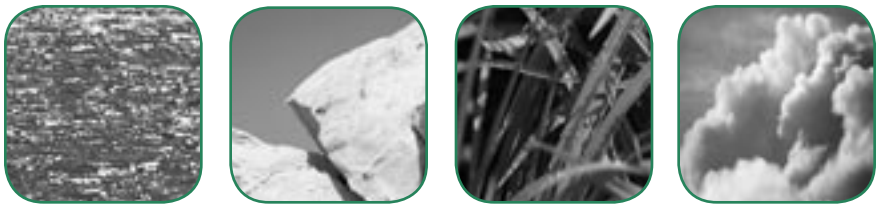


Introduction

This report is about a widely-held belief followed by a persistent question. The *belief* is that, if we are ever to get real control of environmental problems in the U.S. and abroad, we will need a public with a sound base of education, able to understand these problems and address them at their source. Most of us can visualize such education in action! We can envision homeowners who recycle and reduce their use of polluting products in the kitchen, laundry, garage, and garden. We can envision manufacturing plant and shop workers who are more careful about their use of electricity, toxic substances, and waste disposal. And we can imagine business managers running cleaner operations, and using more environmentally beneficial products. We can also envision community leaders who are skillful at balancing development and transportation plans with public needs for open spaces, trees, wildlife, clean water, exercise, and fresh air.

Many Americans feel strongly about the need for environmental education. One can hardly go to a public forum on environmental topics without hearing a passionate call for more environmental literacy. NEETF/Roper research reveals that this need is so keenly felt that 95% of American adults (96% of parents) think environmental education should be taught in the schools, and 90% believe that people in the workplace and in other places in adult society should receive environmental education too. The persistence and strength of America's belief in environmental education seem to come directly from the hope for a cleaner, greener, and more balanced future.

But then comes that nagging *question*. Can environmental education ever accomplish such a far-reaching vision? Does it really work? Is there reliable evidence that environmental education can produce measurable results? The simple answer, found throughout these pages, is yes. This report elaborates on how and in what context. Basically, competent and well-applied environmental education can help achieve an improved environment, better-planned communities, a more vibrant economy, and even optimal human health. These are environmental education's "bottom lines," and they are achievable. There are, of course, nuances and provisos to this statement. They are challenging but are not true impediments.

Is such environmental education in place? Here, the simple answer is: not yet. Despite a great deal of activity in the environmental education field, we are not at a point, as a society, of providing solid environmental education of the sort that leads to environmental literacy and the benefits listed above. What passes for environmental *education* in American is usually environmental *information*. One might compare it to the difference between a full-course meal and a quick snack. True education nourishes a deeper understanding and an all-important ability to skillfully apply that knowledge; information simply makes one

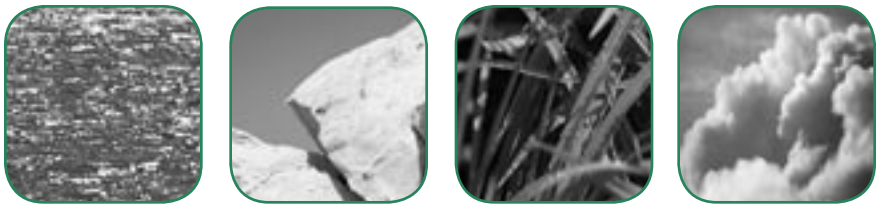
aware of a topic and goes no farther. Ironically, it seems that many of those who have a powerful vision of widespread environmental literacy are unaware of this basic distinction, and therein lies environmental education's principal stumbling block. Those who are often the most anxious for improved public environmental understanding are prolific information providers but lack skill as educators. They publish checklists and guidebooks, give public addresses, issue press releases, produce films, obtain media coverage, print attractive posters, and more. But these attempts at education are cursory, lack expert pedagogy, and fall short of creating actual environmental literacy.

This inexpert "dabbling" in environmental education is not all bad. It can produce widespread environmental awareness even if fails to elicit the desired attitude and behavioral changes. But if, as a nation, we could convert the resources we now spend on distributing environmental information into a much deeper commitment to education, we would break the cycle and realize the larger vision of environmental literacy. This report is also about how to understand and then break the current cycle.

We start by exploring the status of American environmental knowledge. We end with a plan for reaching environmental literacy. The plan is based on research from many disciplines and looks at environmental education as a lifelong ("pre-K to gray") undertaking. The basis for this report rests on primary research conducted over a ten-year period through our partnership with Roper Public Affairs, a major international survey research firm and now part of NOP World. Over the last decade, NEETF has been issuing reports based on survey data collected by Roper on Americans' environmental knowledge, attitudes, and behavior. This report summarizes what we have learned in the process.

- Chapter 1 summarizes the current state of environmental knowledge in America, explores where adults acquire environmental information, and examines the disparity between what Americans know about the environment and what they think they know.
- Chapter 2 examines the environmental "myths" that people hold, and explores how the media may contribute to the durability of these myths in the public's mind.
- Chapter 3 explores American attitudes toward the environment and environmental education, and their activities on behalf of the environment ("environmental stewardship").
- Chapter 4 examines the role of the media in environmental education, and the potential for targeting different segments of the population with higher levels of environmental literacy.
- Chapter 5 examines what constitutes environmental education and environmental literacy.
- Chapter 6 discusses support for environmental education in the U.S. and parental expectations, and summarizes research on the effects of environmental education on student performance in academic subjects, character development, and overall learning skills.
- Chapter 7 discusses the long-term value of environmental literacy, looking at community leadership, cultural diversity, health care advances, and other societal goals.
- Chapter 8 contains recommendations for a bold but feasible plan of action that would dramatically improve the state of environmental literacy in America.

Although a considerable amount of research is now available on environmental education, significant gaps still remain. This report points out areas for further study that, if addressed, would help take environmental education to the next level and fulfill its ultimate promise.



Chapter 1

Knowledge: What Americans Know About the Environment

In April 1970, environmental education received its greatest endorsement ever. The first Earth Day galvanized public enthusiasm around cleaning up the planet and correcting widespread and long-overlooked environmental problems affecting the air, the water, and the biosphere. The 1970 Earth Day also filled adults with the hope that their children could learn about the environment and the natural world in new and thoughtful, organized, and scientific ways. Such an education would ultimately equip future generations with the knowledge and skills to mitigate, or even avoid, environmental perils.

Professional environmental education has burgeoned in the past three decades and become highly popular. Annually, an estimated 30 million K-12 students and more than 1.2 million teachers participate in environmental instruction. Moreover, hundreds of colleges and universities now have environmental science and related natural resource programs. A wide range of education and training opportunities are also available to adults through post high school programs, the media, the Internet, conservation centers, zoos, aquariums and museums, and career-related professional development.

The field of environmental educators occupies a special place in the realm of public education. Although some people incorrectly see the field as a direct educational extension of the nation's environmental activist movement, it is no such thing. In actuality, the field is populated by dedicated and disciplined educational professionals who offer students and many adults a well-rounded, balanced, and vital learning opportunity. Environmental education (EE) is a rich mixture of teaching strategies, subject matter, learning locations, and multi-disciplinary complexity. Unlike many arms of education that impart cognitive knowledge and stop there, environmental education pursues a powerful mix of deep understanding tied to the ability to apply what has been learned. This fuller approach – what the experts call "environmental literacy" – is defined in detail in Chapter 5.

So, how are we doing a generation and a half later? Have we succeeded in bringing environmental literacy to those who will soon be running the nation's businesses, schools, and communities – or is there considerably more we need to do?

The NEETF/Roper Survey of Environmental Knowledge

These are questions we began to explore in 1997 when we first converted our ongoing survey/research partnership with Roper into an assessment of adult environmental knowledge. We felt that by directly quizzing adults of all ages we could get an idea of the impact of environmental education and perhaps make the case for tighter scientific study of this question. Such an assessment was overdue and had been called for by many educational professionals.

Roper officials were initially cautious about assessing adult knowledge. They worried how people might react to "being given a test." Fortunately, there were enough knowledge-related questions in some previous Roper surveys that their comfort levels soon rose and we were on our way.

Social scientist and educator Lynn Musser designed our first quiz. She selected question subjects that the public was likely to have heard about through the media, and pre-tested more than 50 such questions with focus groups to screen out confusion and bias. For the 1997 survey, 12 questions were crafted to reflect a profile of basic environmental knowledge. (See Appendix 1 for the full list of questions.) Each question was shaped into a multiple-choice format with one correct answer, one plausible but incorrect answer, and two non-plausible answers. Dr. Musser counseled us on the need to aim the questions at the average intelligent adult and to avoid using an insider's familiarity with the subject matter. Here are two examples:

What is the most common cause of pollution of streams, rivers, and oceans? Is it...

1. dumping of garbage by cities;
2. surface water running off yards, city streets, paved lots, and farm fields; (correct)
3. trash washed into the ocean from beaches; or
4. waste dumped by factories?

What is the primary benefit of wetlands? Do they ..

1. promote flooding;
2. help clean water before it enters lakes, streams, rivers, or oceans; (correct)
3. help keep the number of undesirable plants and animals low; or
4. provide good sites for landfills?

We were not looking for, nor did we expect to find, deep environmental science knowledge or even a complete understanding of basic issues. We mostly wanted to assess whether, after 30 plus years of growth in environmental education and media coverage, members of the public could readily identify the most significant environmental principles and related problems, and indicate a rough understanding of their causes and solutions. We also wanted to gain some rudimentary insight into the relationships among levels of environmental knowledge, attitudes toward the environment, and environmentally supportive behaviors. As will be discussed in later chapters, the professional EE field has developed clear benchmarks for environmental literacy. Our survey questions did not measure specific progress against these benchmarks, but probed at a much more general level.

NEETF/Roper Knowledge Reports

1997 – Basic environmental literacy

1998 – The influence of myths and misapprehensions

1999 – Readiness for the issues of the future

2001 – Basic environmental literacy reprised

2002 – Energy literacy

The results of the first quiz in 1997 were not too encouraging, but were not entirely discouraging either. The NEETF/Roper Report Card that year found that fully two-thirds of adults were unable to pass the quiz, and just one in 10 could answer 11 of 12 questions correctly, thus qualifying for an "A" grade.

In the ensuing years of research, we further discovered that the public fails to understand the basic principles underlying many of the major environmental subjects discussed in the media. Each of the NEETF/Roper studies from 1997 through 2001 found that Americans have low levels of knowledge on basic environmental facts, underlying science, causes of certain conditions, and important public environmental issues. After three decades of school-based environmental education programs, only one-third of American adults can pass a simple test of environmental knowledge with a grade equivalent to A, B, or C (see Figure 1-1). While it may be true that overall environmental consciousness has risen over time, a lack of sound and detailed environmental knowledge is the stark reality. This lack of detailed knowledge parallels other school-taught subjects such as the physical or life sciences. But, because environmental education has such strong implications for action in the real world, low knowledge levels are particularly troubling.

After three decades of school-based environmental education programs, only one-third of American adults can pass a simple test of environmental knowledge with a grade equivalent to A, B, or C.

Perhaps most disturbing, we also determined that there was no appreciable difference in knowledge levels between people who finished high school prior to 1970 and those who graduated after 1990 when EE was more commonplace in schools. If anything, the former are more knowledgeable about the environment. Subsequent studies have had similar findings and have helped us develop new strategies for creating more vital and viable environmental literacy in America.

Figure 1-1: National Environmental Report Card – 1997 and 2000

Subject: Environmental Knowledge • Student: The American Public

Grade		% of Total Sample Receiving Grade	% of Men Receiving Grade	% of Women Receiving Grade
A (11 or 12 correct)	Pass	11	15	6
B (10 correct)	Pass	10	14	7
C (9 correct)	Pass	11	14	8
D (8 correct)	Pass	13	13	13
F (7 or fewer)	Pass	55	45	65
Overall passing grade		32	43	21

The report card shows the percentage of Americans correctly answering each question for the 1997 and 2000 quizzes.

Source: NEETF & Roper, 1997 and 2001

This chapter recaps five years of NEETF/Roper research on adult Americans' knowledge of environmental issues, and combines those findings with the results of similar but independent studies, such as the Roper Green Gauge Report series. We also examine the sources of environmental knowledge that adult Americans regularly access.

The NEETF/Roper *Basic Environmental* Report Cards

The studies conducted in 1997 and 2000 are particularly telling for a number of reasons: both studies assessed *general* environmental knowledge, the quiz questions were fairly easy by most standards, the questions were pre-tested, and the subject matter had been visible in the media during the preceding 12 months (NEETF & Roper, 1997and 2001). Each survey sampled 1,500 adults and was designed as a set of multiple-choice questions administered by random telephone interview. (See Appendix 1 for a sample questionnaire, Appendix 2 for survey methodology.)

Questions posed in the 1997 and 2000 NEETF/Roper report cards addressed subjects ranging from energy, water, and air pollution, to habitat loss and more. Few people passed the overall quizzes, but several questions elicited high and encouraging response levels. After several years of probing public knowledge, a pattern became clear: higher levels of public knowledge are found on simple, one-step environmental issues; a considerable drop-off in levels of public comprehension occurs with more complex, multiple-step environmental issues or processes.

Originally the NEETF plan was to repeat the basic knowledge questions every three years or so, but we found there was little change from 1997 to 2000. (See Figure 1-2.)

Statewide studies in Minnesota and Pennsylvania have produced similar results. The Pennsylvania study (Pennsylvania Department of Environmental Protection, 1998) was modeled after, and almost identical in its results to, the nationwide NEETF/Roper studies of 1997 and 2000. The Minnesota study (Murphy, 2002) also showed nearly identical results, but Minnesota respondents scored higher on questions related to energy generation, water pollution, and climate change issues. Still, only 35% of Minnesotans overall passed the quiz.

The NEETF/Roper *Energy* Report Card

In an effort to elaborate on our understanding of basic environmental knowledge, we focused the 2001 NEETF/Roper Report Card questions on the important subject of energy (NEETF & Roper, 2002). With energy issues prominently featured in public discussions over the previous year, we assumed we would find higher levels of energy knowledge in the adult public than overall environmental knowledge. Instead, we found that just 12% of the adult public passed the ten-question energy quiz with a score of seven or more questions answered correctly. (See Figure 1-3.) Just 25% would have passed if the threshold were lowered to six or more correct answers. The public correctly answered an average of just 4.1 of the 10 energy questions, lower than they scored on general knowledge questions.

The public correctly answered an average of just 4.1 of the 10 energy questions, lower than they scored on general knowledge questions.

Figure 1-2: Percentage Answering Basic Knowledge Questions Correctly

Subject: Environmental Knowledge • Student: The American Public

Content of Environmental Knowledge Question	2000	1997
The most common source of water pollution	28	23
How most electricity in the United States is generated	33	33
Definition of biodiversity	41	40
The primary benefit of wetlands	53	53
Protection provided by ozone in Upper Atmosphere	54	57
Disposal of nuclear waste in the United States	57	58
Recognition of a renewable resource	65	66
The largest source of carbon monoxide (air pollution) in United States	65	69
Knowledge about materials considered hazardous waste	67	67
Name of the primary federal agency that works to protect the environment	72	74
The most common reason for extinction of animal and plant species	74	73
Where most household garbage ends up	85	83

Please see Appendix 1 for the exact wording of the questions.

Source: NEETF & Roper, 1997 and 2001

Figure 1-3: National Energy Report Card Results – 2001

Subject: Knowledge of Energy Issues and Problems, 2001 • Student: The American Public

Grade		% of Total Sample Receiving Grade	% of Men Receiving Grade	% of Women Receiving Grade
A (9-10 correct)	Pass	1	1	*
B (8 correct)	Pass	3	4	1
C (7 correct)	Pass	8	10	5
D (6 correct)	Fail	13	16	10
F (5 or fewer)	Fail	76	68	84
Overall passing grade		12	15	6

* Less than 0.5%

Source: NEETF & Roper, 2001

The survey's energy questions addressed issues that adult Americans were likely to be aware of from exposure in the media. They range from energy usage in the home to international import questions. (See Figure 1-4.) We should note that informal feedback on the energy survey indicated the questions were considered somewhat more difficult than the general knowledge test applied in 1997 and 2000.

The Environmental Knowledge "Gender Gap"

Figures 1-1 and 1-3 reported the results of the NEETF/Roper quiz by gender. Even a cursory examination of the figures suffices to show a significant difference in the responses of men and women in the studies. In the 1997 and 2000 NEETF/Roper studies, men averaged 7.75 correct answers while women answered an average of 6.25 questions correctly. (See Figure 1-5.) Looking at the responses of those who received a "passing grade," the difference is more pronounced: 43% of men received a passing grade while only 21% of women passed (9 or more of a possible 12 correct answers).

The topics with the largest differences between males and females are: the primary benefit of wetlands (64% vs. 43%), disposal of nuclear waste in the United States today (67% vs. 48%), the function of ozone (63% vs. 46%), and how most electricity in the United States is generated (46% vs. 22%).

This disparity signals a special challenge for those working to increase environmental literacy nationwide. Although women consistently register higher support for the environment over

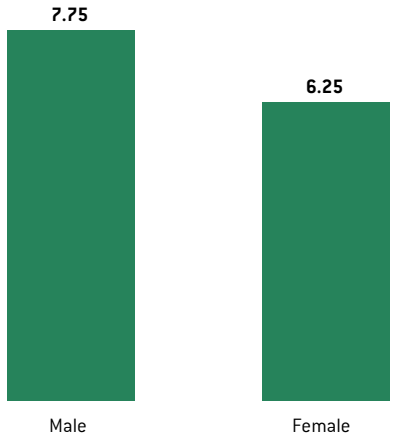
Figure 1-4: Percentage Answering Energy Knowledge Questions Correctly

Content of Energy Knowledge Question	2001
Source of most energy usage in average home	66
Percentage of oil imported from foreign sources	52
Percentage of world's energy consumed by United States	50
Disposal of nuclear waste in the United States	47
Fastest and most cost-effective way to address energy needs	39
United States industry increased energy demands the most in past ten years	39
Fuel used to generate most energy in the United States	36
How most electricity in the United States is generated	36
Sector of United States economy consuming greatest percentage of petroleum	33
Average miles per gallon used by vehicles in past ten years	17
Average number of correct answers:	4.1

Source: NEETF & Roper, 2002.

Figure 1-5:
Basic Environmental Knowledge by Gender, 2000

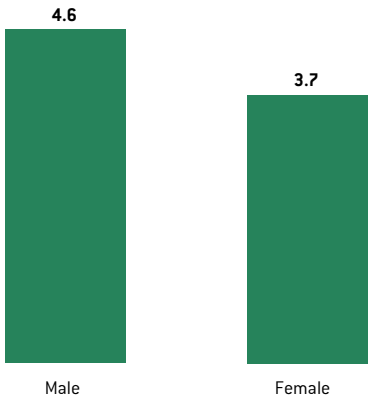
Mean number of correct answers in 12-question quiz



Source: NEETF & Roper, 2001

Figure 1-6:
Energy Knowledge by Gender, 2001

Mean number of correct answers in 10-question quiz



Source: NEETF & Roper, 2002

the economy, and more support for additional environmental regulation (see Appendix 6), when it comes to environmental knowledge this "gender gap" is reversed.

The men and women in the survey sample generally have the same levels of education. This is particularly true of the age groups younger than 45 years. The main difference between men and women from an educational perspective may be their knowledge of, and involvement in, science and technology. Nationwide, men are twice as likely as women to have education and/or a career in science-related fields. Educators we have consulted think this could help explain why men outperform women on the NEETF/Roper environmental knowledge tests. We did note while designing the 1997 study that in focus groups made up of environmental science graduate school students, women and men performed equally well on the quiz; however, this was too small a sample to be statistically valid.

The main difference between men and women from an educational perspective may be their knowledge of, and involvement in, science and technology.

The gender disparity in environmental knowledge was the same for the energy quiz, with men in the 2001 NEETF/Roper study outperforming women on energy knowledge questions. Men averaged 4.6 correct answers (out of 10 questions), while women answered an average of 3.7 questions correctly. (See Figure 1-6.) When we look at the responses of those who received a "passing grade" (i.e., 7 or more correct answers), the difference is more pronounced: 15% of men received a passing grade, while only 6% of women passed. (See Figure 1-3.)

The energy issues with the largest differences between males and females are: the way most electricity in the United States is generated (47% vs. 25%); disposal of nuclear waste in the United States today (57% vs. 39%); and the percentage of oil imported from foreign sources (60% vs. 44%). For five of the ten questions, there is no significant difference between the proportion of men and women answering correctly.

The environmental knowledge gender gap has surfaced elsewhere too. A 2001 study done in the United Kingdom by the Department for Environment Food and Rural Affairs found that 86% of men reported having heard of climate change, while 69% of women had heard of the subject. Some 42% of men had heard of sustainability compared to 26% of women; 33% of men had heard of biodiversity vs. 19% of women.

The knowledge gender gap may begin to form early. A study of the environmental knowledge, attitudes, and behaviors of 251 high school seniors in a Maryland county found that males scored higher on environmental knowledge but females scored higher on awareness and behavior (Haddon, 1995). The study offered no explanation for the differences. However, the study also found that both male and female 10th graders evidenced more environmental knowledge than students in 11th and 12th grades, and attributed that to the recent introduction of EE into the 10th grade curriculum.

An Unexpected Age Profile

A person speculating on the state of environmental knowledge today would likely assume that younger people, ages 18 to 34, would know more about the environment than older people. The logic is impeccable: younger adults who were exposed to formal EE in school since the late 1970s should know more than older adults. The reality, however, is different. Both the 1997 and 2000 studies found that Americans aged 35 to 54 – *not* those aged 18 to 34 – are more knowledgeable about the environment. The differences, as shown in Figure 1-7, are slight but statistically significant.

Given that older adults, including "Baby Boomers," had little or no environmental education in school, this suggests that environmental knowledge is acquired over a lifetime and probably mostly through the media. Adults, as discussed later in this chapter, obtain their environmental knowledge from many sources – jobs, friends, television, etc. This is true for most adult learning. However, the slightly higher knowledge in older people also made us wonder about the weaknesses in current environmental education of school children. It may also be that what actually gets through to the student is too scattered, episodic, and out of sequence to build a durable base of knowledge and a critical mass of environmental literacy.

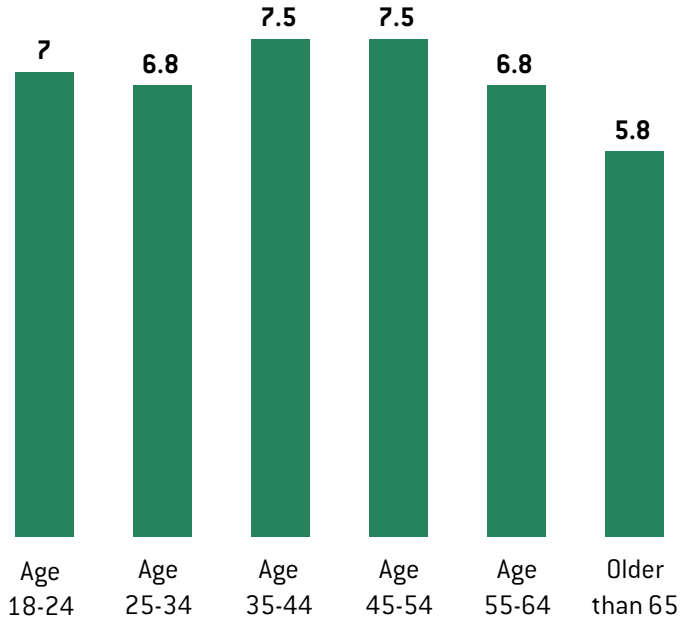
As with general environmental knowledge, knowledge of energy issues shows the same relationship with age, whereby Americans age 35-64 are the most knowledgeable, followed closely by those age 18-34. (See Figure 1-8.) Each of these groups correctly answers significantly more questions than those age 65 and older. This pattern may be a reflection of overall interest in science and the environment (other Roper data show that interests in both topics peaks among middle-aged Americans), as well as interest in technology (for which interest decreases with age).

The energy issues with the largest differences between the various age groups were: the fastest and most cost-effective way to address the nation's energy needs; the disposal of nuclear waste in the United States today; and the U.S. industry that increased its energy demands the most in the past ten years. However, for four of the ten questions, there were no significant differences by age group.

The explanation of age group differences may reflect not only the effectiveness of EE, but also the differences in interest levels between adults and children. When asked about a range of issues including the environment, fully 82% of adults say they are interested in the

Figure 1-7: Environmental Knowledge Results by Age, 2000

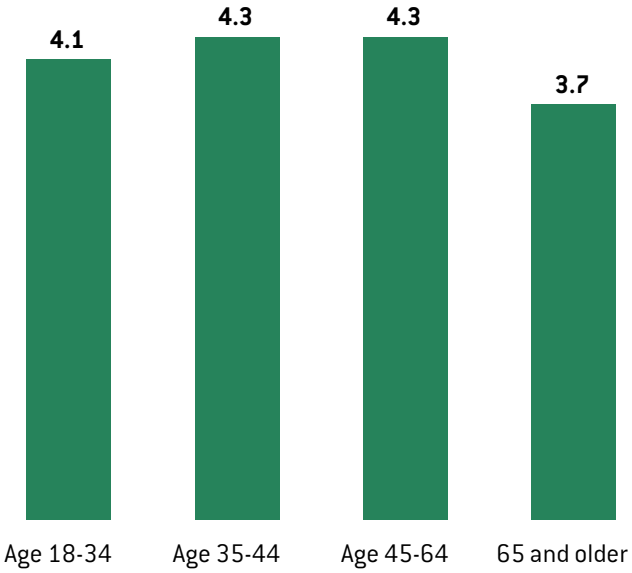
Mean number of correct answers in 12-question quiz



Source: NEETF & Roper, 2001

Figure 1-8: Energy Knowledge Results by Age, 2001

Mean number of correct answers in 10-question quiz



Source: NEETF & Roper, 2002

environment, as compared to just 55% of children (although 75% of children say they are interested in nature and animals) (Roper, 2001).

There is a common assumption that adults with children in the home have a higher level of environmental knowledge than adults without children in the home. Some studies of parent awareness of cigarette smoking issues, for example, have shown that children were a factor in building awareness and knowledge. Although this may also be true of the environment, five years of NEETF/Roper data find no statistical difference in environmental knowledge between the two groups. The long-accepted idea that children are a significant factor in passing environmental knowledge on to their parents is not supported by our data. Parents and non-parents performed virtually the same on the 1997 and 2000 NEETF/Roper quizzes (7.0 correct answers vs. 6.9).

In other studies, however, some parents identify children as a source of environmental information. Green Gauge data in 2000 and 2001 reported that between 11% and 16% of adults said their children were a source of information on the environment.

Neither do children seem to play a major role in passing on energy knowledge to their parents. Parents (4.3 correct answers) and non-parents (4.1 correct) perform statistically the same on the energy quiz. The only issue that parents are significantly more likely than non-parents to answer correctly is the fastest and most cost-effective way to address the nation's energy needs.

Education Levels Are Significant Factors

The NEETF/Roper studies find that the most significant single factor in the level of environmental knowledge appears to be people's level of education. In the 2000 report card, for example, Americans with less than a high school education averaged 5.8 correct answers (5.7 in 1997). This compares to 7.6 correct answers for those with some college education (7.5 in 1997), and 8.6 (8.3 in 1997) among those who graduated from college. (See Figure 1-9.)

The issues with the greatest divergence in the number of correct responses between college graduates and high school graduates are: the definition of biodiversity (70% college graduates, 23% high school graduates); the primary benefit of wetlands (71% vs. 41%); and disposal of nuclear waste in the United States (74% vs. 45%). Importantly, this may show that higher levels of education are helpful to a person's understanding of complex subject matter.

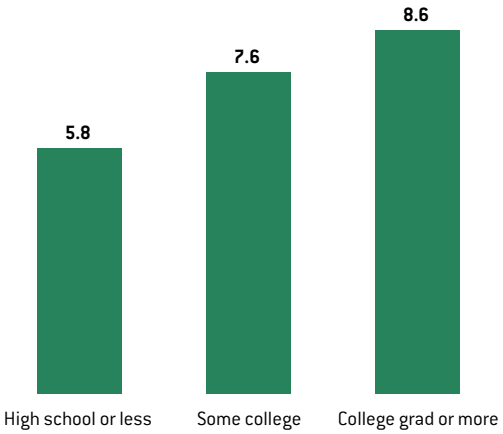
Level of education is equally significant as a predictor of knowledge of energy issues. (See Figure 1-10.) Americans with less than a high school education average just 3.7 correct answers out of 10. This compares to 4.4 correct answers for those with some college education, and 4.9 among those who graduated from college.

The energy issues that show the largest differences in number of correct responses between college and high school graduates are: disposal of nuclear waste in the United States (65% college graduates, 38% high school graduates); how most electricity in the U.S. is generated (51% vs. 28%); and the percentage of world's energy consumed by United States (62% vs. 43%).

Surprisingly, Americans with no more than a high school education are more likely – by a 42% to 34% margin – than those with a college degree to correctly answer that the U.S. industry that increased its energy demands the most in the past ten years was transportation.

Figure 1-9: Basic Environmental Knowledge by Education Level, 2000

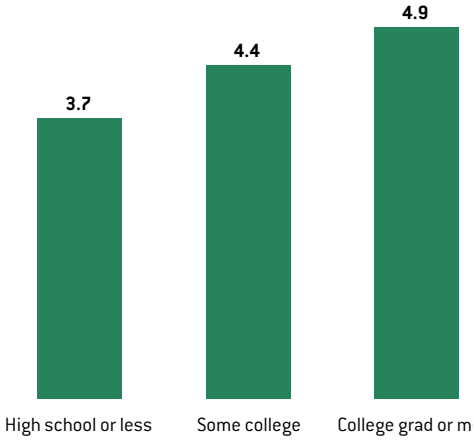
Mean number of correct answers in 12-question quiz



Source: NEETF & Roper, 2001

Figure 1-10: Energy Knowledge by Education Level, 2001

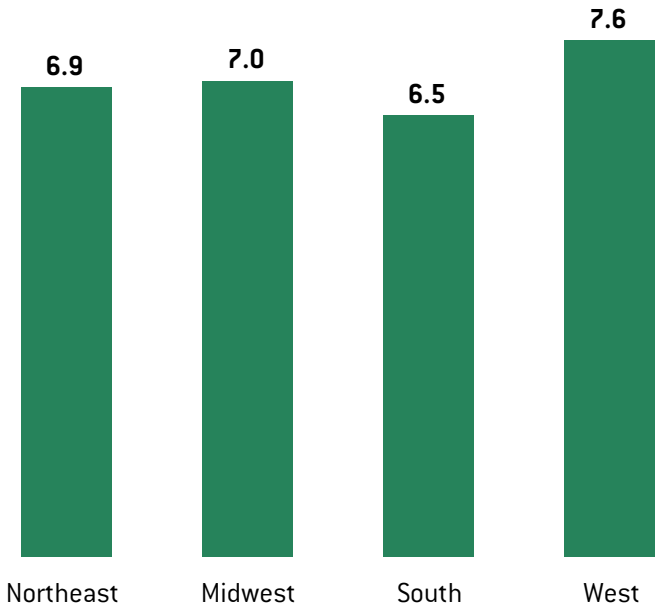
Mean number of correct answers in 10-question quiz



Source: NEETF & Roper, 2002

Figure 1-11: Basic Environmental Knowledge by U.S. Region, 2000

Mean number of correct answers in 12-question quiz



Source: NEETF & Roper, 2001

Figure 1-12: Percentage of Adults Answering National Geographic Questions Correctly

	All	Male	Female
Most water pollution comes from industrial sources	67	58	78
Not all rivers are fresh water (such as rivers near oceans)	66	66	67
A watershed is also a wetland because it gets flooded	65	58	73
Runoff causes more pollution than industry facilities	59	60	57

Source: Penn, Schoen and Berland Associates, 2000a

This is the only topic showing this pattern; for the other nine questions, higher education levels equate with higher proportions of correct answers.

Regional Differences in Environmental Knowledge

Geographic region is somewhat of a factor in environmental knowledge, as seen throughout the NEETF/Roper surveys. The 2000 study, for example, found that Americans in western states tend to score better (7.6 correct answers) than those in other parts of the nation. (See Figure 1-11 on the previous page.) Other Roper data show that Westerners spend more time outdoors or engaged in recreational activities than other Americans, which could be one reason for the knowledge difference. In Chapter 5 we discuss how environmental education that includes field study and outdoor experiences is particularly effective.

The questions with the largest differences among the four regions of the nation are: the disposal of nuclear waste in the United States, the definition of biodiversity, and an example of a renewable resource.

Figure 1-13: International Comparison of Knowledge of Scientific and Environmental Facts

Mean number of correct answers in a seven -question quiz

Sources: Gendall, et al., 1995.

Corroborating Research on Environmental Knowledge

On a national scale, the NEETF/Roper report cards offer informative by no means definitive insights into the scope of environmental knowledge. The results, however, are consistent with other studies, such as the National Geographic Society's Education Foundation and River Network studies in 2000 of children's and adults' knowledge of rivers. As Figure 1-12 shows, approximately two thirds of the 750 adult respondents answered the knowledge questions incorrectly.

The International Social Survey Programme, a collaborative of leading academic institutions in 22 countries conducted a study of public understanding of broad scientific and environmental facts (Gendall, Smith, & Russell, 1995). The questions were placed in a true/false format that raised the opportunity for a correct answer. In response to seven questions on the environment, U.S. respondents had close to the lowest score, with an average of 4.2 answers correct. That put U.S. respondents about even with East and West Germany, but lower than people from Great Britain (4.5), New Zealand (4.7), and Norway (4.6). (See Figure 1-13 on the previous page.)

Another study conducted in 1999 explored five multi-choice knowledge questions concerning ocean resources. The Ocean Project study found that only about 10% of the respondents answered four to five of the questions correctly, while 40% could do no better than one correct response. These findings and percentages are consistent with NEETF/Roper data on environmental knowledge, which indicate some level of awareness but very little detailed knowledge.

A significant information gap uncovered in the Ocean Project study is that people do not understand the depth and complexity of the ocean ecosystem, including its capacity to generate fresh supplies of oxygen for the planet. Probably due to years of public education on the importance of trees, forests, and other plant resources as a source of oxygen for the planet, 75% of respondents incorrectly said that forests generate more oxygen than oceans. Oceans in fact generate 70% of the world's oxygen supply. In keeping with the lack of knowledge of the richness and complexity of the ocean ecosystem, 60% of respondents did not know that more plant and animal species live in oceans than on land.

Also similar to NEETF/Roper data, higher education levels were associated with somewhat higher levels of correct responses to questions. In a study by the American Association for the Advancement of Science (AAAS, 2003) on the question of whether human-made stresses are endangering coastal regions and the ocean's ability to sustain itself, 84% of respondents with college plus education perceived the threats, while 74% of respondents with high school or less level of education did so. Conversely, 16% of the more educated group believed oceans are so vast and healthy they can absorb pollution and other stresses, as compared to 26% of the less educated group.

Dissecting the Knowledge Gap

With consistent and clear evidence that Americans do not have a deep understanding of environmental issues, it is worth investigating the "knowledge gap" in more detail. Two elements of that are discussed here.

A. Terminology Disconnect

Some of the easier-to-find reasons for the environmental knowledge gap have to do with terminology. Environmental scientists and experts don't always help with public understanding; too often they assume that the public easily grasps what they consider rudimentary concepts and relationships. Consider the prevalent use among experts of the term "watershed" in public policy discussions of water quality. Every public agency that addresses water resource management, land planning, or related subjects relies on the watershed concept as an organizing principle. A watershed is defined as "an area of land that, due to its natural drainage pattern, collects precipitation and deposits it into a particular body of water." In the West these land areas are often called "drainages" and throughout the nation they are sometimes referred to as river or stream "basins."

The 1997 and 2000 NEETF/Roper Surveys provided the public with several possible definitions of a "watershed," and 41% of respondents were able to identify the true meaning of the term. (This number may be artificially high because of the multiple choice format.) Significantly, 35% were unable to venture a guess even when presented with the options. When considering that the bulk of our water pollution problems come from water run-off, there is logic to addressing water pollution issues through a basin-wide or watershed-wide approach. The issue is that people need to be more aware of what a watershed is, how it functions, and what effect poor watershed condition can have on their own lives, health, and activities.

Another related water term that relies on understanding of causal steps is "non point source pollution." It grew out of the taxonomy of the Clean Water Act as a way to contrast specific or "point" sources of pollution, such as the outflow of a water treatment plant, with run-off from the land (non-point). Such run-off, according to the U.S. Environmental Protection Agency, is now the leading form of water pollution and is discussed frequently by environmental experts. The term's consistent usage assumes that the public understands that rain water causes pollution on the ground to "run off" into streams, lakes, and bays. The Roper/NEETF research indicates low levels of comprehension of this process. A National Geographic study (Penn, Schoen and Berland, 2000a) found that only 14% of the public is familiar with the term "non-point source pollution."

Few people seem to grasp multi-step causal relationships even when they involve such critical concerns as water pollution caused by run-off from the land.

B. Chronic "Causal Disconnect"

By far the biggest problem in the level of environmental knowledge of Americans is not a lack of knowledge of terminology or even of environmental facts. While a command of factual information is certainly helpful, the goal is not to become an "environmental encyclopedia." Instead, environmental education is more about understanding important causal relationships – what might cause air and water pollution, the ramifications of recycling, what contributes to species loss, how different parts of a moving system affect one another, and about an individual's ability to sort out those connections. This understanding of causal connection is the single biggest problem in the environmental knowledge gap.

The NEETF/Roper studies show that most people grasp simple one-step causes of problems easily enough. The majority can, for example, understand that a car pollutes the atmosphere or a factory can pollute a stream. But add a couple of complicating steps to the process (a car deposits small amounts of oil on the ground and rain washes it into a drain that eventually goes to a stream), and understanding drops off steeply. Few people seem to grasp multi-step causal relationships even when they involve such critical concerns as water pollution caused by run-off from the land, or how the use of electricity affects the quality and temperature of the atmosphere.

That is why environmental educators place such emphasis on the *process* of learning. With subject matter as complex and diverse as the environment, learning raw facts alone is fairly meaningless. The true challenge is to equip the learner with a set of decision-making and problem solving approaches (Disinger, 1989). Understanding complex causal relationships requires systematic environmental education; it cannot be expected to occur in response to occasional stories in the media.

An important study of Ohio adults (Manci, Carr, & Morrone, 1999) offers tremendous hope. It indicates that people probably have an innate ability to grasp such basic ecological principles and apply them to factual settings if the principles are clearly and simply presented. The Ohio study finds that people can reason-through answers with even a modicum of information presented in a multiple-choice question. The study found, for example, that people grasp that increasing population increases the potential for pollution; that mosquitoes can over time become resistant to insect sprays; that crop rotation decreases the need for pesticides; and that when natural deer predators are removed, the number of deer in an area will increase. Similarly, a 1996 SeaWeb study indicated that providing even simple causal information to the public – such as "all water ends in ocean" – lets people see how sewage, run-off, and rainwater are connected.

Figure 1-14: Major Sources of Environmental Information

Percentage of adults responding

Mode	2000	2001
Television	59%	63%
Newspapers	57%	59%
Environmental groups	39%	31%
Radio	33%	32%
Product packaging	n/a	27%
Government	27%	n/a
Internet	19%	23%
Your children	16%	11%
Large companies	13%	n/a

Sources: Roper, 2000 and 2001

Sources of Environmental Knowledge for American Adults

Where do adult Americans typically acquire their environmental knowledge? Most adults, particularly those older than 35, did not receive much environmental education in school. About half of those in the age group of 18 and 35 had some form of organized EE in school. The media is by far the leading source of environmental information for adults. Although adults may have a more mature capacity to absorb and process the environmental information they receive, they generally do so without the guidance of thoughtful instructors. For a profile of adult sources of environmental information, the Roper Green Gauge reports identify major sources of environmental information for adults, as shown in Figure 1-14.

These reports support the idea that most adult Americans rely mainly on traditional media sources (TV, newspapers) to satisfy their environmental information needs. Relatively few are inclined to go out of their way to seek out information; it seems fair to say that most information gathering happens in a fairly haphazard manner.

Interest in the environment increases and decreases based on external forces. The 2003 Roper Green Gauge report found that, in the face of a downturn in the economy and more pronounced security concerns, fewer Americans were educating themselves about the environment. Only 52% of Americans – down 9 points from 2002 – said they often or sometimes read an article or watch a TV show or some other source of environmental information. Another large decline in 2003 was the number of people turning to newspapers for environmental information – down 9 points from the previous year to 48%.

What People Think They Know

Now that we have a general sense of what adult Americans know and don't know about the environment and where they acquired this information, it's interesting to examine

Figure 1-15: Self-Assessed Knowledge of Environmental Issues, by Year

Percentage responding

	Practically Nothing	Only a Little	A Fair Amount	A Lot
2000	6	24	59	11
1999	5	25	59	10
1998	5	27	58	10
1997	4	30	55	10
1996	5	32	53	9
1995	4	32	54	10

Question wording: In general, how much do you feel you know about environmental issues and problems – would you say you know a lot, a fair amount, only a little, or practically nothing?

Sources: NEETF & Roper, 1995-2001

what Americans *think* they know. Since 1997, NEETF has been collecting data to compare *perceived* levels of knowledge to *actual* levels. Our studies have found a generally positive relationship between self-reported knowledge and actual knowledge, but the degree to which Americans feel knowledgeable about the environment is out of proportion to reality.

Despite their own poor performance on quizzes, Americans believe themselves to be fairly knowledgeable about environmental issues and problems. Seven in ten rate themselves as having "a lot" (11%) or "a fair amount" (59%) of knowledge about the environment (see Figure 1-15). Following the pattern seen in recent years, self-assessed knowledge is higher among men than women (76% vs. 65%), and peaks among people age 45-64 (76%, compared to 68% among those 18-34 and 62% among those 65 and older).

Despite their own poor performance on quizzes, Americans believe themselves to be fairly knowledgeable about environmental issues and problems.

In addition to *environmental* knowledge, most Americans overestimate their *energy* knowledge too. In 2001, three Americans in four rated themselves as having "a lot" or "a fair amount" of knowledge about energy, even though just 12% passed our quiz. This gap between real and imagined knowledge could stand in the way of Americans realizing a more energy efficient future.

As seen in previous years, there are important differences among gender, education and age subgroups for the combined know "a lot" and know "a fair amount" figures. On a self-reported basis, 72% of men say they know at least a fair amount about environmental issues (13% "a lot"), compared to 65% of women (8% "a lot"). Self-reported environmental knowledge increases dramatically with education, from 60% among those who are high school graduates, to 75% of those with some college, and to 81% of those with at least a college degree.

In a pattern also seen in 1997, self-reported environmental knowledge peaks among those age 35-44 (70%) and 45-64 (73%), compared to 66% among 18-34 year olds and 59% among

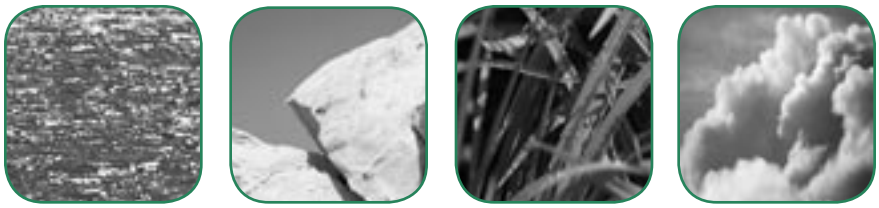
those 65 or older. Despite increased emphasis on environmental education in schools and colleges in the last three decades, it might be that life experience and exposure to newspapers and television have provided Americans age 35 to 64 with sufficient information to make them feel knowledgeable about environmental issues and problems.

The 2003 Roper Green Gauge Report shows a 5 point decline in the number of people who feel they know a lot or a fair amount about key environmental issues. Roper ascribes this to an overall lowering of public environmental concern in the face of increased homeland security risks and a downswing in the economy. This also points to the idea that self-reported knowledge may be as much an attitudinal measure as a measure of actual knowledge. The decline may also due to fewer environmental stories and media coverage in the last several years while other topics have received more attention.

Given that adult Americans receive most of their environmental information from the media (television, newspapers, radio), it is not surprising that adult Americans lack a foundation of deep environmental understanding. Media coverage of environmental issues is seldom intended to produce a depth understanding. It is also not surprising that adult Americans think they know more than they do – again, the more superficial coverage of issues in the media produces familiarity, rather than understanding. As we shall see in Chapter 5, familiarity or awareness is an important first step in environmental literacy – but it's only the first step.

The media's impact

on environmental knowledge should not be ignored or underestimated by educators.



Chapter 2

Beliefs: Environmental Myths and the Media

The formal field of environmental education has never quite come to grips with the undeniable power of the media as both a positive and negative source of environmental information and knowledge. The common view among environmental educators is that the media does not supply much actual *education*; instead, the media is a powerful form of environmental *information*. The result of this view is that environmental educators tend to focus on education programs and to largely ignore how the media affects baseline public environmental knowledge. By contrast, organizations that have a strong stance as advocates for environmental protection often employ the media as a principal tool of public communication and have less patience for or interest in formal pedagogy.

The NEETF/Roper data over the past decade strongly imply that the media's impact on environmental knowledge should be taken more seriously and not ignored or underestimated by educators. That is because the media supplies a steady stream of sometimes complex and sometimes oversimplified environmental information that lands upon a fairly sketchy and unreliable base of pre-existing environmental knowledge. One study explains this by comparing the effect of television vs. classroom instruction. Students who relied on television as a source of information showed greater knowledge about global warming but also held more misconceptions. Students who reported learning most about the greenhouse effect from school held fewer misconceptions (Boyes & Stanisstreet, 2001b).

Public tendencies to oversimplify complex issues can lead to incorrect, sometimes humorous, misconceptions.

It is not that the media is supplying incorrect information. Rather, individuals assimilate sound-bites and information in their own unique way and according to their own unique worldview. We all have different "knowledge structures," as cognitive scientists would call them. The assimilation of limited information into pre-existing ideas can result in powerful beliefs that defy the normal mitigating factors of education. For ready reference we have labeled these widely-held misperceptions as "myths." Our 1998 study examined their power.

Reinforced Myths and Misperceptions

Public tendencies to oversimplify complex issues can lead to incorrect, sometimes humorous, misconceptions. The NEETF/Roper (1998) data found, for example, that 45 million Americans think the ocean is a source of drinking water. One hundred million Americans think that aerosol cans are the main source of CFCs going into the atmosphere (in truth, CFCs in spray cans were completely banned in 1978), and a similar number think that disposable diapers are the leading problem in landfills (they actually account for about 1% of what ends up in land fills; paper products are by far the larger problem).

Critics of environmental education have gone so far as to speculate that these types of misperceptions are the result of some form of environmental zealots' plot. The truth is much more interesting. While there is no conspiracy to mislead the public, there are a number of powerful forces at work that affect how people hear environmental information and how they absorb it.

In an attempt to measure the templates or beliefs that adult Americans hold with respect to the environment, the 1998 NEETF/Roper Survey focused on some prevailing myths and misperceptions. It asked the public ten multiple-choice questions and five true/false questions. As with the other studies, each multiple-choice question had four possible answers – the correct answer, two plausible sounding but incorrect answers and, for this study, one "myth" answer. Americans were also given the option to say that they "don't know" the answer. Each question addressed an issue that had been visibly covered in the media over the previous year.

We discovered how powerful some myths are. In seven of the ten multiple-choice questions in the 1998 survey, the myth answer was selected most often. In fact, as Figure 2-1 shows, in three cases, a *majority* of Americans gave the incorrect myth response.

Environmental Myths vs. Reality

Myth	Reality
America uses air pollution-free energy. (hydro-nuclear-solar)	Most electricity is produced by burning coal which causes air pollution
Spray cans contain CFC's and are dangerous.	CFCs were banned from aerosol cans in 1978.
Underground nuclear fuel storage is safe.	No fail-safe, permanent solution has yet been found.
Diapers fill landfills.	Paper products are 50 times more a factor.
Famine is the primary cause of childhood death worldwide.	Water pollution causes more childhood death, by far
Most water pollution is caused by factories.	Factories are still a problem, but land run-off is the number one problem now

Figure 2-1: Responses to Environmental Knowledge Questions, 1998

Content of Environmental Knowledge Question	Percentage Giving "Myth" Response	Percentage Answering Correctly
The goal of paper recycling programs	63	24
Leading cause of entanglement	56	10
Leading cause of childhood death worldwide	55	9
Most common source of water pollution	47	22
Primary source of oil found in rivers, lakes, and bays	40	16
How most electricity in the United States is generated	38	27
How the United States disposes of spent nuclear fuel	34	17
Only current sources of CFCs in the United States	32	33
Greatest source of landfill material	29	23
Definition of a watershed	11	41

Source: NEETF & Roper Starch Worldwide, 1998

Since significant numbers of Americans believe in common environmental myths and others give either of the two plausible but incorrect responses in the NEETF/Roper quizzes, the percentage who correctly answer each of the ten questions is relatively small. As seen in Figure 2-1, at most 41% and as few as 9% give the correct answer to any one of the questions. These low figures are especially important since knowledge is often linked to behavior. In fact, Americans correctly answer an average of just 2.2 out of ten questions. Random guesses would have produced 2.5 correct responses due to the four-answer multiple-choice format of the quiz.

Myths and the Media

The origins of these environmental myths have not been carefully studied but their very nature provides us with clues. One can readily imagine how media-based information delivered in sharply focused sound bites, combined with pre-existing cognitive structures and knowledge allow for a sort of mental "editing" that gives a myth its durability. Reading between the lines, the NEETF/Roper data indicate at least four ways the myths become widespread and accepted:

Myth Process 1 – Vivid Images Burned on the Collective Mind

In 1969 the Cuyahoga River in Ohio became so polluted and full of oily trash and residue that it caught on fire. The image, shown on television and in newspapers, burned itself deeply into the American mind. Reinforced by similar examples of industrial pollution, the nation galvanized around environmental cleanup for factories, sewer plants, and other large

America's car-owners

are now the number one

oil pollution source.

pollution sources. Perhaps because of the power of these vivid images, or perhaps because industrial pollution formed the main focus of government and media attention at the time when most American adults were just learning about environmental pollution, a majority of study respondents are stuck in the mindset of environmental conditions of thirty years ago. They continue to believe, thirty years later, that large industrial facilities are the primary cause of pollution. The fact is, government regulation of such facilities in the intervening years, coupled with new and more difficult-to-control sources of pollution, have changed the relative rankings of pollution problems. For example:

A. The Main Form of Pollution of Rivers and Streams

Few Americans understand that precipitation running off from farm fields, roads, parking lots, and lawns (called "non-point source" pollution) is the leading cause of water pollution in America today. NEETF/Roper studies found that just 22% of Americans know that run-off is the most common form of pollution of streams, rivers, and oceans, while nearly half of Americans (47%) think the most common form is waste dumped by factories (NEETF & Roper, 1997 and 2001). Factories and municipalities remain a cause of water pollution and must continue their clean-up efforts, but they are no longer the leading cause as they were in the 1960s and 1970s. Many government programs acknowledge the importance of looking closely at run-off pollution and are focusing on land use management, improved farming and timber practices, and more. For these programs to be successful, however, there surely must be greater understanding of the run-off problem – how significant it is, where it comes from, and how to prevent it. Indeed, Americans routinely identify clean and safe water as a top priority, but they may be reluctant to accept that their own day-to-day actions and those of their neighbors have a substantial effect on water quality.

B. The Main Source of Oil into Rivers, Lakes, and Bays

It has been 16 years since the oil tanker Exxon Valdez ran aground in March 1989 in Prince William Sound in Alaska. The tanker released millions of gallons of crude oil into a pristine natural ecosystem. The image was vivid and public recognition of the accident is nearly universal. But, according to public agencies including the U.S. EPA and NASA, many millions of gallons of petroleum still find their way into rivers, lakes, bays, and the ocean each year through simple ignorance and thoughtlessness (NASA, 1992). There was a time, thirty years ago, when much of this petroleum pollution came from American industries. Today, individual vehicle users contribute the most to this pollution. The oil comes from people changing car oil and dumping it down a nearby storm drain or pouring it into the ground, or from poorly maintained automobiles. Estimates in the mid-1990s were that individual Americans dump more oil on a monthly basis than the entire amount of oil spilled by the Valdez (NASA, 1992). Just 16% of the American public knows this, while 40% believe that oil pollution comes primarily from ships and offshore oil well spills, and 17% think it comes mostly from coastal oil refinery discharges. As with the most common cause of water pollution, Americans continue to see larger industrial facilities as the main problem and may fail to consider the impacts of their own actions. Certainly steps must be taken by the petroleum industry to prevent oil spills and other pollution problems. But America's car owners would do well to understand they are now the number one oil pollution source.

Myth Process 2 – Persuasive, Powerful Consumer Campaigns

When the media picks up on an information campaign involving the potentially harmful effects of a consumer product, it can have a lasting impact on public knowledge. The NEETF/Roper studies indicate that even if a product is later rendered more environmentally benign, its initial damaged reputation will carry on. Moreover, sometimes a product is identified as *a* problem but through some subtle shift in mass perception, the product is redesignated as *the* problem. Here are some illustrations from the 1998 NEETF/Roper study.

120 million Americans

think spray cans still have CFCs in them even though CFCs were banned in 1978.

A. Current Source of Chlorofluorocarbons (CFCs)

In 1978, chlorofluorocarbons (CFCs) were completely banned from aerosol spray cans in American markets due to concern about their release into the Earth's upper atmosphere and their potential depleting effect on the globe's protective ozone layer. Yet, a generation later in 1998, 32% of Americans still said that spray cans are the *only* source of CFCs in America today. The fact is that CFCs are still found in some older auto air conditioners and refrigerators, but only 33% of Americans seem to recognize this. Another 9% think Styrofoam cups are the only source of CFCs, while 20% of Americans said they couldn't pick the answer. The public awareness campaign around CFCs in aerosol cans produced profound public sensitivity to the issue. By contrast, efforts to make people aware that CFCs have been banned from aerosol cans did not reach the same awareness level. Some spray can producers may actually add to the confusion out of self-defense by promoting their products as "CFC-free" due to the strength and persistence of this myth.

B. Wildlife Entanglement

In the 1980s, images of dead or injured birds or fish entangled in plastic beverage six-pack rings had an effect on millions of people across America. In kitchens, in schools, on boats, and at campsites everywhere, children and adults conscientiously snipped empty beverage six-pack rings with knives and scissors to keep wild animals from becoming ensnared and possibly harmed. The hopeful news here is that this "snipping" practice is vivid evidence of how the public can be mobilized around an environmental issue and how the public's behavior can change. However, plastic six-pack rings are not the leading cause of fish and wildlife entanglement in the United States or elsewhere. The main cause of such entanglement by far, according to the Oceans Conservancy in Washington, DC, is abandoned fishing line. This is a fact known by only 10% of Americans. Millions of anglers throughout America may be dutifully snipping their six-pack rings, but are just as readily cutting snagged fishing lines and leaving them in the wild to sometimes trap fish and wildlife. The myth that it is necessary to snip plastic rings is made more ironic by the fact that such rings are now designed to become brittle and breakable when exposed to direct sunlight (such as would occur if they are left outside where they could possibly harm wildlife).

The main cause of wildlife entanglement by far is abandoned fishing line. This is a fact known by only 10% of Americans.

C. Greatest Source of Landfill Material

Notwithstanding the shift to the computer age and the beginning of a switch to a paper-free society, paper products are still the number one source of landfill material in America. However, only about one American in four (23%) knows this, while 29% incorrectly think that disposable diapers are the greatest cause of over-stuffed landfills. This comes in part from yet another media-based consumer awareness campaign, in the early-to-mid 1980s. It identified diapers as a significant solid waste problem. The myth soon evolved so that, by 1998, diapers were seen by many as the *leading* source of landfill material. Indeed, diapers *are* a source of solid waste (about 1% of the total) and efforts to reduce waste of all sorts should continue. But, newspapers, boxes, packaging, and office paper should be clearly understood as the greatest largest sources of landfill material and a necessary focus of reduction, reuse, and recycling programs.

Myth Process 3 – Visible Public Debates that Go Unresolved

In a few situations, environmental problems such as the disposal of nuclear power plant waste or the incineration of chemical weapons are discussed so much in the public press without actually being resolved that the public thinks they are anyway. Two examples:

Only 27% of

Americans know that most of our electricity is produced by burning coal and other flammable materials.

A. Yucca Mountain and Nuclear Fuel Waste

The105 nuclear power plants in the United States generate approximately 20% of the nation's power. These plants make use of nuclear fuel rods that maintain a controlled nuclear reaction to power the plant and generate electricity. The fuel rods can produce energy for three to five years and then are no longer useful for that purpose. Though "spent" for fuel purposes the rods are still dangerously radioactive and will be for thousands of years. There are now some 40,000 tons of spent nuclear fuel in the U.S. There has never been a permanent and accepted way to dispose of these spent fuel rods despite seemingly endless rounds of discussion in the political arena, so the spent rods are kept on site at the power plants. Our 1998 survey found that 34% of Americans believe that spent fuel rods are safely stored in a secure underground facility in the West. Just 17% correctly know that the rods are being stored temporarily at the power plants and monitored. Significantly, 35% say they do not know what happens to the spent fuel.

B. SUVs and Average Gas Mileage

In the past 10 to 15 years the average number of miles per gallon of gasoline achieved by vehicles in America has decreased. Just one in seven, or 17% of adult Americans know this. The popularity of larger vehicles, such as sport utility vehicles (SUVs), has contributed to the average mileage decrease. Other factors found in the survey include less emphasis by younger age groups on fuel conserving driving habits. Importantly, two thirds of Americans fail to recognize that the transportation sector is the largest petroleum user in the U.S. The debate over an increased number of SUVs on the road goes on but, as the public may see it, gas mileage continues to improve and fuel economy may not be a significant need.

Myth Process 4 – Time-Honored Heroic Efforts

Just as the Cuyahoga River and Love Canal define the public's negative images of industrial pollution, so there are positive images in many Americans' minds of heroic public efforts relating to the environment that continue to color our views of how the world works. Examples include:

A. Electricity and the Iconic Dams of the West

Only 27% of Americans know that most of our electricity (some 60% of all electricity) is produced by burning coal and other flammable materials. Coal burning has clear implications for air quality in both the United States and in the larger context of the global climate change discussion. Most of the coal burned today is for electric energy purposes. But some 40% of people think that hydroelectric power is America's top source of energy (in reality it accounts for about 10% of the total). Add up hydropower, nuclear, and solar sources, and a majority of Americans think our electricity is generated in ways that have little or no impact on air quality.

Add up hydropower, nuclear, and solar sources, and a majority of Americans think our electricity is generated in ways that have little or no impact on air quality.

Although this point has not been studied, the public's view of the predominance of hydroelectric power may actually arise from the highly revered nature of public works projects in themselves. The public has received a fairly constant stream of information, documentaries, and historical accounts of the struggle of humans to tame the great rivers of the nation. Moreover, the dams themselves are vast and memorable structures.

B. CARE Packages vs. Water Purification

Many adult Americans grew up hearing about famine and starvation in other parts of the world and learned of the importance of sending food to less well-off nations. The term "care package" used so often in our vernacular grew out of this movement. As a result, perhaps, a majority of Americans (55%) continue to think that a lack of food rather than contaminated water causes most childhood deaths in the world. The role of the environment in worldwide loss of life remains one of the most critical and the least understood issues in the public mind. A recent report published in Lancet found that chronic diarrhea brought about through polluted water is the second leading cause of death in the world's children ("New Estimates," 2005). Only 7-9% of the American public understand this. The prevalence of the myth that lack of food is the main cause of childhood death could divert attention from the need for effective public health and environmental protection efforts in many nations around the world

Education has a single, consistent effect: Americans with a college degree are significantly more likely to give the correct answer than those with a high school education or less.

Environmental Myths and the Gender Gap

As Figure 2-2 shows, men and women are equally likely to give the incorrect myth answers to seven of the ten questions. In our view, this again indicates the powerful hold the myths have. The exceptions are:

- Most common water pollution source – 50% of women believe the myth versus 43% of men.
- How the United States disposes of spent nuclear fuel – 43% of men believe the myth vs. 26% of women.
- Greatest source of landfill material – more women (34%) believe the myth than men (24%).

Roper has speculated that the myths are so powerful that men and women are equally influenced to think the myths are correct.

Self-Reported Knowledge and Myths

Despite the fact that two-thirds of the American public say they know a fair amount about the environment, large numbers actually subscribe to environmental misapprehensions. Ironically, for several issues, those who think they know the most are the ones who are most likely to believe the environmental myth. (See Figure 2-3.) When asked about the leading cause of wildlife entanglement, 64% of those who say they know a lot about the environment give the myth response, compared to 59% of those who say they know a fair amount and 48% of those who say they know only a little or practically nothing about environmental issues and problems. Similarly, whereas 45% of those with the most self-reported knowledge give the myth response when asked about how the United States currently disposes of spent nuclear fuel, this falls to 38% for those with a fair amount of knowledge and 24% for those with only a little or practically no environmental knowledge. This pattern also holds true for the greatest source of landfill material.

Figure 2-2: Environmental Myths, by Gender

Percent answering question correctly

	Total	Male	Female
Definition of watershed	41	49	33
Only current source of CFCs in the United States	33	37	30
How most of the electricity in United States is generated	27	36	19
The goal of paper recycling programs	24	25	24
The greatest source of landfill material	23	28	19
Most common source of water pollution	22	29	15
How United States disposed of spent nuclear fuel	17	21	14
Primary source of oil in nation's rivers, lakes, bays	16	20	11
The leading cause of entanglement	10	9	10
The leading cause of childhood death worldwide	9	11	8

Source: NEETF & Roper Starch Worldwide, 1998

Figure 2-3: Environmental Myths, by Self-Reported Environmental Knowledge

Percent answering question correctly

		Self-Reported Environmental Knowledge		
Environmental Knowledge Question	Total Correct	A lot	A fair amount	Little/practically nothing
Definition of watershed	41	58	43	30
Only current source of CFCs in the United States	33	44	35	26
How most of the electricity in the United States is generated	27	35	30	20
The goal of paper recycling program	24	21	25	24
The greatest source of landfill material	23	22	26	18
Most common source of water pollution	22	31	23	18
How the United States disposed of spent nuclear fuel	17	20	19	13
Primary source of oil in nation's rivers, lakes, bays	16	25	16	11
The leading cause of entanglement	10	8	10	10
The leading cause of childhood death worldwide	9	18	10	6

Source: NEETF & Roper Starch Worldwide, 1998

However, on six of the ten issues, those who say they know a lot about the environment do give the correct response more often than the other knowledge subgroups. For example, though just one-third of all Americans in general can identify the only current source of CFCs in the United States, 44% of those who say they have a lot of environmental knowledge answer this question correctly, compared to 35% of those who say they have a fair amount of knowledge and 26% of those who say they possess only a little or practically no environmental knowledge.

In all, though, those who self-report a lot of environmental knowledge correctly answer an average of only 2.8 questions, slightly higher than the 2.4 average for those saying they have a fair amount of environmental knowledge and just one question better than those who say they know only a little or practically nothing of environmental issues and problems (1.8 correct). Thus, self-reported level of environmental knowledge can be a useful, but not always reliable, method for gauging *actual* environmental knowledge.

Figure 2-4: Environmental Myths and Knowledge, by Education Levels

Percent answering question correctly

		Education		
Environmental Knowledge Question	Total	HS graduate or less	Some college	College graduate or more
Definition of watershed	41	32	44	60
Only current source of CFCs in the United States	33	30	30	45
How most of the electricity in the United States is generated	27	22	28	39
The goal of paper recycling programs	24	19	31	30
The greatest source of landfill materials	23	19	25	31
Most common source of water pollution	22	17	22	34
How United States disposed of spent nuclear fuel	17	13	17	28
Primary source of oil in nation's rivers, lakes, bays	16	12	20	20
The leading cause of entanglement	10	10	10	8
The leading cause of childhood death worldwide	9	6	11	16

Source: NEETF & Roper Starch Worldwide, 1998

Education Levels and Myths

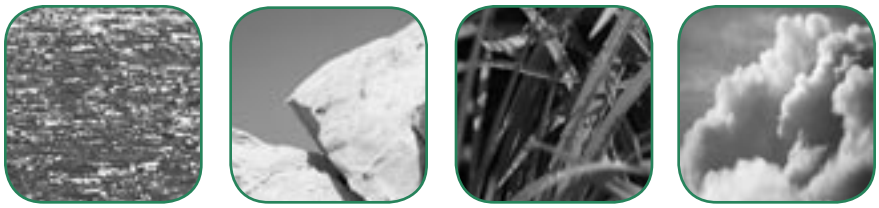
Formal education has a mixed impact on environmental knowledge, according to the 1998 NEETF/Roper survey. As Figure 2-4 shows, respondents with higher education levels answered more questions correctly but were almost as inclined to choose a myth response as respondents with lower education levels. Nevertheless, when it comes to answering the questions correctly, education has a single, consistent effect: Americans with a college degree are significantly more likely to give the correct answer than those with a high school education or less. For example, while 32% of those with a high school education know the definition of a watershed, this figure rises to 44% among those with some college and to 60% among college graduates (the only exception to this is the issue of entanglement, which few answer correctly regardless of education level).

Still, there is work to be done at all levels, as those with a high school education average just 1.8 correct questions, those with some college average 2.4 correct, and college graduates answer an average of only 3.1 questions correctly.

There are no consistent trends in the environmental knowledge survey by age or region. In fact, the relatively few differences among demographic subgroups highlight the universality of incorrect beliefs, and the need for more environmental education for all.

Two thirds of

Americans say that environmental protection and economic development can go hand in hand.



Chapter 3

Environmental Attitudes and Actions

With nearly 300 million people living in the United States, small across-the-board changes in behavior can have a huge impact. Unfortunately, as Roper research shows, people don't always know what to do to benefit the environment, and they often feel that small personal sacrifices won't mean anything when compared to the responses of a company or public institution.

This attitude is reflective of a lack of environmental knowledge. The lack of large-scale personal responses to environmental problems shows in many quarters. Many of today's leading pollution problems are increasingly the result of individual actions, personal consumer decisions, and the activities of small businesses. There was a time when larger companies and institutions were the leading causes of the problems. But now the indicator arrow tells us that a greater focus on the individual's environmental impact or "footprint" is appropriate.

Unfortunately, the individual's environmental "footprint" has been growing. Consumer packaging, energy usage, water usage, lawn care and pest management, the size of homes and vehicles, and other factors have collectively made the United States the world's top consumer of environmental resources. Our 4% of the world's population consumes 25% of the world's energy.

Many of today's leading pollution problems are increasingly the result of individual actions, personal consumer decisions, and the activities of small businesses.

What do Americans actually *do* to protect and care for the environment? NEETF/Roper research helps us get a handle on what millions of Americans do on a day-to-day, personal level to benefit the environment. This is the behavior that we call "environmental stewardship." The 2000 National Report Card study (NEETF & Roper, 2001) investigated some of the activities people engage in to benefit the environment, and indicates how these actions relate to beliefs and knowledge about the environment. This chapter reviews those findings, and correlates them with a related study conducted in Minnesota.

Attitudes Toward Environmental Stewardship

Over a ten-year period, the NEETF/Roper studies and supporting data have shown high levels of public support for the environment. The question asked most consistently in

the NEETF/Roper studies is whether people would "choose environmental protection or economic development if a choice had to be made." Usually 65% to 70% of the public say they would choose the environment, compared to roughly 25% who would select economic development. (See Appendix 6 for a full discussion of this issue.) Adult Americans also consistently support environmental education in the schools (see Chapter 6).

Evidence abounds that people respond positively on the environment when they know what to do. When for a while paper supermarket bags were identified as beneficial for the environment, compared to plastic, their use increased manifold. When plastic six-pack rings were publicized as a cause of wildlife entrapment, millions began snipping the rings with knives and scissors before throwing them out. These were easy-to-do actions. People felt they could make a real difference and that others were participating too. Although the environmental efficacy of these particular actions did not withstand later re-examination, people's willingness to take individual steps on behalf of environmental protection was impressive.

Evidence abounds that people respond positively on the environment when they know what to do.

The link between simple knowledge and behavior is positive but not very strong. Some factors militate against environmental stewardship; other factors encourage it. For example:

- Researchers have looked at the impact of cost and time constraints on the decision to take a pro-environment action. They conclude that people are relatively less inclined to take steps that will disrupt their lives (Lane, 1996).
- Social or community context appears to be one of the key factors that can motivate people to take pro-environment actions. Conversely, many people can be discouraged by what they perceive as a hopeless or overwhelming situation. Some 33% of Americans say they feel others are not sacrificing enough and there is little they can do by themselves (Roper, 2001).
- Another key factor is whether people experience a feeling of being in control, defined as access and convenience. Thus, curbside recycling has been more successful than asking people to take materials to local recycling centers.

The second factor helps to explain why a crisis situation can so readily mobilize people throughout the country to pitch in. In 2000, for example, California experienced frequent electricity blackouts. Government experts estimated that conservation efforts on the part of the public, including small businesses, would at best contribute 2% or 3% in overall energy demand reductions. The results were stunning. The Governor's "Kill a Watt" energy conservation program, aimed at individuals and small businesses, later found that the actual savings from a public education program was closer to 10% – far beyond original expectations (California Energy Commission, 2001). The public was made aware of the issue and told how to help; most important, people had the sense that they were not acting alone.

The assurance that individual action can make a difference is key to the success of public mobilization programs. The 2002 Roper Green Gauge report finds, for example, that 70% of Americans see recycling as effective with just 21% feeling it is not. That might also help explain the success of recycling programs, in addition to the fact that so many are strongly encouraged through local laws.

These observations help us resolve an ongoing debate about whether people will take pro-environment steps on their own or if they need prompting from laws, regulations, public

policy, or peer pressure. The answer is that both are important: environmental education works best in the context of an environmentally supportive society.

In looking at people's attitudes toward environmental stewardship, the Roper Green Gauge reports provide a number of valuable insights. The 2000 Green Gauge finds that many Americans (56%) say they want to help and do more for the environment but they do not know how. In this time of worry over growing apathy, that is an encouraging statistic. By contrast, some 36% say they would not do more even if they knew more. This too is a sizeable number but is also consistent with the Green Gauge classification of about one-third of Americans as "Basic Browns" who are hardcore in their lack of support for the environment and rarely, if ever, undertake environmental conservation activities.

The 2001 Roper Green Gauge report also finds that, even though 45% of Americans don't have the scientific and technical knowledge to understand environmental problems, 52% say they believe there is enough information available to answer questions they have about environmental conditions in their community. The 2000 Green Gauge also asks people to identify their reasons for not taking more action to protect and conserve the environment. Some 54% say they are "too busy" to make changes in their current behavior. As with any personal issue, there is a certain amount of inertia in favor of maintaining the current way of doing things.

There are other factors at work besides inertia, not knowing how to help, and being too busy. These revolve around who is responsible for environmental problems. There is a deeply ingrained idea that most environmental problems are the fault of industry or municipalities. Roper finds that 47% of Americans believe that large companies, rather than individuals, should take environmental action (Roper, 2000). A majority of adults (51%) say that decisions by a few large companies have much more of an impact on the environment than the decisions of *millions* of consumers. (Note that this is consistent with public perceptions that industry continues to be the main cause of air and water pollution.) Some 36% disagree with this view and feel that the millions of decisions of individuals matter more.

Overall, though, the vast majority of Americans believe that responsibility should be shared. Only 18% of Americans agree that *only* corporations can affect the environment and that individual people cannot. Fully 76% disagree with this line of thinking (Roper, 2000). Again, while 35% of adults feel that environmental pollution is such a big problem that there is little an individual can do about it, 60% disagree with this and feel the individual can make a difference (Roper, 2000).

What Americans Do for the Environment

Although they may not realize it, many Americans perform environment-friendly activities each day. Asked how often they perform each of eight activities that benefit the environment, a majority of Americans perform four "frequently." (See Figure 3-1.) As in the past, the simplest behaviors top the list: 85% report that they frequently turn off lights and electrical appliances when not in use. How much people consciously do this to benefit the environment vs. to save on the electric bill is not entirely clear, but at least part of the motivation is likely environmental.

Another 59% say they frequently recycle newspapers, cans, and glass. A majority of Americans also say they frequently try to conserve water in their homes and yards (61%) or

Figure 3-1: Percentage of Americans Performing Environmental Activities Frequently in Day-to-Day Life

Percent Responding	2000	1999	1998
Turn off lights and electrical appliances when not in use	85	83	85
Conserve water in your home and yard	61	64	65
Recycle things such as newspapers, cans and glass	59	59	61
Try to cut down on the amount of trash and garbage you create	54	57	62
Buy biodegradable or recyclable products	42	46	50
Avoid using chemicals in your yard or garden	36	39	39
Use other types of transportation, such as biking or the bus, instead of driving your car	14	15	16
Participate in a volunteer clean-up day*	9	10	8

* In 1999, asked as "Participate in a public land clean-up day"

Question wording:

Now I would like to ask you about some of the things you may do in your day-to-day life.For each of the following things, would you please tell me whether you never do it, sometimes do it, or frequently do it. [First/Next]/[Ask about each]

Source: NEETF & Roper, 2001

cut down on the amount of trash their households create (54%). All of these activities are connected to regular activities that are convenient to perform.

Another place Americans feel empowered and emboldened is in their consumer behavior. Americans believe in the power of "voting with their pocket book." There is substantial and increasing evidence that environmental education can cause changes in purchasing patterns. In 2003, Roper found that 56% of Americans had purchased a product because it was labeled energy efficient; 48% had purchased a product because it was labeled environmentally safe or biodegradable (Roper, 2003).

With product packaging becoming a significant source of environmental information, people are expressing a willingness to pay modest premiums for environmentally less-polluting products. (See box on next page.) This is even more the case if some added benefit (such as saving cash) is also attached. Roper's willingness-to-pay studies find that Americans will pay 7% to 8% more for major appliances that benefit the environment and 5% to 6% more for environmentally sound autos (see, for example, Roper, 2001). Consumers will pay similar premiums for recycled paper products (5%) and less polluting gasoline (5%). Some 54% of

American consumers support the use of solar energy even if costs 6% to 7% more. These data are corroborated by the Minnesota Report Card on Environmental Literacy (2001), although a tight economy may have lowered people's willingness to pay a premium for environmentally sound products by a point or two (Roper, 2003).

In light of public uncertainty over what to do to help the environment, the larger EE community may want to emphasize how learning about solutions to environmental problems can bolster positive behaviors toward the environment. Such education has been a specific goal of the EE community for more than 25 years. It may also be true that people need to be constantly reminded. In a 2001 report on energy knowledge, for example, NEETF recommended that a major energy "refresher course" would help to remind people of the needs and opportunities associated with energy conservation-minded behaviors.

Eco-Labeling

In recent years a number of programs have evolved aimed at telling consumers that one product (or class of products) is more environmentally "friendly" than another. A visible way to achieve this is for a third party to "eco-label" the product. These are often government-supported programs but they are elective and rely on public information and market forces for their success. Examples of such programs in the United States include the EnergyStar program for energy efficient appliances and the GreenSeal program for many consumer goods. Eco-labeling programs were introduced in Europe in the early 1980s. Programs include the Nordic Swan Program in Scandinavia and Blue Angle labeling program in Germany. Researcher John Thogerson (2002) has studied these European programs and found many important aspects of their success. In addition to becoming well known, with significant name recognition (80%) through public information campaigns, they have been found to produce measurable environmental results.

Thogerson finds that the Blue Angel has been credited for a reduction in emissions in sulphur dioxide, carbon monoxide, and nitrogen oxides from oil and gas heating appliances by more than 30% and for a reduction in the amount of solvents emitted from paints and varnishes by some 40,000 tons. In Sweden, the Good Environmental Choice and Nordic Swan labels have been credited with similar reductions, including changes in forest and paper product chlorine emissions and reductions in household chemical pollution notable in laundry detergents. In 1997, eco-labeled detergents had a market share of more than 90% in Sweden.

Initially eco-labels had fairly low name recognition but they have lent themselves well to public information campaigns and media promotion. The length of time a label is on the market correlates highly with its public recognition. Still, active promotion is needed. The Swan label is illustrative of this. A two-year promotional campaign boosted public recognition from a rate of 29% prior to 1998 to 52% after 1999.

While labeling programs may be effective at building awareness, many consumers have little real comprehension of what might actually be involved. One study in the U.S., for example, found that only 5% of a representative sample of consumers exhibited a thorough understanding of the term "recycled" as distinguished from "recyclable" (Hastak et al., 1994). Even when a consumer campaign produces outstanding increases in the use of a product, knowledge of the underlying principles may be lacking.

Regional Differences

The region in which an individual resides is also a factor in participation in activities that benefit the environment (see Figure 3-2). "Frequent" recycling of newspapers, cans, and glass is higher in the Northeast (67%) and West (66%) than in the South (51%), with the Midwest (60%) close to the national average.

Perhaps due to differences in weather and rainfall amounts in different parts of the nation, the proportion of Americans attempting to conserve water in the home and yard also varies by region. With a dry spring and summer in 2000, residents of Southern (65%) and Western (63%) states were more likely than those in the cooler and damper Northeastern (57%) or Midwestern (57%) states to report that they frequently conserve water. There were no differences by region for this action in 1999. Also, Westerners (91%) are more likely than those in other regions to report that they frequently turn off lights and electrical appliances when not in use.

The Knowledge/Action Link

Although the pattern is not totally consistent, for several environmental activities there is a relationship between environmental knowledge and frequent engagement in the activity (see Figure 3-3). As overall knowledge increases (as measured by the number of correct answers to the quiz section), the likelihood of participating in some activities also increases. This is most evident for turning off lights when not in use; recycling newspapers, cans, and glass; and avoiding the use of chemicals in the yard. An inverse relationship is evident for the use of alternative types of transportation, but this is most likely reflective of household income and "urbanicity," as lower income households and urban residents are more likely to have access to, and the need to use, mass transit.

Maria Lane (1996) suggests there is a positive relationship between environmental awareness and knowledge, on the one hand, and attitudes and behaviors on the other, but though the relationship is statistically significant, it is not strong. NEETF/Roper data have consistently found that awareness has an effect on stewardship but does not by itself bring about lasting change.

In a helpful analysis, P. Wesley Schultz (2002) asks the question of whether knowledge about recycling actually leads to a change in recycling behavior. Schultz and his colleagues provided educational materials to households and then monitored their activities. They found that while there was a knowledge increase, the actual change in recycling behavior was fairly small and short-term in nature. Schultz's research shows that, for recycling and by extension to other subject areas, the sense that people were participating with (and perhaps even being observed by) others was a more powerful predictor of behavior change. This type of "normative intervention" works well with recycling programs because they are so visible to neighbors.

Schultz also found that one of the most important determinants of behavior change is not information/education but people's beliefs about the pro-environmental behaviors of others. Even if an activity is not publicly visible (such as saving water or electricity), it is more likely to occur if people think others are participating too. This indicates, in part, that public information campaigns aimed at bringing about changes in behavior could usefully focus on creating a larger sense of communal involvement, at a minimum informing the public about how many people are participating in an activity.

Figure 3-2: Percentage of Americans Performing Environmental Activities Frequently, by Region, 2000

		Region			
Environmental Activity	Total	Northeast	Midwest	South	West
Turn off lights and electrical appliances when not in use	85	80	83	85	91
Conserve water in your home and yard	61	57	57	65	63
Recycle things such as newspaper, cans and glass	59	67	60	51	66
Try to cut down on amount of trash you create	54	56	55	54	51
Buy biodegradable or recyclable products	42	41	44	40	45
Avoid using chemicals in your yard and garden	36	34	37	33	42
Use other types of transportation, such as biking or the bus, instead of driving your car	14	16	12	13	18
Participate in a volunteer land clean-up day	9	8	5	11	8

Source: NEETF & Roper, 2001

Figure 3-3: Percentage of Americans Undertaking Environmental Activities Frequently, by Performance on Environmental Knowledge Quiz

		Performance on Environmental Quiz		
	Total Correct	9-12 Correct	5-8 Correct	0-4 Correct
Turn off lights and electrical appliances when not in use	85	88	84	80
Conserve water in your home and yard	61	58	65	59
Recycle newspaper, cans and glass	59	70	58	47
Try to cut down on the amount of trash and garbage you create	54	52	55	55
Buy biodegradable or recyclable products	42	41	45	37
Avoid using chemicals in yard and garden	36	45	34	29
Use other types of transportation; biking or the bus, instead of driving your car	14	11	14	22
Participate in a public land clean-up day	9	7	9	11

Source: NEETF & Roper, 1997 and 2001

Thomas Marcinkowski (2004) has pointed out weaknesses in the conceptual model that knowledge affects attitude, and attitude affects behavior. In his research and that of his colleagues, these relationships are much more complex, involve a number of factors, and indicate the need for more carefully designed educational approaches. He points out that the KAB model is too simplistic and is non-linear. There may be correlations among environmental knowledge, attitudes, and behaviors but they do not mean causation and may not even be the strongest correlates. Marcinkowski also points out how other factors, such as a person's locus of control, or understanding of and skill in using environmental action strategies, are better predictors of environmental stewardship. Marcinkowski uses a model developed by Hungerford and Volk in 1990 to determine whether environmental education will lead to responsible environmental behavior (REB).

The Hungerford Volk Model arrays three stages educational involvement ranging from first exposure (entry) to real involvement (empowerment), and then suggests that each stage has certain knowledge and attitude characteristics, as shown in the following table:

Stage	Major Variables	Minor Variables
Entry level	Environmental"sensitivity"	Knowledge of ecology Attitudes toward pollution, technology, and economics
Ownership	In-depth knowledge of issues Personal investment in issues and the environment	Knowledge of the consequences of behavior (+ and -) Personal commitment to issues resolution
Empowerment	Knowledge of and skill in using In-depth knowledge of issues action strategies	Locus of control Intention to act

Source: Marcinkowski, 2004

Importantly, the NEETF/Roper data show that the environmental activities performed most frequently can be done easily at home (e.g., turning off lights, adjusting the thermostat down in winter or up in summer) or are encouraged by law in many areas (e.g., recycling newspapers and cans). More education about the environment will help Americans 1) understand how their actions affect the environment, 2) be able to communicate their attitudes toward the environment to others, and 3) become more involved in activities which directly or indirectly benefit the environment.

Energy Consumption and Conservation

The simplest energy-related behavior tops the list of environmental activities frequently performed: 89% of Americans report that they frequently turn off lights and electrical appliances when not in use. Whether people consciously do this to save energy or to save money on the electric bill is not clear. The fact is that they are performing this activity, which protects the environment by reducing the need for power generation at electric plants, many of which use oil or coal to produce energy. Roper 2001 Green Gauge data indicate that "saving electricity at home" has the highest rating of activities done regularly, with 65% support (up 8% since 1996).

Figure 3-4: Percentage of Americans Performing Energy-Saving Activities Frequently in Day-to-Day Life

	2001	2000	1999
Turn off lights and electrical appliances when not in use	89	85	83
Lower the thermostat in the winter to conserve energy	65	59	59
Recycle things such as newspapers, cans, and glass	60	NA	NA
Reduce the use of air conditioning in the summer to conserve energy	51	NA	NA
Purchase lamps and appliances that are energy efficient	47	NA	NA
Accelerate slowly to conserve gasoline when driving	41	NA	NA
Use other types of transportation, such as biking or the bus, instead of driving your car	13	14	15

Question wording: Now I would like to ask you about some of the things you may do in your day-to-day life. For each of the following things, would you please tell me whether you never do it, sometimes do it, or frequently do it. (First/Next)...(Ask about each)

Source: Roper, 2003; NEETF & Roper, 2002

The 2003 Green Gauge report supports this finding, as does the 2001 National Report Card. (See Figure 3-4.) Two out of three Americans (65%) report that they lower the thermostat in the winter to conserve energy. A slim majority of Americans (51%) say they reduce the use of air conditioning in the summer to conserve energy. In both cases, a combination of saving energy and saving money may lead people to take these steps.

The Minnesota Report Card

Significant corroboration of the NEETF/Roper studies comes from the Minnesota Report Card on Environmental Literacy (Murphy, 2002), which found that the majority of Minnesotans frequently conserve energy (89%); service their vehicles regularly (87%); recycle glass, paper, and cans (80%); conserve water (58%); and cut down on creating garbage (55%). The top two activities documented in the Minnesota report are likewise related to actions that save money, such as lowering electricity bills or avoiding costly car repairs. Significantly, fewer adults (58%) than those who recycle or save energy indicated that they conserve water by turning off water when brushing their teeth, considered by researchers as an accurate indicator of conservation. In light of the knowledge and concern of Minnesotans on water issues, researchers were somewhat surprised that the percentage of adults who conserve water in this way was so low. Nineteen percent of Minnesota adults reported that they frequently use other types of transportation, such as walking, biking, riding the bus or carpooling instead of driving. In addition, 80% of residents consider a candidate's record on the environment at least some of the time when voting.

Almost half of Minnesota residents do not use chemicals in their yards and gardens. The number of Minnesotans (46%) who never use chemicals in the yard probably indicates concern over pollution and health, as does the low number of people (5%) who frequently use chemicals in their yards. On a national level, only 36% of U.S. residents frequently avoid using chemicals in gardens, considerably lower than the Minnesota level. Seventy-

Figure 3-5: Percentage of Minnesota Residents Undertaking Environmental Activities Frequently, by Environmental Knowledge Grade

Activity	Knowledge Grade	
	A (7-8 correct)	F (0-2 correct)
Conserve water	63	48
Consider a political candidate's environmental record	56	31
Learn about environment	50	21
Donate funds	15	7

Source: Murphy, 2002

three percent of Minnesota adults reported they would be willing to pay extra for gas if they knew that the additional money would significantly improve the environment. At the time the report was completed, the average Minnesota adult would have been willing to pay up to 18¢ extra per gallon.

The Minnesota study is particularly valuable due to its efforts to quantify the relationships between knowledge and behaviors. Here, a stark contrast emerges between environmental activity levels of the most and least knowledgeable respondents. As Figure 3-5 shows, the most environmentally knowledgeable group was substantially (from 8 to 25 percentage points) more likely to engage in environmental activities than the least knowledgeable group.

NEETF/Roper Study Findings

High-knowledge respondents, when compared to low-knowledge respondents, were:

- 10% more likely to save electricity in the home
- 50% more likely to recycle
- 10% more likely to purchase environmentally safe products
- 50% more likely to avoid using chemicals in yard care

Minnesota Study Findings

High knowledge respondents, when compared to low-knowledge respondents, were:

- Twice as likely to have a high environmental behavior rating
- 31% more likely to conserve water
- 100% more likely to donate funds to conservation
- 138% more likely to be interested in learning about the environment
- 26% more likely to have a positive attitude toward the environment

Both the Minnesota study and the NEETF/Roper data show strong similarities in their profiles of high-knowledge and low-knowledge respondents, and how likely each group is to undertake environmentally-friendly behaviors. (See boxes below.)

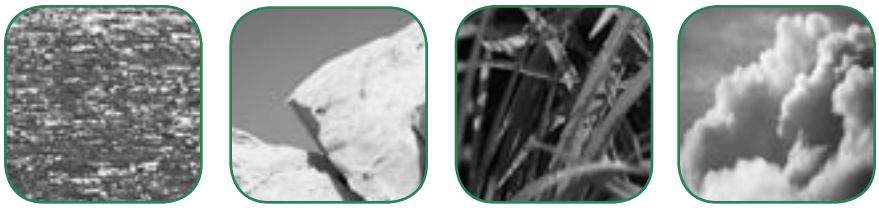
Conclusion

For those skeptics who wonder if measurable results can come from environmental education, recent research also detailed in this study offers answers and tremendous hope. It shows that the environmental literate person is significantly more likely to engage in a set of pro-environment activities than someone who is not educated on the environment.

The previous three chapters have led us to several conclusions: Americans have a substantial familiarity with environmental issues, but a long way to go in developing a working environmental/ energy knowledge to accompany them in the 21st century. Learners typically receive smatterings of environmental information rather than building a deep, cumulative knowledge of underlying principles. They then apply these informational tidbits to their own individualized understanding of the world, with sometimes alarming results. This lack of proper attention to environmental fundamentals makes the media, in its many forms, the most powerful "tidbit provider" and thus both a positive and a negative force in the dissemination of environmental information. Although the majority of Americans support protection of the environment, their base of insufficient understanding often prevents them from taking appropriate environmentally-friendly actions. The more Americans know, the more likely it is they will act on behalf of the environment. The next chapter examines how the media could be deployed to enhance environmental learning for Americans.

Fully 80% of all

adults, including community leaders, watch the news primarily to see the weather.



Chapter 4

Media Strategies for Enhancing Adult Environmental Learning

Consider the next-door neighbor who, at age 40, decides to learn how to fly a plane; the retired lawyer who becomes a master gardener; or the heart patient who becomes his or her own nutritionist and exercise specialist. Consider even the more casual event of a visit to a museum that stirs enough interest to spark research on the subject.

John Falk, head of the Institute for Learning Innovation (ILI) near Washington DC, believes that people are not only naturally curious but have avid learning responses to nearly anything that galvanizes their interest. He points out that while schools are a vitally important learning venue, on average, they deliver just three to seven percent of the average person's education over a lifetime. Thus, over 90% of lifetime learning takes place outside school on subjects that matter to people intensely. Falk and his colleagues examine how people continue to learn – avidly and efficiently – throughout their lives. They point out that there are stunning examples of what they call "free choice learning" everywhere around us.

There are stunning examples of "free choice learning" everywhere around us.

Moreover, the number and types of places where lifelong learning takes place has vastly increased: not limited solely to museums and community colleges, a wide range of places have begun to take environmental education seriously, including zoos, aquariums, arboreta, botanical gardens, national and state parks, and nature centers.

This chapter examines several strategies for making better use of both the pervasiveness of the media and the power of free choice learning.

Media Strategies

Our analysis to this point might lead one to see the media as more of a menace to environmental education than a source of support. But, the media offers a number of opportunities to strengthen environmental literacy. They include the following:

- Media coverage of issues raises awareness and familiarity with ongoing environmental problems.

- In-depth TV documentaries or newspaper articles can provide a more detailed understanding of an environmental issue.
- Media coverage can generate a feeling of larger communal support for action, helping individuals feel that their actions make a difference, and thereby eliciting more environmentally-friendly behavior.

One recent study (Hobert, Kwak, & Shah, 2003) examined the impact of television on awareness and on changing environmental behaviors. The study examined both news reporting and documentaries (factual-based television) and more entertainment-oriented media such as situation comedies. It found that factual-based programming has a positive influence in creating a greater desire within individuals to recycle, purchase products that are environmentally friendly, and be more energy efficient in their daily routines. By contrast, fictional-based programming did not have a positive effect on environmental behaviors.

A promising but underutilized element of television is weathercasters. Already America's most visible science communicators, broadcast and news meteorologists can use their unique positions and skills to educate people on environmental conditions. Their combination of science expertise, frequent use of graphics, and high level of public trust make them ideal science and environment ambassadors to the public. Weathercasters are particularly well-positioned to explain complex natural systems and to educate the public on important cause and effect relationships. Fully 80% of all adults, including community leaders, watch the news primarily to see the weather.

Pivotal Segments

Another strategy for enhancing the environmental learning of adult Americans focuses on the makeup of the population and targeting education to particular sectors. Different segments of the population have different learning styles, impacts on public opinion, and levels of interest in the environment. The most promising news for the environment may be that pivotal segments of the public are more avid in their pursuit of environmental information. This suggests the value of highly targeted media strategies for educating the larger public.

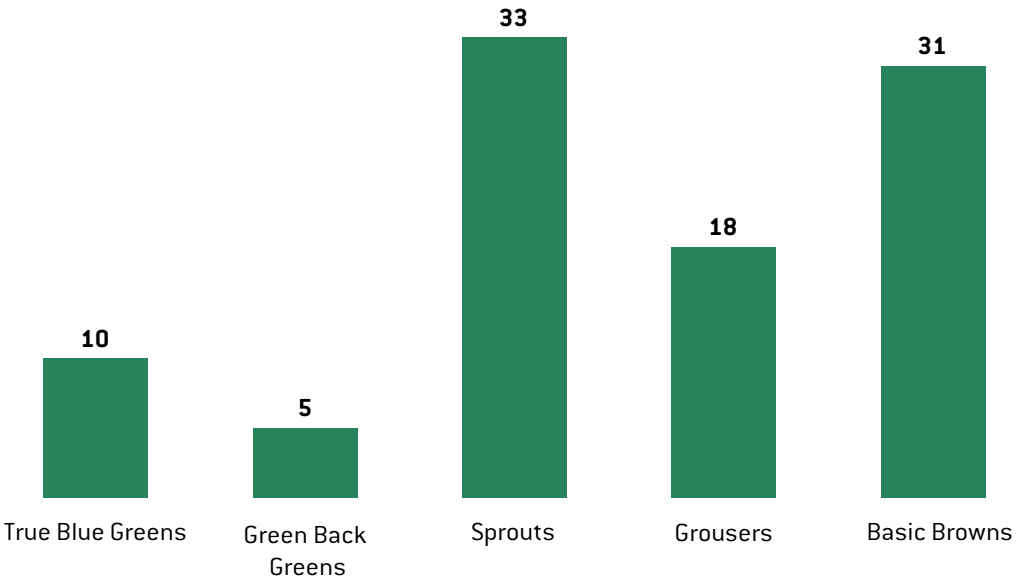
In one classification system, Roper (2002) has divided the American public by its interest in environmental issues. Figure 4-1 shows the percentage of the population that falls into these five categories.

The stars in this classification are the "True Blue Greens," about 10% of the population. Roper likes to say that True Blue Greens "walk their environmental talk." They form a sharp contrast with a much larger group of adults (33%) at the other end of the spectrum, termed Basic Browns, who rarely support environmental causes. According to Roper data, True Blue Greens are older, wealthier, and better educated than the average adult and they pay much more attention to environmental issues, corporate environmental records, and candidate voting records. They recycle and volunteer more, buy more environmentally friendly products, and are more anxious to learn about the environment than the average citizen (see Figure 4-2).

In another set of set of studies focused more on information behaviors than environmental actions, Roper identified a subgroup of more than 50 million Americans they call Environmental Information Seekers (Roper, 2000-2002). These "seekers" show a higher level of interest and activism in seeking out information about the environment than the

Figure 4-1: Roper's Population Segments by Interest in the Environment

Percentage of U.S. population



Note: Remaining 3% not classified.

Source: Roper, 2002

TRUE BLUE GREENS – about 10% of the public likely to be most interested and active on the environment.. Some 43% of the True Blue Greens are likely to do pro-environment activities on a regular basis.

GREEN BACK GREENS – about 5% of the public who mostly fight environmental problems with consumerism. They are willing to pay the most for a cleaner environment but have less time to devote. About 25% of them are likely to engage in pro-environment activities on a regular basis.

SPROUTS – about 33% of the adult population who can best be defined as environmental "fence walkers." When they get behind an environmental cause, it has real clout. Some 26% say they are likely to perform pro-environment actions on a regular basis.

GROUSERS – about 18% of adults who are somewhat concerned about the environment and do some inexpensive non-intrusive activities. While 17% of them say they regularly take steps to conserve the environment, they are the most likely to make excuses for not taking such steps.

BASIC BROWNS – 31% of adults who consider the environment to not be a problem and are fairly resolved in that conclusion. Just 6% are likely to regularly engage in pro-environment behavior.

general population. Their main source for this information is the media in its broadest context – news, documentaries, feature stories, and the Internet. These environmental information seekers represent about 20% of America and trend toward being community leaders, educators, and highly educated.

Figure 4-2: Characteristics of Environmental Information Seekers Compared to the General Public

More likely to perform pro-environmental behaviors	35%	23%
Premium people are willing to pay for pro-environmental versions of products	9.5%	5.7%

Source: Roper, 2000

Environmental Information Seekers represent a important prime target for improved delivery of environmental information on the part of the media. Several recommendations in Chapter 8 of this report look at ways to employ the media as a more organized and effective backdrop for environmental learning. Roper indicates that Environmental Information Seekers are serious enough in their environmental interests to benefit from such efforts. These efforts could include greater use of visual presentations of complex environmental subjects, more background articles for news topics, and greater deployment of television and newspaper weather reporting as a tool for environmental and science learning.

Members of the Environmental Information Seekers group overlap significantly with True Blue Greens as well as with still another group that Roper has identified in its research. This is a group called the "Influentials" – a term Roper has trademarked. Influentials comprise about 10% of the adult population and are our most active and involved community leaders – school and PTA board members, planning board members, town council members, voting commission members, chamber of commerce members, hospital and library volunteers, and others active in helping to run our communities.

Roper researchers pay attention to "Influentials," not only because they are community leaders, but because they are frequently trend-setters and opinion leaders. For example, Influentials were the first to take up the use of home computers, setting a trend that millions followed. Influentials also set the pace for adopting and promoting organized youth sports that eventually made a political demographic out of soccer moms. Some 74% attended a public meeting on town or school affairs (compared to 16% for the total public). Fully 50% served on a committee of a local organization (7% for the general public), 40% wrote a letter to the editor (6% for the general public, 35% were active members of groups trying to influence public policy (5% for the general public) and 31% made a speech (4% for the general public). Other research underscores that Influentials are highly active in their communities by being among the core of people who volunteer. More than 60% of Influentials engage in volunteer work in a typical month. As many as 44% of the nation's Influentials or community leaders are also Environmental Information Seekers.

Roper finds that the environment matters to the Influentials. Some 78% of them, for example, think that businesses should also consider what is good for society and not just what is good for profit. Influentials have in fact been pushing government and business the hardest to improve the environment. A majority (52%) believes that laws to protect the environment have not gone far enough, and many of them seem ready to do more than recycle their trash, indicating, for example, that they would pay more for green products such as autos, gasoline, and electricity. Figure 4-3 shows the levels of interest of Influentials in the environment compared to other topics.

Figure 4-3: Profiles of Roper's Category of "Influentials"

Percentage of Influentials who are *moderately* or *very* interested in topic:	
News and Current Events	96
Environment	92
Fitness and Health	87
Nature and Animals	87
Politics	84
Percentage of Influentials who are *very* interested in topic:	
News and Current Events	76
Environment	57
Nature and Animals	55
Politics	51

Source: Berry & Keller, 2003

The strong desire to learn about the environment on the part of a majority of Influentials is crucial to our communities. In many places, real environmental literacy could boost the capacity of local governments to maintain healthy and economically viable living conditions. Researchers have found that land values rise significantly around dedicated public open spaces and that the quality of the environment and the amenities in a community are significant factors in whether people and companies will move to the location (Crompton, 2001). Poor environmental decisions made by community leaders reduce the quality of air and water in the community and increase pressure on landfills. Poor environmental decisions are also expensive – they increase tax burdens, cause unnecessary traffic, and lower property values. A lack of awareness of the impacts of land use, transportation, and other environment-based decisions is a leading contributor to failing tax bases.

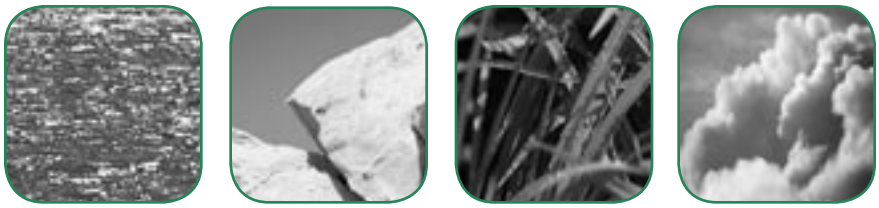
Conclusion

Influentials, True Blue Greens, and Environmental Information Seekers add up to nearly one in four adults and have a significant role in environmental education, even if their learning occurs largely outside of school. Knowing the importance of these segments as opinion and action leaders, and knowing the power of "free choice learning," offers environmental educators useful direction in designing media strategies to address the interests and needs of these people.

Understanding the power of free-choice learning can help us rethink the role the media plays and how we view the influential world of zoos, aquariums, nature centers, parks and refuges, museums, schoolyard habitats, scouting, field trips, vacations, and more. It will also provide a backdrop for us to understand the role that such endeavors as weather casting (the media's most galvanizing topic) can have on environmental learning. Ultimately, there are numerous avenues for enhancing environmental learning at all ages.

After 35 years

of effort, the environment has yet to achieve "core subject" status in our schools.



Chapter 5

Understanding Environmental Education

Imagine for a moment the confluence of environmental information that a high school student might be exposed to. On television news, the student might hear about climate change policy discussions or see a televised speech by an elected official explaining a political position. Then a scientist might warn about a possible rise in sea levels in the next 200 years. The next bit of coverage may contain a rebuttal from another expert saying that we can expect less sea level change. A friend may report having heard that "it was all made up anyway." That afternoon the student goes on the Internet and finds a series of graphic simulations showing water advancing along the New Jersey coast. Later that evening he or she goes to see the Steven Spielberg film "AI." It contains a dramatic scene showing New York City under hundreds of feet of water. In none of these media exposures was there information on what might cause sea level rise other than some quick and mostly undefined references to "the greenhouse effect" or global warming.

One way to describe the current condition of environmental education in America is as a gifted child who has yet to reach his or her full potential.

From an educator's viewpoint, all this is downright confusing and an opportunity to truly educate the public about an important issue has been missed. Perhaps it would not matter as much if Americans were receiving a solid foundation of environmental understanding in the school system. As of this writing, there is no comprehensive scientific overview of the exact status of environmental education in America; such an overview would be of huge benefit to the field. But it seems safe to say that not enough environmental education is getting through to Americans of any age.

One way to describe the current condition of environmental education (EE) in America is as a gifted child who has yet to reach his or her full potential. U.S. environmental and sustainability education is still in its youth compared to many other academic subjects. Despite its popularity, it is still mostly considered an educational "extra" – grafted on to a core syllabus as an enhancement. After 35 years of effort, the environment has yet to achieve "core subject" status in our schools.

Nor is EE is delivered in a way that achieves adequate depth and that progresses year-to-year to form a long-term basis for environmental literacy. This discipline of proper depth and

concept-building is what the professional educator calls "scope and sequence," and it is not widely employed for EE.

Major progress *has* been made in the past thirty plus years. The professional field of environmental education has developed a host of first-rate programs. It has burgeoned in both the formal and informal arenas, and stands ready to achieve much higher levels of effectiveness. But what constitutes environmental education, in theory and in practice? This chapter discusses what EE should ideally look like, and how it can contribute to environmental literacy in America.

Early Efforts: A Mile Wide and an Inch Deep

Three decades ago, the accepted thinking was that if we could educate a generation of young people to better understand and take care of the environment, America would have an improved chance of balancing the environment with economic realities. Environmental education would provide the fundamentals on how the younger generation could avoid, or at least mitigate, the environmental mistakes of their elders.

The shortcoming in this line of thinking was the failure to comprehend how great an educational challenge it is to impart both the sense of stewardship and the knowledge to back it up. Most of the leaders interested in the environmental education of the next generation had too simple and limited an educational view. Even sophisticated environmental and natural resource leaders thought that infusing a modicum of environmental information and awareness would result in significant changes in knowledge, attitude, and individual behavior – more recycling, less wasted energy, more careful product purchasing, greater care for wild animals, more local support for open spaces and water bodies, etc.

Through the 1970s and into the 1980s there was a proliferation of well-intentioned environmental education programs and materials. This abundance of EE activity continues today although with a stronger involvement from bona-fide and professionally developed EE programs. Still, schools and teachers continue to experiment with the subject and public agencies see it as a way to support their missions. Nature centers, zoos, aquariums, and even classical natural history museums have started their own versions of environmental education programming. Environmental science and related issues are a popular subject of children's books, and science text books now consistently add environmental content to their chapters.

But a few years after EE began operating at a higher level, a round of professional assessment, research, and evaluation began to reveal a disappointing truth. The many "educational" efforts were really little more than informational excursions and were not having much effect at all on creating true environmental literacy, application skills, or a sense of stewardship in young people. (See bibliography in Appendices 3 and 4.)

Goals of Environmental Education: Knowledge, Action, or Both?

Organized EE originated with a focus on the future (rare enough for the formal education arena) and an interest in applied stewardship. Similar to civic education, EE is empowering and constructivist in its pedagogy. Controversy arises over whether such activism is the whole point of EE, or an inappropriate use of public resources. There is widespread agreement, for example, that it is acceptable to teach a student about nature through tree

planting or imparting common sense in personal activities such as conserving energy and water. There is much less agreement when instruction extends to the civic or political (small "p") process, especially for younger children. Professional environmental educators have always followed rules of age-appropriateness and do not promote such activities as second graders writing letters to Congress by rote. Still, many Americans feel that issue awareness, skill, and application are all necessary parts of the overall EE picture, and that individual empowerment is basic to American life.

As early as 1978, at a conference in Tblisi, environmental educators assembled to develop useful definitions of environmental literacy and environmental education – definitions that would also suggest a focus on deeper learning, skill development, and stewardship (Tblisi Intergovernmental Conference on Environmental Education, 1978). A classic and highly regarded definition of sound environmental education comes from Hines, Hungerford, and Tomera (1986-87). They maintain that environmental education goes beyond the mere imparting of information to provide:

- a working knowledge of environmental issues,
- specific knowledge of approaches to address those issues,
- the ability to make appropriate decisions, and
- possession of certain affective qualities (attitudes) that make people care about and pay more attention to environmental conditions.

The 1994 definition of environmental literacy developed by the North American Association for Environmental Education expands these categories to the following: affective qualities, ecological knowledge, socio-political knowledge, knowledge of environmental issues, cognitive skills, additional determinants of environmentally responsible behavior, and environmentally responsible behavior. The professional EE field has incorporated these categories into a set of professional guidelines coordinated by Dr. Bora Simmons of Northern Illinois University (Simmons, 1995).

A decade later, researchers (Tomera et al, 1987; Hungerford and Volk, 1990) reached some important conclusions about the difference between environmental knowledge and changes in behavior:

- Developing awareness and ecological knowledge is not enough to cause long-lasting behavior changes.
- Ownership – developing a personal connection with and knowledge of issues – is critical to responsible environmental behavior.
- Instruction that focuses on ownership and empowerment changes behavior.

Hungerford and Volk (1990) noted that educators are able to change learners' behaviors when they:

1. Teach environmentally significant ecological concepts and the environmental inter-relationships that exist within these concepts.
2. Provide carefully designed and in-depth opportunities for learners to achieve some level of environmental sensitivity that will promote a desire to behave in appropriate ways.
3. Provide a curriculum that will result in an in-depth knowledge of issues.
4. Provide a curriculum that will teach learners the skills of issue analysis and investigation as well as provide the time needed for the application of these skills.

5. Provide curriculum that teach learners the citizenship skills needed for issue remediation as well as the time needed for the application of these skills, and
6. Provide an instructional setting that increases the learner's expectancy of reinforcement for acting in a responsible way; i.e., attempt to develop an internal locus of control in learners.

These principles form the basis for true environmental literacy.

What is Environmental Education?

One of the most difficult things to accomplish in environmental discourse may be a consistent discussion of environmental education. People frequently use the same word – education – to describe completely different concepts. Anyone who wants a rubric for avoiding confusion in an EE discussion can start by distinguishing *information* from *education*. The first is the simple provision of facts and easy concepts that most often generates "awareness;" the second involves a sequenced series of learning steps that results in a thorough understanding of the subject and its dynamics, including developing skills and learning how to apply them in a real world setting.

To make matters even more challenging, there are different levels of awareness. At one level, awareness can simply mean that people know or have heard about a topic. At a more dynamic level, awareness may be fused with a personalized action step that an individual can take to address an associated environmental problem – such as recycling or conserving energy or water. In this chapter we will examine three categories of environmental awareness and learning. They are:

- Simple awareness – knowing that a topic exists and is important but unfamiliar with its complexities and little relationship to personal change or action.
- Personal conduct knowledge – understanding of a class of environmental subjects that are simply and easily grasped, such as energy shortages, water shortages, and solid waste disposal problems, that lend themselves to changes in personal conduct but that do not require detailed comprehension.
- Environmental Literacy – the outcome of a sound program of environmental education through which the learner progresses from deep knowledge, to skill, to actual field application.

Level One: Environmental Awareness

In the first level of environmental awareness, NEETF/Roper research finds that about 50 to 70% of adults have "heard of" most major environmental subjects such as water and air pollution, energy waste, solid waste disposal concerns, habitat loss, climate change, beach closings, mysterious deaths of whales and dolphins, and more. At this initial level of awareness, there is little understanding of the deeper causal sequences or inter-connections among issues. Research demonstrates that environmental awareness by itself has limited lasting effect on personal attitudes to environmental stewardship (although it can reinforce existing sentiments), and by itself has little effect on environmentally "friendly" behavior. The main advantage of widespread environmental awareness is its contribution to public support for government action in environmental policy and management. The most important tool for creating such awareness, by far, is the public media.

Advocates for changes to environmental policy often see the creation of public environmental awareness as a primary objective. While environmental educators may not classify this form of information brokerage as true education, a high public awareness profile can mean huge public support for new laws, regulations, and government and corporate administrative policies aimed at protecting the environment. There are many examples of environmental subjects which, once they were broadly disclosed to the public, experienced an upswelling of support for public reforms. As noted above, research shows that actual knowledge of the environmental and ecological underpinnings of these subjects may not be well understood even as they rise in public support.

Level Two: Personal Conduct Knowledge

At a second, slightly deeper, level is personal conduct knowledge, which involves a combination of awareness and action. Personal conduct knowledge is similar to awareness in that it does not require much knowledge of the detailed workings of a subject. Most of what is grasped is fairly simple and most often requires just one action step on the part of an individual – like the activities identified in Chapter 3 that Americans frequently engage in, such as saving electricity, gasoline, and water, buying "green" products, and reducing solid waste and individually-caused run-off pollution (for example, refraining from washing one's car in the driveway). Unlike general environmental awareness, people at this level willingly go a step further by taking action. Moreover, they make a connection between the environment and their own conduct.

A 5% increase in environmental activities would yield an immediate $75 billion improvement in saved energy, water, and reduced health care costs.

This type of environmental information/education is abundant. Those who deliver information at this level often do so in the hopes that teaching people about one simple, environmentally friendly behavior (such as water conservation) will over time lead to larger impacts on environmental ethics and stewardship. Although professional environmental educators have their reservations about the value of this level of knowledge, the research points to potentially significant benefits. A person who is well-versed on specific personal conduct knowledge is anywhere from 5% to 50% more likely to engage in related environmentally-friendly actions, based on a rough compilation of the many studies cited earlier in this chapter. Even at the lower end of this range, a 5% increase in environmental activities would yield an immediate $75 billion improvement in saved energy, water, and reduced health care costs. (See box on next page.)

Level Three: Environmental Literacy

The third and final level, "environmental literacy," is distinct from simple awareness or personal conduct knowledge because of its depth of information and the actual skills (thinking and doing) that are imparted. True environmental literacy takes time. It can't be placed in the educational "microwave." It starts out with framed information but it also imparts underlying principles, the skills needed to investigate the subject, and an understanding of how to apply the information. Most real environmental education involves hands-on experience either in a lab or the field.

While there are no "hard" numbers on the subject, we estimate that only 1 to 2% of adults in America have sufficient environmental knowledge and skill to be considered environmentally

Quantifying Personal Environmental Conduct Savings

The following is a "back of the envelope" calculation of what an improved level of environmental knowledge might mean for savings in the national economy. It was compiled from a cursory review of government websites and information sources.

The U.S. Energy Department estimates, for example, that home electricity use in America costs about $233 billion per year. Today, for a number of reasons, people seem to have stopped saving electricity the way they did some 30 years ago during the first major oil crisis. If simple environmental knowledge were to reach a level where people knew more about electricity production as a source of pollution, then we could assume a reduction in energy usage. A 5% reduction (saving one watt of electricity out of 20 now being used) would generate annual savings of $11.5 billion and a significant reduction in fossil fuel burning. Similarly, gasoline use accounts for $137 billion per year and a sizable percentage of our petroleum usage. A 5% savings in gasoline brought about through improved fuel efficiency and driving habits would save nearly $7 billion per year. A 5% reduction in domestic water use would save $14.2 billion in water and trillions of gallons of water. Rough calculations are shown below, for the activities that Americans are mostly likely to engage in, or expand their participation in, according to Roper data. The emphasis is on direct savings to the public.

Activity	Current Expenditures	% Change in Participation	Estimated Savings	Education Goal
Domestic electricity use	$233 billion	5	$11.5 billion	Lower home heat Raise AC temp Install low usage bulbs and appliances
Gasoline use	$137 billion	5	$6.8 billion	Fuel efficient cars Driving habits
Domestic water use	$285 billion	5	$14.2 billion	Water saving habits and appliances
Small business overhead	$500 billion	5	$25 billion	Energy and water savings, recycling
Health care costs	$900 billion	2	$18 billion	Hazard prevention in home and office
TOTAL ANNUAL SAVINGS			**$75.5 billion**	

Sources: Electricity – US Dept. Energy, Gasoline – US Dept. Energy, Water – US Geological Survey, Small Business – US. Commerce Dept., Health – CDC, Recycling – US EPA

literate. This means: a) most graduating 12th graders lack basic environmental literacy, and b) most adult decision-makers, whether business leaders, elected officials, or community volunteers, are also lacking in real environmental education and literacy. Having environmentally literate community leaders would mean considerably wiser and more balanced decisions on development patterns, resource extraction, and more.

As noted in Chapter 1, one of the problems with achieving environmental literacy in the U.S. population today is the difficulty most Americans have in understanding complex causal relationships in the natural world. Environmental education, however, is an important place for nurturing students' appreciation of causal relationships. In one study, Tina Grotzner (1993) examined children's understanding of complex causal relationship in natural systems. She found that children develop the best understanding of such systems when the teaching includes complex causal models as compared to linear models. There is clearly an age-related ability to pick up causal relationships. Once they are taught them, however, students can transfer this learning to other topics. Researchers Monroe and Kaplan (1988) point out that students can address global environmental issues only after they have a knowledge of problem identification and the range of inter-relationships and alternatives.

Most real environmental education involves hands-on experience either in a lab or the field.

In an examination of causes and possible consequences of climate change, one study found that an appreciation of the mechanism of global warming takes time to become established over the course of secondary education (Boyes & Stanisstreet, 1993). While children were aware of a range of environmental problems and understood some environmentally friendly and unfriendly actions, they could not link particular causes with particular consequences. Some of this problem may be inherent in the age of the students and their capacity for higher order thinking. Unfortunately, as research by the NAAEE and the Environmental Literacy Council (2000) shows, EE is taught by 83% of elementary school teachers, but only 44% of high school teachers. Thus, older students who have more developed higher-order thinking capacity and are more able to absorb complex environmental subject matter (Myers & Stanisstreet, 1999) probably receive less EE than younger students. This indeed may be one of the reasons why younger adults who received EE in school are not substantially more knowledgeable than older generations – much of the EE they were exposed to was in elementary school, where it was used as engaging subject matter rather than being taught in a systematic, grounded fashion.

Environment-Based Education vs. Environmental Literacy Programs

It is worth briefly examining the distinction between programs that use environmental education as a tool to improve academic achievement overall, and programs that are aimed at environmental literacy but that also yield academic benefits.

Education that uses the environment as a way to advance overall academic performance is sometimes referred to as environment-based education (EBE). EBE uses the environment as subject matter while focusing on improvements in science, mathematics, language arts, social studies, and cognitive skills. Environment-based education (also known as school subject area outcomes, or SSAOs, in Thomas Marcinkowski's analysis) can be aimed at meeting state standards of learning or other educational goals (Marcinkowski, 2004).

Marcinkowski differentiates between SSAOs and environmental literacy outcomes (ELO). ELO programs may also yield wider academic improvements, but these improvements are a by-product of the goal of creating an environmentally educated student. Because SSAOs focus on the cognitive domain rather than the affective or behavioral domains, SSAO assessments typically pay attention to knowledge and skills gained; little or no attention is given to attitudes or behavioral impacts. This makes it difficult to determine whether environment-based education that produces academic improvements in students also strongly improves students' motivation and attitudes towards the environment. More holistic evaluations of both SSAOs and ELOs would be helpful – for example, in determining whether the hands-on investigations that are part of ELOs help students retain information better and become better test takers.

This is more than a conceptual discussion in the current educational environment, which stresses high-stakes testing and more measurable forms of accountability. Because environmental education has never achieved "core subject" status in America, there is no parental demand or standard test for it and little pressure to increase EE in the schools. To the extent that EBE or ELO programs can improve test scores for students in science, language arts, math, and other subjects, there may be more public interest in environmental education in the schools.

Environmental Literacy: Nailing Down What Works

Hungerford and Volk's principles have successfully held up under considerable scrutiny and testing over the years. They are reflected in the guidelines for excellence by the North American Association for Environmental Education (1999), and are borne out in subsequent research. They are a useful filter in understanding and predicting whether an EE program will lead to true environmental literacy and to stewardship behaviors.

In a seminal 1998 survey, Trudi Volk of Southern Illinois University and Bill McBeth of the University of Wisconsin examined 32 different studies of environmental literacy. The studies were not strictly comparable, covering a number of different variables: affective attributes (assessed in 75% of the 32 studies), ecological knowledge (9%), socio-political knowledge (6%), knowledge of environmental issues (47%), additional determinants (3%), and responsible behaviors (19%). Eighteen of the studies included adults; 10 included high school students; 6 included college or university students; and 6 included elementary or middle school students. Seventeen states were reflected in the studies.

Volk and McBeth summarized how different instructional and learning approaches affected the variables:

1. **Traditional courses:** Two investigations (Wilson & Tomera, 1980) examined the impact on attitudinal variables of adding environmental cases studies to traditional high school biology courses. While there were slight shifts in a positive direction, the differences in pre- and post-measurement were not significant. Another study (Adams, Thomas, Newgard, & Cooper, 1987) found significant attitudinal changes related to a high school biology course. A third study found that adding environment-based activities to a traditional social studies course made a significant difference.
2. **Community investigations:** Issue investigation approaches – teaching students to shape a hypothesis and then thoroughly explore an issue – showed a significant impact on

attitudinal variables. Of the 18 variables examined, 15 showed a significant difference with investigation approaches; one evidenced mixed or questionable results.

3. **Instructional units:** Defined educational units on subjects such as energy, water conservation, and recycling were associated with significant differences in five variables and mixed results in two.
4. **Supplemental magazines and instruction in the classroom:** This approach was found to be the least effective, with a positive effect in only two variables, and no significant effect or mixed results in six others.
5. **Field trips and out-of-class activities:** These activities evidenced a significant effect on six of nine variables.
6. **Residential camps:** Consistent with many immersion experiences, the studies found significant differences in eight of nine variables.
7. **College level environmental courses:** These evidenced clear and significant positive effects in eight of nine instances.
8. **Workshops for teachers and adults:** Positive impacts were found in five variables, mixed results in three, and no difference in two.
9. **Television documentaries:** In two instances knowledge was improved but attitude was not clearly affected.

Volk and McBeth concluded that we need to better understand the overall status of environmental literacy; the studies examined in the survey were essentially just preliminary examinations of impact on attitudes and knowledge. Research into responsible behavior indicates a complex interaction among attitudes, knowledge, cognitive skills, and psychological characteristics. Such sophisticated research is needed to tell us more about the impact of environmental education on stewardship.

What follows is an examination of four types of EE programs with tremendous potential for behavior change:

- investigational approaches,
- outdoor learning,
- place-based learning, and
- community service.

A. The Power of Investigation: IEEIA and Molokai

Researchers Hungerford, Petron, Ramsey, and Volk (1996) place particular emphasis on the importance of investigation and problem solving as a way to get at these more complex inter-relationships and to promote true environmental literacy. To that end, they have developed a thorough and highly crafted curriculum entitled "Investigating and Evaluating Environmental Issues and Actions" (IEEIA). This curriculum embodies a critical thinking approach to environmental issues of all sizes, from site-based to global. The model permits the learner to become an expert information gatherer and data processor who can evaluate and resolve environmental issues while also taking his or her own belief systems into consideration. Students are given an opportunity to apply their skills. In many ways, the IEEIA program is the archetype of environmental literacy.

In 2002, IEEIA was put to the test in a detailed assessment and evaluation in Molokai, Hawaii. Five researchers studied the effect of the program on 38 fifth and sixth grade IEEIA students and compared them to 28 non-IEEIA students (Cheak, Hungerford, & Volk, 2002). Findings include:

- In a t-test of critical thinking, the IEEIA student scored 14.18 as compared to 10.86 for the non-IEEIA students.
- IEEIA students scored higher than non-IEEIA students on other dimensions as well: Knowledge of issues (2.84 vs. 1.24); ecological foundations (10.55 vs.7.86); issue analysis (9.24 vs. 4.32).
- In a test of actual environmental knowledge, 38% of the IEEIA students achieved a score of 80% or higher, while 76% scored 60% or higher. Just 25% of non-IEEIA students scored 60% or higher.
- Three quarters (75%) of the IEEIA students reported they had taken an environmental action, compared to 43% of non-IEEIA students.

Researchers also found that the IEEIA program had a significant positive effect on reading and writing skills. Students in the IEEIA program improved their critical thinking and problem-solving skills, their knowledge of ecology, their familiarity with important environmental issues, and their ability to analyze issues, including the key players, salient positions, and underlying beliefs and values. Most important of all, students in the program were better able to identify actions appropriate for issue resolution. This specific knowledge is missing from many EE programs.

The Molokai study also suggests the importance of social context in producing sophisticated knowledge and modeling. There is significant research that grounding environmental education within a community will help enhance the educational experience and incline the learner toward stewardship (Berger & Neuhaus, 1977; Siemer and Brown, 1997). Without such grounding, the education will remain abstract and irrelevant, beyond the experience of the learner and inconsistent with cultural norms.

The IEEIA program developers are not naive about how challenging their formula can be to implement in the conventional classroom. As convinced as they are that they have evolved a powerful and successful tool for bringing about environmental literacy, they also understand the need for skilled educators to effectively deliver the program. Marcinkowski (2004) points out that, as the field has professionalized and become more sophisticated, the need for specific professional preparation has increased. As early as 1991, Fortner and Mayer called for teacher training to maximize the use of curriculum and materials.

B. Outdoor Learning, or Learning Outside the Box

In this context, the "box" is the American classroom. Moving environment learning outside the classroom walls – whether to an outdoor nature setting or a community location – seems to create more powerful, focused, and memorable learning experiences. A number of case-specific studies have examined attitude shifts brought on by environmental education and related outdoor or outside the classroom activities. This research is sometimes labeled as "meaningful lifetime experience." Some of these focus on an immersion experience in the wild. In a seminal 1998 review of these studies, Steven Kellert of Yale University identified several studies that showed 70-80% of outdoor program participants experiencing more positive attitudes toward the environment. Examples from Outward Bound, the National Outdoor Leadership School (NOLS), and similar immersion type programs indicate that exposure to learning in the outdoors affects people profoundly and can even be life-changing.

Importantly, as time passed these feelings seemed to grow stronger. Participants in wilderness-oriented programs routinely report these experiences as among the "best in their lives." When that question is revisited several years later, the memory has grown fonder and a higher percentage of participants identify these programs as among their best lifetime experiences. Kellert's findings also indicate that outdoor education experiences positively affect behavior. Kellert (1998) concludes that a personally meaningful environmental ethic requires a fundamental affection for and identification with nature and related capacity to perceive oneself as an integral and obligate member of the ecological community.

Were students in these programs naturally predisposed to pro-environment attitudes and behaviors? To an extent, this is so. However, a 1995 examination by Porter et al (unpublished but reported in Kellert, 1998) of 288 students at the National Outdoor Leadership School confirmed that while incoming students tended to be relatively ecologically-minded to begin with, they still experienced positive changes with respect to the environment. For NOLS the goal is to convey what it calls "minimum impact ideology" in its core curriculum, often emphasizing this in a debriefing after a NOLS outing.

Another study (Schatz, 1996) found roughly equal results between outdoor environmental education programs and guided outdoor recreation. Both yielded a significant increase in environmental awareness among participants. This means that weaving environmental education into outdoor recreation experiences could be a useful approach.

C. The Promise of Place-Based Education

In his book on Place-Based Education, David Sobel (2004) both reinforces and challenges conventional approaches to environmental education by calling for a rethinking of its underpinnings. His concern is that the longstanding emphasis in EE on the natural environment is too limited. Rather, Sobel feels, the built environment, history, culture, and similar human concerns are crucial elements in achieving environmental literacy. Place-based education emphasizes the ways in which human and natural environments shape each other, and focuses more on the here and now rather than the distant future.

Sobel also sees a valuable modern trend in environmental education, which he calls "speciation." Speciation involves trying and refining more specialized, individualized approaches to EE that move beyond set curricula and syllabi to draw from real dimensions and diversity in the learner's life. He believes that our schools have a wonderful potential to develop a strong new pedagogy of place that connects the school to the larger community. Place-based learning sets learning *within*, rather than *alongside*, of the world. It is another example of the richness with which learning about the environment can support a complete and well-rounded education in our young people.

There is considerable evidence that placed-based education enhances academic achievement (see Chapter 6). There is still a need for research on the impact of place-based education on environmental stewardship, but Sobel points out some promising studies. A 1989 study by Marguerite Harvey of 850 schools in England found that students exposed to undeveloped, vegetated school grounds showed higher scores for the enjoyment of pastoral or natural environments, and a lower sense of human domination of nature. This impact on affective qualities in students indicates a noteworthy potential to reinforce stewardship. Sobel identifies a 2000 Texas study that showed similar student reactions to a schoolyard gardening program.

Conclusion

The bottom line: a base of environmental education developed through scientifically sound instruction and with an emphasis on skill-building can cause a lasting change in the way some – certainly not all – individuals feel and behave toward environmental resources. Well-presented environmental education ramps up pro-environment behavior, particularly if the instruction incorporates hands-on experiences beyond the classroom setting.

To understand EE's true bottom line, there are three important concepts its critics need to grasp:

- First, environmental education will only work to improve environmental stewardship if it is done right, such as in the IEEIA example provided above. Most of what passes for environmental education is unfortunately not anything of the sort, but that can be fixed with a greater commitment to educator training and further outcomes research.
- Second, if EE is done right, the average person is more likely to take regular positive actions. The extent of behavior change will depend on the complexity of the action, its level of ease or difficulty, whether people feel they are acting alone or in a larger supportive community, and if there is a link to something else that person values. NEETF estimates, at minimum, that these types of readily elicited behaviors could be worth up to $75 billion a year in measurable environmental benefits.

D. The Community Service Connection

One of the most encouraging developments for environmental education in the past decade is its popularity as a form of community service learning and support for environmental service. The idea of encouraging young people to engage in local community service projects has gained tremendous support in schools across America. The recent sense of public urgency behind community service programs came from a growing concern that our computer-based and television-based modern society is fostering passivity, selfishness, and even isolation among our youth. We want our children to care about people, work in teams, and be willing to help out in their homes and communities.

Middle schools, in particular, are handing pre-teens and young teens the responsibility for serving a specified number of community service volunteer hours. Today, most major school districts have some form of community service requirement. This means that most of our 50 million school children will now have a set number of community service hours during their K-12 education. Students document their participation in programs that help local community organizations: hospitals, libraries, park agencies, animal shelters, and more. In this way they fulfill their service requirements as an academic condition. Still, the educational impact of community service can be limited unless a learning component is built in.

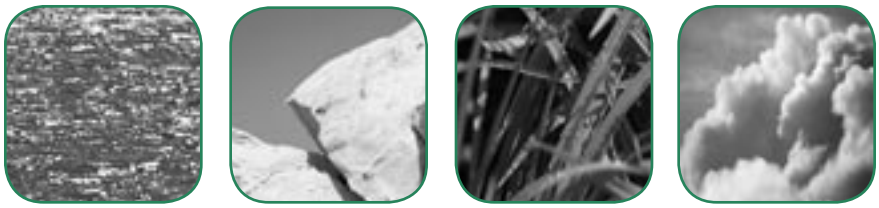
The environment is a leading subject for middle school service projects. A poll taken in 1995 confirmed that the environment was one of the three most popular subjects for community service (Wirthlin Group, 1995). The popularity of environment-based community service may be due to its combination of short-term tangible projects, physical outdoor work, and variety of opportunities. A number of studies are finding that environment-based community service is having a noteworthy impact on student motivation, attitudes toward education, disciplinary problems, and building self-esteem (see Chapter 6).

- Third, the people who are most active in our society – who run school boards, planning boards, volunteer fire departments, civic associations, animal welfare leagues, and other such groups – are also much more responsive to environmental education in all of its forms than the general public. The more these people know – all 30 million of them – the cleaner, healthier, and more beautiful America gets and stays.

It may be too much to expect environmental education to bring *all* of the public into the realm of model decision-making and behavior. The research presented in this report, however, shows that environmentally literate people can and do take simple but important actions such as saving water and electricity. And for a core group of opinion shapers and leaders, EE will also lead to more committed actions such as volunteering, contributing to a conservation organization, and other activities that require time, energy, and sometimes money.

Fully 95% of adults

and 96% of parents support the practice of teaching school children about the environment.



Chapter 6

Effects of Environmental Education on Youth

Preparations for the 1997 NEETF/Roper Report Card came amid public debate in the media on the hidden agenda of environmental education. Despite diligent efforts by bona-fide environmental education organizations to foster EE materials and instruction of the highest scientific and educational integrity, the occasional inaccuracy or overzealous teachers had fueled the claim that environmental education had become co-opted by environmental advocacy organizations and reduced to a thinly veiled campaign to convince children to become pro-environment activists. Proponents of that claim also proclaimed that parents were "upset" about their children receiving environmental education. Our researcher, Lynn Musser, offered a wise response: "Let's ask the parents what they think," she said. And that is what we did.

Level of Parental Support for EE

The 1997 NEETF/Roper Report Card – and every subsequent report card – found that adult Americans, including parents, overwhelmingly want environmental education for school children. Prior to conducting the research we expected a majority to be supportive. We never expected the magnitude of the majority: fully 95% of adults and 96% of parents support the practice of teaching school children about the environment (NEETF & Roper, 1997). In survey research, few undertakings receive such a high level of support. We were pleased and encouraged - but we wanted to know more about where such a high level of support comes from and what it actually means for the prospects of environmental literacy.

Accordingly, the 2000 survey included several follow-up questions about possible effects of EE on school children. Common sense would indicate that adults would support the notion of preparing the next generation for a more challenging environmental future. We assumed that adults generally want children to live in a better world. But the 2000 data also show that Americans believe that an appreciation and understanding of the environment creates well-rounded children who are better prepared to be part of society (NEETF & Roper, 2001).

This chapter reviews the expectations and reasons for adult support of environmental education. It then goes on to ask the question: are these expectations being met? How much of its promise is EE able to deliver? What do the data show about the academic and non-academic benefits that EE is producing?

Reasons for Supporting EE

Predictably, the most common reason to support EE in the schools, according to 87% of those surveyed, is to help children better understand environmental issues when they become adults (NEETF & Roper, 2001). (See Figure 6-1.) Almost as important, however, 85% of American adults think that environmental education contributes to a young person's thoughtfulness, consideration, and character in the form of respect for the people and places around them. Further, environmental education is seen by 86% of adults as encouraging children to get involved in community service volunteer work. They may not want their kids to be political "activists" but, for the community's sake, they want them to be "active." And, some 84% of adults feel that environmental education enhances science learning.

Fully 95% of adults and 96% of parents support the practice of teaching school children about the environment.

Similarly designed statewide studies showed equivalent levels of general support for environmental education for school children in Minnesota (90%) (Murphy, 2002) and Pennsylvania (95%) (Pennsylvania Department of Environmental Protection, 1998). Moreover, Roper's annual Green Gauge survey has twice corroborated these findings about the perceived value of environmental education. In 2000, 75% of adults said learning about the environment in school should be as important as math or English; in 2001, 77% agreed with that statement (Roper, 2000).

Figure 6-1: Expected Effects of Environmental Education

Percent responding

	No effect at all	Only a little	A moderate amount	A great deal
Preparing children to better understand environmental issues when they are adults	1	8	31	57
Teaching children to respect the people and places around them	3	9	35	50
Encouraging children to get involved in community service projects	2	12	35	50
Helping children perform better in science	2	12	37	47
Helping children find jobs later in life as the environment will play a larger role in future employment opportunities	5	21	39	31
Helping children perform better in social studies	7	19	40	29

Question wording: There are many ways that environmental education in schools can affect children. Do you think environmental education has a great deal of effect, a moderate amount of effect, only a little effect, or no effect at all on ...?

Source: NEETF & Roper, 2001

A study in 2004 by Karin Fernbach Kraft at Evergreen State College elaborated on the nature and scope of support for environmental education. Kraft surveyed 1,165 visitors to seven Environmental Learning Centers in the State of Washington. She compared this group to 99 patrons of the post office in Centralia, a small rural community in the Western part of the state, and 64 members of the Environmental Education Association of Washington. She found that support for environmental education by survey respondents was strong and virtually identical consistent across all three groups, regardless of their demographic characteristics. The data are shown in Figure 6-2 below.

While 83% of respondents did not know about a Washington State law to integrate environmental education into public schools, 80% of them still wanted all levels of government to support and fund environmental education programming.

Gender differences continue to predominate on the issue of support for environmental education. For four of the six effects mentioned in the NEETF/Roper survey questions, women were significantly more likely than men to state that EE in schools has a *great deal* of effect on young people. This is especially true for two effects in particular: encouraging children to get involved in community service projects (57% of women responded "a great deal of effect" versus 41% of men), and teaching children to respect the people and places around them (56% of women vs. 44% of men).

In other words, women appear to be more optimistic than men about the community and character-building benefits of environmental education. By extension, women are probably more likely to give environmental education a chance to prove its worth (remembering that the vast majority of *both* genders say that environmental education should be taught in schools). This is consistent with the NEETF/Roper findings that women evidence greater support and concern for the environment than men.

Figure 6-2: Expected Effects of Environmental Education

Percent responding

Expected Effects of EE	Env. Learning Ctr. Respondents
Maintain a healthy environment for people	96
Preserve long-term sustained use of natural resources	96
Preserve the beauty of nature and scenery	95
Preserve biodiversity	94
Connect children with nature	92
Prevent expensive environmental problems	91
Workers address complex environmental problems	91
Increase involvement and caring for the environment	91

Source: Kraft, 2004

Finally, most Ameri-cans do not want to see environmental edu-cation end with school graduation. They be-lieve in some level of education and training for people of all ages. There is, for example, strong support for governmental and cor-porate involvement in environmental educa-tion for adults. In a question in the 2000 NEETF/Roper Survey, Americans were asked whether the government should be involved in educating adults about environmental issues and problems. The vast majority of Americans (86%) agreed that government agencies should support such educational programs.

In addition, the public endorses the concept of turning to private companies to help solve environmental problems. Over 80% agree that "private companies should train their employees to solve environmental problems." Americans appear to want environ-mental education on the national agenda, and they want government agencies and corporate America to be involved in educating adults about the environment

EE in the Schools

While thousands of trained EE professionals approach teaching with this definition, most of America's 2.5 million K-12 teachers are considerably more casual in their thinking about EE. This is unfortunate, according to Thomas Marcinkowski of Florida Tech, who points out in his lectures that school is one place where each element comprising true environmental literacy can be addressed and taught in a controlled educational setting.

A common public assumption is that school children receive all their environmental education from teachers who are well versed in environmental subject matter and who can impart the causal sequences of complex environmental issues and conditions. In fact, although more than half our teachers say they teach environmental subjects, only 10% of teachers have had specific training on environmental education teaching methods, and only one in four has had any environmental science or related courses (Ruskey et al, 2001).

Funding for EE in the schools has also been variable. At least 32 states have environmental education programs, but as of 1998, less than $7.3 million was directly budgeted for them (Ruskey, Wilke, & Beasley, 2001). Of the 32 states, 15 required an educational component in K-12 curriculum, but only four states included pre-service environmental education training as a criterion for teacher certification. The value of this training for EE can hardly be overstated.

How is EE incorporated into the curriculum? In 1992, researchers Ramsey, Hungerford, and Volk described three main ways most EE takes place. The three forms are: a) "infusion," such as the incorporation of environmental case studies into existing courses, b) "insertion," such as the addition of specific courses to a school program, and c) "framing," a more comprehensive use of the environment as a way to support multidisciplinary study.

A later study in 2000 by the North American Association for Environmental Education and the Environmental Literacy Council indicated that infusion is the most common approach. The study found that 61% of public school teachers say they include environmental topics in their curricula. Nearly half of all K-12 teachers indicate they teach EE during the school year, but most devote fewer than 50 hours to it per year. The true figure may be considerably less than that. In a 2002 study of 1,500 North Carolina Teachers, for example, a majority (54.5%) reported they use environmental education in the classroom from 1% to 24% of the time. Only 15% of these teachers reported using environmental education training on a "daily" basis in the classroom; a majority of them characterized it as "monthly" or "occasionally."

The 1994 NEETF/Roper study of children supports the idea that environmental topics may be infused into the curriculum, but predominantly remain the jurisdiction of science classes. Respondents were asked where in school they learned about the environment. Their answers are shown in Figure 6-3.

Figure 6-3: Sources of Environmental Information in Schools

Percent responding

Science class	73
Field trips	44
Other classes such as English or social studies	40
Recycling or clean up at the school	24
Geography class	21
Special class about the environment	16

Source: NEETF & Roper, 1994

If the schools are not always reliable and consistent source of environmental education, where else do children learn about the environment? NEETF and Roper have conducted several nationwide surveys of school children. We asked kids where they got environmental education and information. Figure 6-4 shows their responses in 1994, and eight years later, in 2002.

Figure 6-4: Sources of Environmental Information, 1994 and 2002

Percent responding

	1994	2002
Television	71	72
School/Teachers	54	51
Family/Parents	30	49
Newspapers	27	30
Zoos, aquaria, etc.	18	na
Movies	17	na
Commercial ads	11	na
Kids magazines	11	11
Radio	10	25
Product packaging	8	na
Friends	na	39
Internet	na	9

Note: na = not asked.

Source: NEETF & Roper Starch Worldwide, 1994; Roper, 2002

The ways children receive environmental education and information seem not to have changed much since 1994, with the exception that parents now seem to be more involved in their children's environmental education.

Despite the expected pervasiveness of television as a source of environmental information for most school children, 54% of children identified school as a major source. This confirms the growing influence of schools in environmental education since the late 1980s (Fortner & Mayer, 1991), and the deeper level of instruction that schools are able to provide (Boyce & Stanisstreet, 2001). Still, as we shall see later in this chapter, there is a long way to go before America's schools are routinely providing students with the critical mass of environmental instruction needed for real environmental literacy. Because school offers the opportunity to learn about the environment in a more disciplined way, we would hope to see a steady increase in the percentage of schools offering organized environmental education. A greater emphasis on teaching basic environmental principles and using EE benchmarks – measures of real progress in learning specific environmental content, such as key ecological principles – would help address weaknesses in environmental literacy.

Even in its best light, most evaluators see American education as too passive and non-participatory. By and large, most school children continue to be confined to the classroom

and learn through lectures. Educators are drawn to EE because it helps students become more active in their own education, and it can be shaped by the students themselves.

Learning about the environment is variable and not static. There is considerable evidence, for example, that non-traditional formats (including the Internet) and informal venues for child learning are increasing in importance. A North Carolina study of teachers found that when teachers were asked what environmental education tool they preferred, 28% said books, 26% said lesson plans, 20% said videos, and 15% said the Internet (Aspinwall & Harrell, 2002). Educational expenditures by museums, zoos, aquariums, and nature centers have increased as these institutions adopt more of an education focus.

The remaining sections of this chapter examine the impact of environmental education on student performance in the following areas:

- Impacts on science learning
- Improvements in integrated learning
- Improved language arts and reading
- Improved thinking skills and motivation
- Equalizing of academic progress across groups
- Improved student attitudes and behavior

Impacts on Science Learning

Leaders in the United States express considerable concern about losing our competitive edge in science and technology. Young people in America are generally showing less interest in science, opting instead for less technical pursuits. This is particularly true for young women. The NSF Advisory Committee on Environmental Research and Education (2003) points out that 80% of all students decide before entering high school to opt out of advanced math and professional scientific pursuits. The report identifies environmental education as a heuristic tool for making science more relevant and appealing to young prospective scientists. Environmental education can offer a richer science experience, integrating science with student interest in the outdoors, and providing an appealing entry point for students thinking about future careers.

Some 80% of all students decide before entering high school to opt out of advanced math and professional scientific pursuits. Environmental education can offer a richer science experience.

The SEER study found that environment-based education stimulated science interest (Hoody, 2002). All educators who observed thousands of children in these programs perceived improvements in the learning of science in both its 1997 and 2002 studies. While most students in integrated environment-based programs show improvements across the board, science is the one educational subject where 100% of the students improved. Moreover, 89% of educators perceived improvements in understanding of complex scientific systems. Other studies support these findings:

- In the **Chariton Middle School in Iowa,** 50% of the students (both male and female) enrolled in the environment program scored at least one grade higher, with some 28% scoring three grades higher (Hoody, 2002).

- At the **School for Environmental Studies in Minnesota,** students exceed state and national standards and are motivated and self-directed learners. Students scored 24.2 on the ACT, compared to a state average of 22.5 and a national average of 21.1 (NEETF & NAAEE, 2000).
- In **Thompkinsville Elementary in Kentucky**, the statewide KRIS study showed improvement from 1995 to 1998 in science, as environmental education students advanced their scores from 24.15 to 50.00 (NEETF & NAAEE, 2000).
- The **Gililland School in Forth Worth, Texas** employs a prairie restoration project as a way to integrate learning, strengthen science learning, and improve student performance. The project involves restoring 28 acres of a former industrial dumping ground to a native prairie site. Over 85% of Gililland students passed all sections of the Texas Assessment of Academic Skills (TAAS), well above the state average (NEETF, 2002a).
- In a **Georgia Southern University** study of students in a science course (Battles et al., 2001), researchers found that of 76% of the students had developed a basic knowledge of environmental science concepts and 56% had acquired the ability to communicate them clearly. Some 65% believed they had developed the ability to make more informed decisions; 73% agreed the course would help them become more responsible citizens. However, while 68% agreed that their ability to analyze environmental science problems had improved, just 41% felt that they knew how to solve problems. No significant differences appeared between male and female students.

Despite the common sense and widely held view that environment-based education improves science learning, there is a need for more controlled study of this question. In one unpublished study, researcher C. Clavijo (2000) investigated the relationship between 4,655 sixth grade students' science test scores and their participation in environmental education programs. The study found that integrating environmental education into science instruction did not improve the ability to predict test scores when scores were controlled for previous achievement and socioeconomic status. While the study did not find a strong positive relationship between environmental education and high scientific achievement, EE did not correlate with low science achievement either, which provides a response to some critics who have claimed over the years that EE actually weakens basic science learning.

This study points up two significant research needs for the field of environmental education. First, not enough controlled studies are being done. Many of the studies discussed in this report show positive correlations but more controlled and evaluative studies are needed to help quantify causes and identify the most effective approaches.

Second, there are many important but mostly unpublished studies that need to be collected and evaluated. Some of these examine outcomes and some even employ controlled evaluation of variables. For example, hundreds of doctoral dissertations and masters' theses need to be collected and reviewed, and their findings made part of the larger, accessible body of knowledge for the field.

Improvements in Integrated Learning

The National Science Foundation has pointed to environmental education and science as serving an important role in integrating disparate subject matter in ways that students can both understand and apply. Isolated disciplines presented in a more confined classroom

setting have documented weaknesses. Integration requires new thinking and a challenge to educational delivery. The NSF values environment-based education for the positive effect it can have on learning in science and engineering.

EXAMPLE: The State Education and Environment Roundtable (SEER, 2000) has developed compelling evidence, research, training programs, and protocols for using the **Environment as an Integrating Context** (**EIC**). SEER research has consistently demonstrated how effective environment-based education can be in promoting high quality learning. This is particularly true if it is used with a large segment of the student body. The SEER evidence record is compelling. It has carefully documented hundreds of examples, ranging from skilled expert testimonials to more controlled studies, showing how student achievement improves when the environment is used as an integrated approach for learning. Consider the following:

- One school's EIC students had composite scores in the statewide performance assessment that were 27% higher than other comparable schools in the same county.
- Another school's EIC students achieved an average growth of one full stanine (or achievement increment) from their testing prior to the EIC program in the Stanford Nine Assessment.
- In Kentucky, EIC students averaged a 10% increase over their previous statewide achievement test scores and elevated the entire school's standing in statewide assessments.
- Randomly selected ninth graders in an EIC program in Washington averaged an overall 3.2 GPA compared to a 2.6 average for other 9th graders in the school. Tenth grade EIC students in the same school averaged a 3.0 compared to a 2.8 for the others.
- A Texas elementary school showed consistently higher performance in the Iowa Test of Basic Skills, particularly in reading and language than in the years before it had environment-based education. Now, students in the environment-based education program perform above the national average while students school-wide are significantly below the national average.

EXAMPLE: Researchers under the auspices of the Center for Instruction, Staff Development and Evaluation (CISDE) found that the **Environmental Issue Investigation and Evaluation** (**IEEIA**) Program had a very positive effect on broader student learning (Cheak et al., 2002). In addition to classical environmental literacy outcomes (ELOs), the 38 fifth and sixth grade students studied in depth were compared to a control group and were found to be using a wider range of reading materials and more difficult and challenging materials; to be skilled analysts of complex issues; to have improved writing skills; to be more motivated learners and enthusiastically up to an academic challenge; and to have a better command of learning technology.

EXAMPLE: A study of 77 pairs of schools in the **State of Washington** found small but positive improvements in school scores in math, reading, writing, and listening for schools with formal EE programs in place, compared to schools without such programs (Bartosh, 2003). Each "EE school" had a formal EE program in place for at least three years. The schools were paired using U.S. Census data and OSPI information. The study compared student performance on two standard tests used in Washington – the Washington Standards or Learning Test (WASL) and the Iowa Test of Basic Skills (ITBS). Results are shown in Figure 6-5.

Figure 6-5: Average Scores of EE vs. Non-EE Schools in Washington State

Test	Average EE school score	Average Non EE school score
WASL Math	44.6	41.1
WASL Reading	63.3	61.2
WASL Writing	47.1	43.7
WASL Listening	76.4	75.1
ITBS Reading	63.2	60.7
ITBS Math	65.8	63.5

Source: Bartosh, 2003

The use of controlled comparisons and the focus on frequently used standardized test scores make this study particularly useful. The study found that even schools with as few as 20% of their teachers using EE materials and programs did better than schools with no EE programs.

EXAMPLE: Zoos and similar facilities can connect with schools to provide a strong science education. At **Minnesota's "Zoo School**," students gain the ability to draw connections between disciplines by pursuing a curriculum unified by the environmental theme. (NEETF, 2002a) Each student spends three hours per day engaged in thematic studies. These studies are a seamless integration of language, social studies, and science classes. One such effort, for example, focuses on the human-water relationship and incorporates literature about water, studies on the role of the water in world civilization, and technical scientific reports on local ponds.

The Zoo School's integrated curriculum has numerous measurable benefits. In all academic areas, Zoo School students score higher on the ACT for college admissions than their peers in the district, the state, and the nation. Students who go on to college are already equipped with study and application skills they will need for college, including the critical ability to work independently.

Improved Language Arts and Reading

For many, the idea that environment-based education advances reading and language skills seems less obvious than that it supports science learning or investigative skills. But 93% of educators observing students in environment-based programs report that the children read and write better as a result of the exposure. And 94% of them say the children in these programs communicate with one another much better (Hoody, 2002).

- Independent data assembled by SEER (2000) from **Dowling Elementary in Minnesota** found an 8% rise in reading skills for low achievers and a 7% rise median reading and comprehension scores overall.

- At **Bagley Elementary in Washington**, another SEER school, reading scores on the Iowa Test of Basic Skills rose from an average of 44 to 53 among students in the environment-based program (SEER, 2000).
- A NEETF/NAAEE study (2001) found that, in **Kruse Elementary, Texas**, first-grade students in the environment-based program had vocabulary skills of 2.0 compared to 1.2 school-wide on the Iowa test. Students in the environment program had reading comprehension scores of 1.9, compared to 1.6 school-wide. Numerical scores were 55 for vocabulary compared to national averages of 50 and school-wide averages of 38. Reading comprehension for students in the environment program were 62 compared to school-wide scores of 44 and national averages of 58.
- At **Isaac Dickson Elementary School in North Carolina**, proficiency in reading advanced from 70% to 79% for environmental program students over the course of one year. Writing scores advanced from 46% to 57% in one year (NEETF & NAAEE, 2001).
- At the **School for Environmental Studies in Minnesota** where higher science scores might be expected, ACT scores in language arts were 24.6 compared to 22.3 statewide and 21.4 for the nation (NEETF & NAAEE, 2001).
- A **California Student Assessment Project** completed by SEER in 2000 paired schools with and without EIC programs. SEER found that in reading and language arts, EIC student performed better than the "paired" students in 69 of 91 (76%) assessments that yielded numerical measures. In typical elementary school findings, third and fourth grade EIC students performed from 4% to 9% better on reading tests (SEER, 2000).

Improved Thinking Skills and Motivation

A recent study of the effects of environment-based education on students' critical thinking and achievement motivation in **Florida high schools** found a significant positive relationship with respect to several standardized tests (Athman & Monroe, 2004). In a controlled study of several hundred students, researchers found that:

- Students in the environment programs at the ninth grade level scored 4.33 points higher than their cohorts on a 76-point scale in the Cornell Critical Thinking Test.
- The twelfth graders in the study sample scored 5.54 points higher. Researchers attributed this to a combination of the integration of multiple disciplines, the open-ended nature of the work, the self-direction of students, and other factors.
- Using the California Measure of Mental Motivation (Giancarlo & Facione, 1998), the study found no difference among ninth graders in the environment program and the control group, but found that twelfth graders scored 3.96 points higher on a 50-point scale.
- On a third test, the Achievement Motivation Inventory, ninth graders in the environment-based programs averaged 2.75% higher on a 100 point inventory. White twelfth graders in the study averaged 8.56 points higher on the scale.

The Florida results show relationships between environment-based programs and both critical thinking and motivation and are very encouraging. The researchers note that while their study may not be entirely conclusive, the results are consistent with theoretical predictions in the critical thinking and achievement motivation literature and previous studies conducted by Lieberman and Hoody (2002), SEER (2000), and NEETF and NAAEE (2000a).

Equalizing of Academic Progress Across Groups

SEER research since 1997 has shown that environment-based education improves academic performance and learning across the board, regardless of socioeconomic or cultural factors (Hoody, 2002). Indeed, environment-based education appears to be a kind of educational equalizer, improving reading, science achievement, and critical thinking skills across ethnic and racial groups.

EXAMPLE: The **Dowdell Middle School** in Tampa, Florida, has a student body of equal proportions of African American, Hispanic, and Caucasian students. Performance improvements in all groups improved as a result of environment-based service learning programs. Dowdell is a magnet school with a diverse population of near-equal numbers of African American, Hispanic, and Caucasian students. Some 65% of the students qualify for free or reduced-price lunches (NEETF & NAAEE, 2001).

EXAMPLE: At the Pine Jog Environmental Education Center in **West Palm Beach**, **Florida**, several schools were tracked from 1995 to 1999 to determine how students reacted to environmental education programming when measured against standardized statewide achievement tests. Pine Jog schools give us some interesting data concerning how diverse student populations react to environment-based programming. One of the schools (Del Prado) has mostly Caucasian students; three others have mostly minority students. The Florida Comprehensive Achievement Test (FCAT) tells an important part of the story.

For language skills and critical expository writing skills, the Del Prado School had FCAT scores of 2.4. At three other schools, including Westward, which is 80% African American and 7% Hispanic, the same FCAT measurement was 1.7 and at the two other schools, both 50% minority, the FCAT score was 1.5.

From 1995 to 1999, Del Prado students in the environmental program advanced from 2.4 to an outstanding level of 3.1, moving up .7 point on the FCAT scale. But the schools with a higher percentage of minority students improved even more. At Westward School, for example, the increase was from 1.7 to 2.8 or 1.1 points on the scale. At Melaleuca School, the increase also totaled 1.1, and Green Acres School experienced a 1.2 point increase (NEETF & NAAEE, 2001).

EXAMPLE: In Washington, DC, the **EnvironMentors Program**, started in 1992, matches adult mentors one-on-one with high school students from the Washington, D.C. public schools to develop and present an environmental science project. Some 1,000 students have been through the program. In an average year they are 85% African American and about 10% Hispanic. System-wide, four-year high school graduation rates average 60%; EnvironMentors students boast a satisfying 98% graduation rate. And with an average of only 10 to 20% of D.C. public school seniors even applying to college, the EnvironMentors students have a 90% college acceptance rate. According to its staff, the EnvironMentors Program demonstrates several important aspects of how learning about the environment offers students from under-resourced schools and neighborhoods significant opportunities. First, the program is student-directed even though it is a mentoring relationship. This instills a greater sense of ownership in the students and helps them feel more responsible (and successful) at managing their own education. Second, many of the projects are locally based. This helps students to learn more about their own communities. Finally, the process of environmental issue research and investigation helps students learn a set of skills that will help them tremendously in their efforts in higher education.

Benefits Brief: EE's Connections to Community Service

Volunteerism: Research shows that environmentally tuned-in Americans are more likely to volunteer for an environmental purpose such as helping out at a local park system or community project.

Youth service: The environment is the number one subject of choice for student community service projects and programs.

EXAMPLE: The **Four Corners School in Utah** successfully uses environment-based service learning to address academic and life skill improvement in Native American students and young adults. Some 25,000 young people age 16-23 have gone through the Canyon County Youth Corps Service Learning Program, performing public land restoration projects while learning life skills and environmental stewardship. About 90% of the school's students are Navajo (NEETF & NAAEE, 2001). The Earth Conservation Corps, a similar program in focused on African American youth in Washington, D.C. and Native American youth in the state of Washington, has had similar results using the environment as a theme for improvements, according to its staff.

Improved Student Attitudes and Behavior

The Washington, DC area-based youth organization Earth Force specializes in building a community service requirement into educational curricula on the environment. Earth Force estimates that half of all students who participate in community service hours will devote some of those hours to environment-based projects, such as scientific water quality sampling, stream restoration, park clean up, tree planting, invasive species removal, local recycling, water conservation, and the like.

EXAMPLE: At the **Huntingdon Middle School in Pennsylvania**, environment-based service learning has had a profound effect on student motivation and willingness to pitch in within the community (Hoody, 2002). Through its Science Teams in Rural Environments and Aquatic Management Studies (STREAMS), the school has evolved a 60-hour core program for all sixth graders. The curriculum integrates environmental topics into hands-on learning projects. Students are taught to undertake complex environmental projects. After completion of the course, many students choose to participate in rigorous after-school environmental education programs.

In a county where fewer than 10% of all adults have post secondary degrees, the success of Huntingdon's programs seems to be reversing some deeply entrenched local attitudes toward education. The students at Huntingdon have become local experts in community stewardship, having received a total of $250,000 in grants to accomplish projects such as assessing watersheds, repairing broken sewage lines, constructing wetlands, and restoring stream banks. When asked why they participate in a not-for-credit after school program, they identify a sense of empowerment and self-satisfaction. Students have formed many community partnerships with public interest organizations, parents have become involved, and academic success has improved dramatically.

Community service is also a response to the concern on the part of educational leaders in America about a break down in "character education." Both educators and parents worry that our schools are not challenging students to become community-minded or to develop respect and responsibility toward the people and places around them. In 1991, author Thomas Lickona called upon schools to become more deliberate about character education by setting up instructional units that focus on activities involving cooperation and respect.

From an educational perspective, says Terri Akin (1995), character education grows out of a continuing series of useful interactions, not through passive, insular activities such as listening to a lecture. Environment-based education can help teachers become character educators with basic messages such as avoiding waste and showing respect for others. Importantly, the environment when employed in this way is politically neutral and reinforces science and academic achievement.

The SEER study in 2000 examined how environment-based education seems to affect student behavior and character and made some important findings. Fully 70% of the educators involved noticed that the students in the environment-based programs evidenced improved behaviors. Importantly, 93% of involved educators observed improved civility toward others among the students.

The **Hotchkiss School in Texas**, for example, saw a 91% reduction disciplinary referrals among students in the environment program. In Little Falls School in Minnesota, the students in the environment program comprised just 28% of reported discipline problems although they represented 46% of the student body (Hoody, 2002).

Youth who receive instruction in both environmental issues and action strategies assume personal responsibility for realizing their values. Such a sense of responsibility increases confidence and self- esteem. It also helps them feel part of "something larger than them" (Iozzi, Laveult, & Marcinkowski, 1990), as the following examples show:

> **EXAMPLE**: The **Helen M. King Middle School in Maine** struggled with rampant discipline problems, poor attendance, negative attitudes, non-existent parental participation, and low academic performance. Nearly 10% of the student body transferred to other area schools in a three-year period. Over the same period, the Limited English Proficient (LEP) and bilingual population of the school rose to 22%. In a school where 70% of the students already qualified for federally subsidized lunches, teachers found their students struggling with basic academics (NEETF, 2002a).
>
> Instead of despairing, the school's principal and a team of teachers changed the rules in 1993 and embarked on a Comprehensive School Reform Program based on environmental learning. It is called Expeditionary Learning Outward Bound (ELOB). Despite steady increases in King School's low-income and LEP populations, the school's standardized test results have shown marked improvement in all disciplines. Importantly, the first ELOB team at King achieved instant results in improved student behavior, with 50% fewer discipline problems and improved attendance and student engagement. Parental involvement rose substantially, and King's performance on the Maine Educational Assessment (MEA) improved in all areas - reading, math, science, health, social studies, and arts.

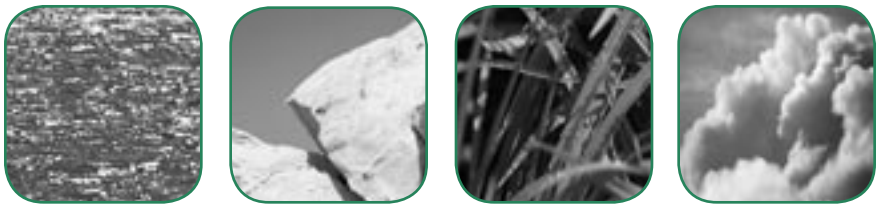
EXAMPLE: The American Honda Education Corporation founded the **Eagle Rock School in Colorado** in 1993 as a haven for high school students struggling in traditional academic settings. Some of the students suffer from problematic relationships at home. Most have dropped out of school, been expelled, or have given up. Some have made poor decisions regarding drugs, alcohol, and gangs, and many exhibit low self-esteem. The School focuses on service learning programs based on environmental study and improvements. The program has created a lasting commitment among students to improving the quality of life for others and contributing to their communities. Importantly, the School found that the students gain a sense of purpose and self-esteem by doing the meaningful work involved in the program (NEETF, 2002a).

Another related response to the need for improved character education has been the profusion, since 1997, of after school programming. Most educational observers agree that young people are at much higher risk for mischievous behavior in the hours immediately following the end of the regular school day. Some 20% of American school children are "latchkey kids" (children home by themselves in the afternoon until a parent gets off work) whose parents would welcome inexpensive and educational alternatives to their children being at home. Moreover, a broad base of research shows that children are more at risk for getting in trouble in the afternoon hours though exposure to sex, drugs, alcohol, or violence. Blending hands-on environmental projects with after-school programs is a natural solution:

EXAMPLE: In Woodlake California, a rural community where 85% of students qualify for free or reduced-priced lunch, the **Heritage Project** provides 2,500 students with enriching and exciting after school activities and courses (Ohio State University, 2001). Through a partnership between three local school districts and the Sequoia and Kings Canyon National Parks, an environmental education program has evolved to complement the Heritage Project's other academic and cultural offerings. The Project is supported through the National 21st Century Community Learning Center program of the U.S. Department of Education. This is a national program that increased from $1 million in funding in 1997 to $1 billion in federal funds five years later.

At the Heritage Project, students meet with a park ranger to learn about topics related to the parks, such as cycles of forest fires and the adaptations of animals and their habitats. Students' connections with the parks become more extensive and regular than the occasional field trip that many schools offer. Educators at the Heritage Project find that their hands-on experiences form greater student motivation to learn and get involved. Nearly three-quarters of local students have become involved in the Heritage Project. Since its inception, test scores in both language and math have improved significantly. Behavioral problems in the classroom have decreased, suggesting that student social skills improve as a result of the program. Also, a higher number or parents have become involved.

Environmental education is not intended as a boot camp or "tough love" program, where some youth are held to the fire to shape up and learn proper behaviors. Instead, EE seems to teach many of the same lessons in a constructive, non-violent way that supports communities, instills solid values, and builds increased self-esteem. Along the way millions of young people are receiving valuable exposure to the outdoors, to environmental improvement projects, and to varied and interesting ways to learn.



Chapter 7

Long Term Value of Environmental Education

What, ultimately, is the value of environmental literacy? In previous chapters, we have made the case that higher levels of environmental knowledge lead to higher levels of environmentally-beneficial actions. We have also described the manifold benefits of environmental education for students' academic progress, thinking skills, attitudes, and motivation. This chapter takes a wider lens and examines some of the longer term and ancillary benefits of environmental literacy for society as a whole.

One thing is certain: the environment is constantly changing. As we have noted earlier, the environmental issues facing this nation have shifted considerably over the last forty years (see box below.) American businesses, individuals, and industry have begun to shift their attention from an emphasis on waste treatment and disposal practices to a more thoughtful integration of environmental factors into business planning and individual lifestyle. Moreover, as environmental topics and problems become more complex and pervasive, our decades of reliance on trained experts within the private and public sectors to handle our needs are nearing an end. In the future, many leading environmental problems, ranging from water quality to ecosystem management, will require the efforts of more skilled non-experts acting as individuals, through small business, or as community leaders.

With world population growing, the strain on limited resources will likewise necessitate higher levels of environmental knowledge. As noted, the National Science Foundation Advisory

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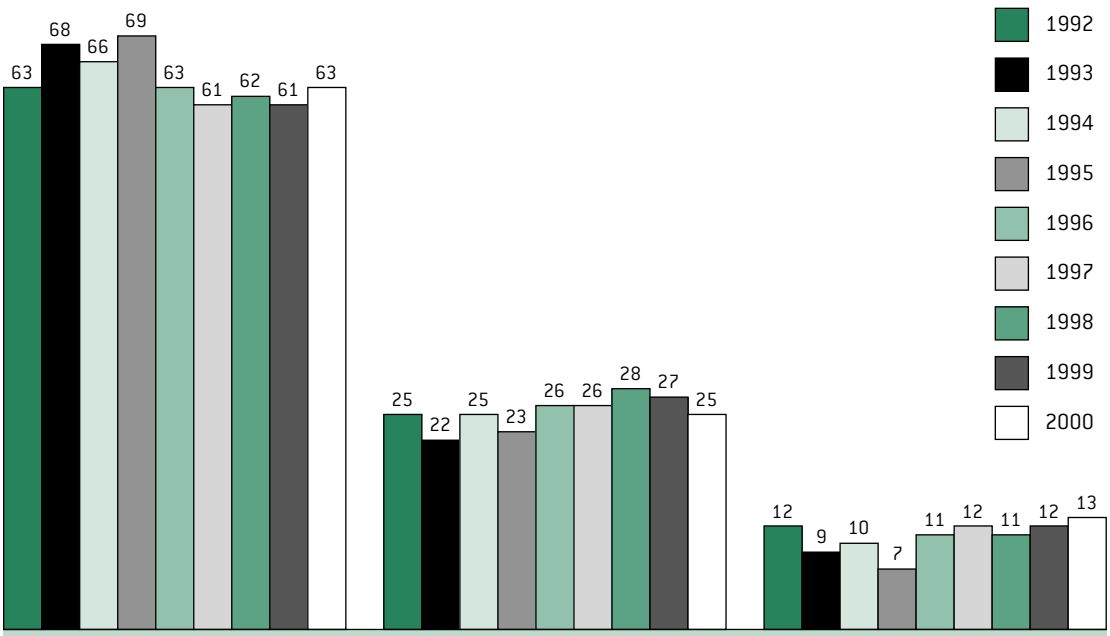
Examples of 30-Year Shifts in Leading Environmental Problems

1970	2000
Industrial and municipal water pollution	Polluted run-off from the land
Industrial air pollution	Autos, homes and smaller businesses
Major land developments (highways, airports, new towns)	Localized but widespread sprawl
Loss of notable species	Loss of ecosystems
Toxic waste from factories	Chemicals at home and in agriculture

Figure 7-1: Environmental Protection and Economic Development Can Go Hand in Hand



Question wording:

Most of the time, do you think environmental protection and economic development can go hand in hand, or that we must choose between environmental protection and economic development?

Sources: NEETF & Roper, 1992-2001

Committee (2003) found that "in the coming decades the public will more frequently be called upon to understand complex environmental issues, assess risk, evaluate proposed environmental plans and understand how individual decisions affect the environment at local and global scales."

An Economy Bound to the Environment

Reading a newspaper, watching television, or listening to a political debate, one might conclude that no bridge could ever span the difference between the needs of the environment and the needs of the economy. However, according to the NEETF/Roper surveys, two thirds of Americans say that environmental protection and economic development can go hand in hand (see Figure 7-1).

Only 25% disagree. These figures have been roughly stable over the period 1992 to 2000. Moreover, when Americans are more optimistic about the nation's economy, they also become more optimistic about the quality of the natural environment. (See additional data in Appendix 6.)

Importantly, 70% of respondents who were top performers in a 12-question environmental quiz (nine or more correct answers) feel the economy and environment can go hand in hand. This compares to 52% among the lowest performers (four or fewer correct answers).

As in the past, these attitudes are consistent across age, gender, and income demographic subgroups, varying only by education level and environmental knowledge. Among Americans with a college degree, 72% think the environment and economic development can go hand in hand, compared to 63% of those with some college and 59% of those with a high school education or less. There is a similar difference between higher and lower income households on this issue (67% of those making $50,000 and more agree, compared to 57% among those with less than $20,000 in annual income).

When the public was asked in the NEETF/Roper studies if they felt a balance between the environment and the economy could *ultimately* be achieved over the long run, nine in ten agreed.

Environmental Education and Gender

Environmental education could have a positive effect on the participation of women in the science professions. Today there are roughly twice as many men in science-related professions as women. Differences between the genders in science education and science professions may also be reflected in their different performance on NEETF's environmental quizzes. As noted in Chapter 1, in the 1997 and 2000 NEETF/Roper report cards, 43% of men passed the general environmental quiz; only 21% of women passed. Men averaged 7.75 correct answers while women answered an average of 6.25 questions correctly. Similarly, some 15% of men passed the 2001 energy quiz while just 6% of women passed.

Despite their relatively poor performance in environmental quizzes, woman typically express a more positive attitude toward the environment than men.

Despite their relatively poorer performance in environmental quizzes, women typically express a more positive attitude toward the environment than men. Perhaps higher levels of female support for environmental conservation and lower levels of environmental knowledge can be brought together in a dynamic way. Because the environment is somewhat more important to women, it may also be an appealing way to approach scientific education for girls. If this higher level of interest can be captured and sustained through environmental education, environmental education could even help turn around current trends by encouraging and fostering more female scientists.

Achieving Increased Cultural Diversity

A persistent challenge confronting the environmental management movement in America is its need for increased racial and cultural diversity. The population of America has been changing dramatically in the past 30 years and becoming more culturally diverse. The professional environmental field has not kept pace and has been largely dominated by middle class whites. Some feel this is due to the very subject itself, but in fact, the quality of the environment is vitally important to people of all cultures and economic standing. Increasingly, all Americans have come to understand the need for more livable communities

and cleaner local environments. There is also much greater recognition of the effect of the environment on human health and the need to use education to manage health risks.

The State Education and Environment Roundtable believes that environment-based education could become a significant tool for creating more cultural and social diversity in the environmental management field. While more research will surely be needed, environmental study programs seem to represent a significant opportunity in attracting a larger number of minorities to the professional science, engineering, and environmental fields. The National Science Foundation (2003) finds that African Americans make up only about 3% of science professionals, although they comprise 11% of the overall population; similar statistics apply to people of Hispanic heritage. The environmental field is one of many science-based fields that will experience an unprecedented rate of turnover as a result of retirements by 2012. The Environmental Careers Organization and several public agencies estimate that for most environment-based professions this turnover will be close to 50%.

Student exposure to the outdoors, the observation of environmental problems, and contact with role models are all factors in selecting environmental careers (Sward & Marcinkowski, 2001). Environmental education programs that provide such exposures and experiences can become a significant doorway for minorities to enter environment-based professions.

Environmental Literacy and Better Health

The National Institute for Environmental Health Sciences notes that the environment is a growing factor in optimizing human health. Because many diseases are preventable, environmental education will only become more important over time. A 1995 study by the National Academy of Sciences found that environmental exposures to toxic substances, *excluding* cigarette smoke, added up to the fifth leading cause of death in the United States (McGinnis & Foege, 1993).

Both the NEETF/Roper studies and the Roper Green Gauge reports have consistently found that the public's top environmental concern is the protection of human and family health. Fully 60% of adults say the main reason to protect the environment is a health concern – to protect themselves from pollution. This is confirmed by NEETF/Roper data (2001) on support for more water quality regulation (around 70%) and more air regulation (around 60%).

When the 2001 Roper Green Gauge study asked people what environmental issues topped their list of concerns, 32% cited ozone depletion over the earth, 31% cited polluted drinking water, 24% identified water pollution and 20% named air pollution in the community – all issues with strong links to human health concerns.

Most people might think there is little they can do to manage their environmental exposures, but the Agency for Toxic Substance Disease Registry (ATSDR), a part of the Centers for Disease Control, states that people experience significant environmental health exposures, often without much awareness (ATSDR, 2000). Some examples:

- There are 13 million wood stoves in use in the U.S. and 800,000 are sold annually. Unless properly maintained and vented, they can emit noxious gases including carbon monoxide and oxides of nitrogen. The nation's tens of millions of gas stoves can also be a source of nitrogen oxide, a respiratory irritant.
- People who live in the more confined spaces of mobile homes can experience exposures from chemicals and resins found in building materials, home improvement products,

carpet adhesives and formaldehyde insulation that can cause eye irritation, breathing problems and dermatitis.

- The rate of childhood asthma has nearly doubled in the past 20 years with pollutants being identified as a significant asthma trigger.
- Asbestos was widely used as a building and soundproofing material through the 1950s to the early 1970s. When it becomes frayed or friable, its fibers can be released into the air.
- Radon gas is found in significant concentrations in some areas. Five to ten percent of single-family homes in the U.S. have been estimated to exceed EPA standards. Radon in combination with certain particles can cause cancer. EPA estimates 14,000 lung cancer cases are annually attributable to Radon.
- Common household products can also cause health problems. Paint strippers, toilet bowl deodorizers, dry cleaned clothes, moth crystals, and other sources can combine to make indoor air unhealthy.
- Lawn care products, lead-based products, poor water supply, and soil contamination are all among the everyday items that can have serious health consequences unless proper knowledge exists and proper care is taken.

The impact of pollutants on human physiological systems is a growing concern and one that could loom larger in our future. Scientists are expressing concerns about the accumulation in our bodies of a variety of chemicals encountered in the environment, from benzene in gasoline, to mercury in fish, to lead in drinking water. Approximately one-third of the public (31%) correctly identifies drinking water as the primary source for the ingestion of chemicals and minerals (NEETF and Roper, 1999a). Another third (32%) wrongly says that unhealthy chemicals enter the human body primarily through the air people breathe. That these two answers receive similar support indicates a public that knows that water and air pollution can be dangerous if they contain pollutants. Nevertheless, Americans have not received sufficient information to differentiate between the two sources of pollution and perhaps do not understand the importance of water as a medium for ingestion.

Modest estimates are that Americans spend about $1 trillion a year on health care. Experts estimate that as much as 90% of diseases are preventable (Fries, Koop, Beadle, et. al., 1993; Iglehart, 1999). If health-related environmental literacy could cut illness by even 2%, that alone would save the country about $18 billion per year.

Readiness for a New Era of Sustainability

The 1999 NEETF/Roper report card was prepared on the eve of the 21st century. Its aim was to assess public understanding of emerging and global environmental issues. Our hypothesis was that in matters of public policy affecting foreign affairs and in community based activities, the American public will be called upon to understand issues of importance to the future. Overall we found knowledge of these issues to be quite low, with American adults averaging just 3.2 of the ten questions correct.

Poised at the beginning of a new century, we are well positioned to consider where the American public now stands in relation to environmental protection and where we need to go. Few issues are likely to be more important in the early part of the next century. Unfortunately, Americans are ill prepared to understand and address the complex and intractable issues that will be our greatest challenges in the 21st century. Even though concern for the quality of

the environment and its relationship to human health will likely increase in the early part of the next century, knowing the issues and doing something constructive about the problems may be more difficult than ever. Many of our leading environmental problems today and into the future will be the result of the accumulated actions of individuals. Issues such as freshwater shortages, global warming, systemic contaminants, run-off water pollution, and environmental problems caused by small businesses, homes, and automobiles will become more of a factor in our environmental future. Following are some examples of the "preparedness" issues we examined:

Main Cause of Global Climate Change

Less than half of the American public realizes that the cars they drive and the appliance-rich homes in which they live contribute to global climate change through increased carbon emissions. Among the general population, only 45% correctly identify emissions from autos, homes, and industries as the main cause of global climate change. Although 77% of Americans rated this as a somewhat or very serious problem for the future, they gave it the lowest score in terms of seriousness of seven environmental problems included in the survey. Although global climate change has received considerable media coverage in the last few years, the controversies and complexities of the phenomenon may have helped to obscure its causes. In addition, it is possible that people lump "global" issues together without careful distinction. Thus, one-quarter (26%) of Americans placed the blame for global climate change on sunlight radiating more strongly through a hole in the upper atmosphere, another issue of global significance but much more tangentially related to global climate change. Clearly, a good deal more environmental education will be needed to reach Americans as a whole on this emerging issue.

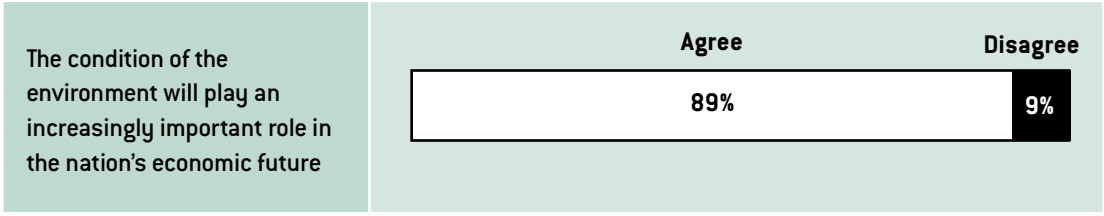
Primary Reason for Worldwide Reduction in Ocean Fish

Most experts agree that ocean fish populations are declining, and governments at federal and state levels are enacting limits on the harvesting of ocean fish to reduce the depletion of fish populations. However, information about this issue is not reaching the public. Only 25% of Americans can correctly identify increased harvesting by fishing vessels as the primary cause of the reduction in the number of ocean fish. Instead, four Americans in ten (40%) place the main blame on pollution in coastal waters, while just over one in ten (12%) say changes in ocean temperatures are at fault. Importantly, Americans residing on the coasts of the United States (West, 30%; Northeast, 28%) are somewhat more informed about this issue than those living in the interior (Midwest, 23%; South, 22%), an indication that the local nature of a problem shapes the public's environmental knowledge.

Fresh Water Available for Use

The availability of abundant, clean water may be one of the most troubling questions Americans will face in the future. In arid regions of this country, water shortages are already a significant issue. Just 1% of the world's water is fresh water, and nearly one half of that is situated on the North American continent. This means that competition will be fierce in most other nations; water could become a leading environmental concern for the 21st century. In what turned out to be the second-most difficult question in the quiz, just 13% of Americans know that only 1% of the world's water is fresh and available for use. This may reflect a lack of interest in, or concern for, global issues that do not impact most Americans. The misconception that there is more drinking water available than actually exists (64% gave an incorrect response) may make Americans less concerned about water conservation. Ironically, even though those who live in the American West are reminded of water needs daily, they did not have a significantly greater understanding of this issue than respondents in any other region.

Figure 7-2: Healthy Environment Equals Healthy Economy?



Question wording: Please indicate for each of the following statements whether you strongly agree, mostly agree, mostly disagree, or strongly disagree.

Source: NEETF & Roper, 2001

"Environmental Catastrophe" in the Next Decade?

Concern about the planet's future remains high. A majority of Americans (56%) in 1999 believed that we may be headed for an environmental catastrophe in the not-too-distant future. This sentiment was reflected in the majority of Americans who agreed with the following statement: "The next 10 years are the last decade when humans will have a chance to save the earth from environmental catastrophe." Interestingly, a full 40% of those who believed that environmental regulation had gone too far still felt that catastrophe loomed in the next decade (vs. 65% of those who say current regulations do not go far enough). Women were more likely than men (59% vs. 53%) to agree that an environmental catastrophe could occur in the next ten years if something is not done to protect the planet. Interestingly, concern about catastrophe decreases with higher levels of education – from 58% among those with a high school education to 50% among those with a college degree. Conversely, 46% of college-educated respondents disagreed with the statement while 37% of high school grads disagreed.

Healthy Environment/Sustainable Economy

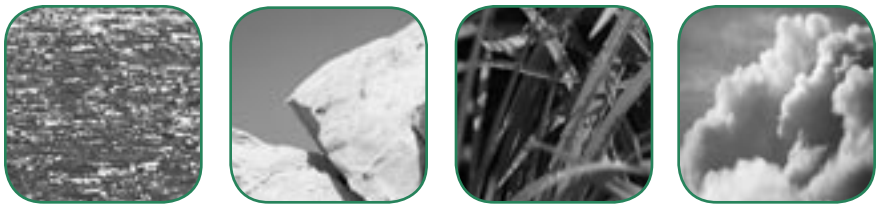
In a NEETF/Roper question added in 2000, Americans were asked not only to offer their views on whether the economy should take precedence over the environment or vice versa, but also the importance of the relationship between the two. As Figure 7-2 shows, the public overwhelmingly agrees that, "The condition of the environment will play an increasingly important role in the nation's economic future." Fully 89% either strongly or mostly agree with this statement, further supporting the belief that environmental protection and economic development can and must work together to ensure a prosperous nation.

We can only speculate on the reasons why nine out of ten adult Americans feel the environment will have a more important role in our economic future. It may be pure instinct or it may be a growing understanding of the interdependency between the two. What may be most impressive about responses to this admittedly vague question is that a solid majority of adult Americans (55%) strongly agree with the assertion. Top performers in the survey's quiz and the most highly educated respondents were also a few percentage points more likely to believe that the environment will play a larger role in our economic future.

Not only are these "preparedness" issues difficult for the public to understand in their full complexity, but some of them are also largely beyond the reach of government regulation. Americans as a whole are vastly unprepared to address the suite of future environmental issues that will require personal knowledge and action. You might say our cumulative 'EQ' – our environmental intelligence quotient – is dangerously low. Rectifying this situation will require a much greater emphasis on education and training than ever before.

Environmental

education programs can help a struggling student become a competent student, and a competent student grow into a star.



Chapter 8

A Plan for Improved Environmental Literacy

If the leaders of America's top environmental education organizations and programs were ever assembled in a room and asked what they most wanted, you would hear many different responses. There would, however, be some common themes. For example, they might suggest that a percentage of the billions of dollars in public resources that are spent each year on environmental information campaigns be redirected from pushing simple awareness to a focus on real learning and skill development. Most might also tell you that they want a fairer shake from American opinion leaders. "Quit blaming the professional EE community for the digressions of over-zealous publishers, public interest groups, companies, or even individual teachers who step over the line in pushing their own agenda," they might say. They would appreciate it if environmental education could be seen for what it really is – a bona-fide effort to bring important, balanced, and useful learning about the world and how people affect it to children and adults.

They might also ask for a little more basic respect as educators. The EE field has developed some highly innovative, effective, and rigorous tools and strategies for the delivery of their programs. If these could be made more mainstream, they could help teachers and school administrators to address some of their toughest problems. Environmental education programs can, for instance, help a struggling student become a competent student, and a competent student grow into a star.

To obtain this type of recognition and support, however, the leadership of the EE field will need to grow in its capacity to work together, find more commonality among its varied approaches and protocols, and become much better at demonstrating results. What follows are some specific strategies for bringing the field to new levels of public acceptance and effectiveness.

1. Achieving a Base of Environmental Knowledge

Every official definition of environmental literacy starts with a competent level of knowledge. But when it comes to creating such a base of knowledge nationwide, the NEETF/Roper data and supporting studies reveal that there is too little environmental education getting through to children and adults, and the base of knowledge is not being built. While schools are not the only venue for environmental information and education, it is clear that students receive

too little EE in school to build environmental literacy. These data force us to ask what it would take to create a critical mass of environmental learning throughout the K-12 system. Here is what we have gleaned from the research and the experts.

A. Increased Commitment to Research, Assessment, and Evaluation

The EE field needs to be much more assertive about assembling and distributing a more powerful base of research and a deeper understanding of its own models, approaches, and outcomes. Throughout this report we have called for improved research, assessment, and evaluation. As a general rule, the EE field is not as strong as it should be in routine assessment and evaluation. Program reviews, metrics, and outcomes need to be more incorporated into the overall culture of the field. While it is true there is a growing body of evidence that EE produces positive academic results and significant environmental literacy results, the gaps in data are also apparent. Here are some prime examples:

- The environmental education field could benefit from a more comprehensive, systematic, and formal assessment of the state of environmental education practice in America – how much is occurring and in what locations and contexts.
- More evaluative and controlled studies are needed of the complex relationships between certain types of environmental instruction and learning strategies and their associated changes in affect, skill, and behavior.
- A thorough and up-to-date compilation and assessment is needed of unpublished or minimally-published research found in doctoral dissertations, masters' theses, and other smaller or site-specific research projects.
- More thorough evaluation is needed of what appear to be the most promising programs for creating environmental literacy, including more testing of comprehensive programs such as IEEIA; more controlled studies are needed of how EIC (Environment as an Integrating Context) and other environment-based education programs support learning and overall school performance.
- The field must provide models, training and other guidance that will help make assessment and evaluation of program effectiveness routine rather than the exception.

B. Stronger EE Quality Assurance for Teachers

K-12 teachers indicate they want EE materials, guides, and activities they can rely on. Fortunately, the North American Association for Environmental Education has developed comprehensive "excellence" guidelines for materials and teaching that represent a new "gold standard." The guidelines call for EE to have proper depth, sound scientific content, and expert pedagogy. They were developed with support from hundreds of EE organizations and provide comprehensive guidance to teachers in the use of high-quality materials and approaches. We recommend:

- A more definitive study of teacher environmental education practices.
- Increased adoption and distribution of NAAEE guidelines for excellence, and more course and material reviews through state education departments and education associations.
- Increased funding and training for the use of NAAEE guidelines in state and school district textbook reviews.
- Development of an on-line clearinghouse of course and material reviews and peer assessment reviews.

C. Better Align EE With State Standards of Learning

The North Carolina Teachers study found that correlation of environmental education activities with standard courses of study would encourage teachers to participate in an EE teacher training. Florida researchers Martha C. Monroe, Jeanette Randall, and Vicki Crisp noted (2000, p. 3): "When teachers perceive environmental education as an "extra," environmental activities will be easily discarded in favor of increasing student knowledge and performance for state tests. In response to such concerns, many national environmental education resource materials are including correlations to state standards. In Florida, for example, Project Learning Tree (PLT) is adapting to state-specific standards and achievement test goals. Each of the 96 activities have been correlated to the age-appropriate Sunshine State Standards. A variety of additional questions or exercises can enhance existing environmental education resource materials to help teachers use the environment to increase Florida Comprehensive Aptitude Test scores." Our recommendations are to seek:

- An NSF-supported comprehensive review of the benefits of environmental education in supporting achievement in state comprehensive testing.
- Amendments to the National Elementary and Secondary Education Act to support and make eligible environmental education course evaluations and model programs.
- Creation of a searchable inventory of grade-adjusted EE activities and mini-courses that reinforce science, language arts and social studies standards.
- Small grants through the U.S. Environmental Protection Agency and the Education Department to support the alignment of leading EE programs with state and national standards.

D. Use EE as a Subject Integrator Nationwide

The National Science Foundation sees environmental education and science as serving an important role in integrating disparate subject matter in ways that students can both understand and apply. Our recommendations are to seek:

- An NSF demonstration grant program to empirically test and support the development EIC models in different regions and types of schools.
- Increased NIEHS funding for EIC demonstrations in health and environmental K-12 education.
- Make EIC approaches more explicitly eligible under Comprehensive School Reform Demonstration Grants Program.
- Make EIC activities eligible under appropriate titles (such as Title One) of the ESEA,
- Encourage state departments of education to certify, fund and support EIC models under programs for reading and science,
- Employ EIC models in state and national charter school programs, and
- Funding for pre-service and in-service education courses and continuing education training for teachers, administrators and principals in EIC basics

E. Bolster Science Learning

America has enjoyed science leaderships for decades. Now that seems to be changing and other nations are moving into leadership positions in science and technology. The NSF Advisory Committee on Environmental Research and Education (2003) points out that 80% of all students decide before entering high school to opt out of professional scientific pursuits. Environmental education, however, can be seen as a way of making science more relevant

and appealing to young prospective scientists, including a higher proportion of women who are all too often absent from scientific professions. Our recommendations:

- Support for increased use of inquiry-based and field-based environmental education programs in the advancement of science learning.
- Greater links between formal science education and the use of off-site facilities and places.
- An assessment of detailed linkages between leading environmental education programs and the statewide science standards.

F. Optimize Emerging Arenas – After-School and Home Schools

One of the fastest growing parts of K-12 education is after-school programming, which provides useful and organized activities for students in the afternoon hours. According to the Department of Education, some 30,000 schools now have after-school programs and the number grows daily. The after-school arena can benefit immeasurably from EE programming. There are rigorously developed and ready-made curricula that can be inexpensively applied to the after-school setting. Our recommendations:

- Expand 21st Century Community Service Learning Center models that emphasis environment-based experiential learning.
- Fund "retrofits" of leading environmental education programs for off-site delivery in an after-school context.
- Create a Web clearinghouse of environmental education programs and materials that work well in a home school setting.

G. Maximize Times of Higher-Than-Average Environmental Interest

One of the most predictable peak times for interest in EE is around the annual Earth Day observance in April. During this period, teachers are more inclined to mention and/or discuss environmental topics in the classroom or to use environmental lesson plans or activities with the students. One way to take advantage of this period is through an official week of educational preparation for Earth Day – National Environmental Education Week – during which concentrated lessons on key environmental subjects can be taught for five lessons leading up to the Earth Day observance. These concentrated five-day programs do not replace a larger emphasis on environmental education in the schools, but they reinforce state and nationwide content standards. Our recommendations:

- Continue and expand Environmental Education Week in the spring.
- Increase state education-related transportation funds for educational field trips.

2. Organize Delivery of EE Content

While our first set of recommendations looks at increasing the amount of environmental education taking place in the classroom, this second set addresses the manner in which that education is delivered. Because environmental education is treated mostly as an elective area of study, there is not enough logical progression of student knowledge from one year to the next.

A. Nationwide EE "Benchmarking"

To better organize what should be taught to students, the NAAEE's new content standards are organized by scientific area – principles of ecological systems, earth systems, atmospheric systems, etc. – and are differentiated by student grade levels. More widespread use of

these content standards would directly address, through formal education and reading materials, shortfalls in the public's ability to understand important causal relationships. Our recommendations:

- Seek NSF funding for the evaluation and refinement of NAAEE content standards.
- Publish detailed national environmental literacy benchmarks on the Web and through education associations and state education departments, based on the refined NAAEE content standards.
- Ensure that federal resource and environment agencies adopt national content standards in their direct environmental education and environmental science programming.
- Seek federal agency employment of routine effectiveness benchmarking and assessment in direct education programming.

B. State EE Benchmark Programs

Several states have developed and adopted specific standards for environmental literacy and education which are useful in addressing the "scattershot" problem. Kansas and Pennsylvania, for example, have both developed EE standards that include benchmarks for environmental literacy. State benchmarks include specific statements of what a student should know and be able to do at specified times in his or her schooling. These are arrayed according to grade level, usually 4, 8 and 12. By measuring a student's progress toward meeting these benchmarks, educators can assess the effectiveness of EE in the schools. Benchmarks provide carefully-thought-out building blocks for more sophisticated understandings at higher grade levels and lead to core environmental literacy. Our recommendations:

- Obtain approval of state environmental education benchmarking as an eligible activity under Department of Education programs.
- Obtain public funding to support state adoption of tailored environmental literacy benchmarks.
- Ensure state and school district use of environmental literacy benchmarks or content standards in textbook selection criteria.

C. A Stronger Earth Science Alliance

The field of science with the most direct connection with the content of environmental education is earth science. Although earth science is widely accepted in the schools today, it has a long way to go to achieve the status of core science enjoyed by other fields of science such as physics, chemistry, or biology. A suggestion that has come from the earth sciences community is to form a more detailed and specific alliance with the EE community. Together, EE and earth science professionals could help build a powerful new level of environmental literacy in America.

3. Extending EE to Professionals

A wide variety of professionals could benefit from environmental education. The following are some of the professional sectors that NEETF has begun working with to increase awareness and environmental literacy.

A. Educator Pre-Service and In-Service Training

Many of the most effective environmental education programs – including student-direct programs, investigations, and subject integration field studies – require teachers to both

grasp environmental content and think differently about how to teach it. With only 13% of schools of education providing courses on the environment, many K-12 teachers start their careers with little or no training in environmental education. Online pre-service courses, increased in-service training, and the adoption of the environment as a tool for increasing academic achievement are among the ways teachers can become more effective environmental educators. To address this shortfall, the University of Wisconsin Stevens Point, for example, offers a new online course entitled "Fundamentals of Environmental Education." The course is offered via the Internet for two undergraduate or graduate level credits. Our recommendations:

- Funding for online courses for use in university and college pre-service teacher education programs.
- Make environmental education a requirement under the programs of National Council for the Accreditation of Teachers (NCATE).

B. EE for Doctors and Nurses

In addition to being caregivers, doctors and nurses can be educators. NEETF/Roper research shows that physicians are highly trusted as sources of environmental information. Yet, despite the seriousness of environmental risk factors for health, health professionals receive minimal appropriate education and training. The average medical school provides about seven classroom hours of environmental education. Nursing schools provide fewer. New environmental risk courses and training programs can help health care professionals become more adept at improving health by addressing environmental risk factors.

The impediments to increasing the amount of environmental education and training that health care providers receive include severe shortages of available time in the crowded curricula of medical and nursing schools and in ever-busy practice schedules. Environmental history-taking offers a specific opportunity to simultaneously educate doctors and parents on environmental risks. By promoting environmental exposure histories as a routine practice we can boost environmental literacy for pediatricians and other primary care givers. Our recommendations are:

- Adoption by medical and nursing associations of comprehensive guidelines on environmental risks both for the education and practice settings of health care practitioners.
- Funding for a Web portal that answers practitioners' questions on environmental health risks.
- Adoption of standard practice forms and protocols for the taking of environmental risk and exposure histories in patients.

C. EE for Community Leaders

Community leaders – many of whom are volunteers – need more environmental education to be effective at representing the public interest. They can avail themselves of several forms of continuing education on such issues as finance and public administration. Environmental education can be added to these through partnerships with associations and organizations that work to educate these officials and through the direct delivery of on-line courses on environmental basics. We recommend:

- Increased public support to NGOs for member training programs on the environment and related issues such as planning, transportation, and land use.
- Public support for more community college courses that will educate local community leaders on environmental issues.

D. EE for Business Managers

Leaders of small and medium-sized businesses could greatly benefit from Web environmental resources and basic training through community colleges, professional development, and information programs such as those of the Small Business Administration. We recommend:

- Public funding for the Small Business Development Centers to offer self-guiding orientation and training programs on environmental actions to client business leaders via the Web.
- Development of state-based business and environment Web portals and technical assistance programs designed to help companies of all sizes improve environmental performance through innovations.
- Adoption of environmental training programs and performance codes among trade associations.

E. EE for TV Weathercasters

Meteorologists are powerful and trusted science communicators. They are expert in the atmospheric sciences but need additional training and education on local environmental issues so they can convert their weathercast to "environmental casts."

F. Education Training for Environmental Scientists and Specialists

Scientific experts in both the private and public sectors need to become better public communicators and educators. We often assume that because scientists have high levels of knowledge they can automatically communicate environmental content to the public. But they, too, need instruction on how to teach others. We recommend:

- Environmental and natural resource staff in the public sector be provided with basic continuing education on how to communicate with, and educate the public on, science and policy issues.

4. More Effectively Deploy Off-site Centers, People, and Places

The larger environmental field has two extremely valuable assets to offer the K-12 educational world. First, it provides a useful and interesting context for science and other forms of learning, and second, it has thousands of places – zoos, nature centers, museums, parks, and more – that can serve as venues for learning.

It is remarkable how many of the informal environmental education venues we have in the United States have identified education as a prime mission, and how many have talented, enthusiastic staffs anxious to work with local schools. As noted above, the outdoor education or "field" experience holds a powerful place in the development of positive attitudes in young people toward both learning and the environment. "Experiential learning," according to the North American Association for Environmental Education, has some distinct advantages over standard classroom learning and makes an appropriate addition to in-school instruction. Schools, however, need help making the connection with such "outside" venues. The North Carolina Study of teachers found that the number one incentive for making more use of off-site centers was to make sure they support standard courses. We recommend:

- NSF support for a comprehensive study of efficacious off-site partnerships and models.
- Federal legislative support for off-site partnerships and model programs.
- State legislative support for an increased number of off-campus education partnerships.

- State emphasis on school curricula that allow for off-site, experiential learning.
- More evaluation of critical school and placed-based programs as a comprehensive and useful model for improving academic performance and environmental literacy.

Making more use of off-site centers involves recognizing the important role and contribution of individual components, including the following:

Zoos, Aquariums, Museums, Arboreta, and Botanical Gardens: While most zoos, aquariums, and museums were originally established for curatorial and research purposes, public education has moved to the forefront of their missions. This is an exciting development for environmental education and a huge opportunity for improving environmental literacy. There are at least 300 sizeable zoos and aquariums across America and hundreds more smaller facilities such as petting zoos. The American Zoo and Aquarium Association likes to point out that more people visit their member's facilities than attend all professional sports games (130 million). All of the larger operations have expert educational programs, with budgets totaling more than $50 million, that they continue to develop, expand, and refine with environmental literacy is a key goal. There are also hundreds of science, natural history, and other types of museums that provide educational programming on the environment.

Nature Centers and Field Study Areas: Based on samples of data from several states there are at least 3,000 established public and private nature centers in the United States. That is an average of one per American county. Many larger urban areas have dozens of such facilities that are staffed with environmental and natural resource experts and educators. One third of the United States is in public ownership. Parks, wildlife refuges, and other "nature areas" can provide teachers and students with boundless opportunities to learn outside the walls of the classroom. Teachers in a particular school can build a nearby site into their teaching of science, social studies or other parts of the syllabus. Moreover, field study areas can enliven a student's interest and expose him or her to aspects of the local environment compelling to his desire to learn.

School Yard Habitats and Gardens: Some educators have found it easier to bring the "field" to the school. The National Wildlife Federation, for example, has had significant success in helping schools develop schoolyard habitat areas for the on-site study of wildlife. Some states have encouraged schools to develop either habitat areas or gardens on their grounds as a way to educate students on science, math, and other subjects. These programs are proving memorable and effective for the students. The EE field needs to increase the availability of schoolyard programs nationwide through state and federal support.

Green Campuses: School campuses can provide outstanding environmental education and learning opportunities. In addition to opportunities for greening schoolyards and school grounds, possibly as many as one half of all American adults will spend some time on university, college, and community college campuses. A quarter of all adults will spend several years on campuses as resident or commuter students. At these places students can be exposed to many practical aspects of environmental education and conservation. There is a significant need for increased public support for model programs and an assessment of environmental and educational benefits of off-site learning centers and places.

Place-Based Models: An innovative and dynamic approach to environmental education uses the social, economic, and built environment of a locale to make schooling fit within a real community context. The emergence of place-based learning and its alignment with EE curricula and practices presents a significant opportunity for strengthening American education using such programs as the Comprehensive School Reform initiative at the federal level.

Agency Professionals: Not all out-of-school resources are places or facilities. There are thousands of environmental professionals employed today with high degrees of environmental science and management expertise. These individuals are not usually educators but still represent educational resources for out-of-school programs. Many agencies are examining how to deploy their staffs and experts in ways that match their scientific, technical, and other disciplinary strengths with the ability to engage in education and pedagogy. Agencies with large numbers of environmental experts must devise ways to train their staff at all levels of management to deliver quality educational programming.

5. Maximize Information Technology for EE Delivery

A transformation taking place today in American education will challenge environmental educators in the coming decade. While many schools now suffer from a shortage of computers and related educational and communication technology, that condition will change in time. These prospective changes amount to much more than making sure schools and students are "wired."

We can foresee a time of lower-cost, more portable, wireless computer use when students and teachers routinely assign, receive, complete, and evaluate homework over the Web. Similarly, the educational field will have a more sophisticated and integrated relationship with software simulations, interactive lesson plans, on-line training, controlled research, testing and much more. The virtual world is well positioned to play a central role in the educational universe. But how ready will the environmental education field be? It is a field full of practitioners who pride themselves on activities in nature, resource conservation, and many low-tech, back-to-earth pursuits.

A. Comprehensive and Organized EE Presence on the Internet

Increasingly, we are living through an information age paradox. Despite unprecedented access to information, there is now too much information on nearly every major topic and too little time to absorb it all. This is true of the highly inventive field of environmental education as well. With some improved organization, screening, and delivery, the problem can be addressed.

The NEETF/Roper and Roper Green Gauge studies show a trend toward the use of the Internet as a source of environmental information. Moreover, the Internet is becoming a leading way for teachers and students at most grade levels to do research. The North Carolina Teachers Study found, for example, that the Internet is identified by teachers as the most effective way to find environmental education resources. In time, a significant part of the discourse between teacher and student will be Web-based. Unfortunately, EE on the Web is not well organized nor as user friendly as it could be. Today's K-12 educators are looking for easier, "push button" access to high quality programs, materials, and training, and EE must stay on top of this curve.

Through the creation of new Web portals or "gateways" we can capture and disseminate key information on the best and most usable environmental education available today. The EE field also has significant needs for teacher training, education for target professional groups, and outreach to community leaders. Important strides have been made in the past few years to make EE training available on-line, but the field needs to become much more serious about the deployment of quality training and Web-based education. The EE field has also learned that effective environmental literacy comes from a combination of educational approaches that create a sense of ownership, skills, and hands-on experience. The education world is opening up to the possibility of using the virtual world for such educational experiences.

This would include such elements as environmental games, three dimensional maps, case-based learning, and more.

We recommend:

- Development of a central federal environmental education Web site similar to the First-Gov portal.
- Support for more teacher on-line refresher courses.

B. More Effective Media Tools

As noted throughout this report, America's most powerful environmental information source is the media. We have suggested that current formats for presenting environmental news are highly useful in making the public aware of the existence of an issue or problem. They provide, however, little educational background on what causes the problems or its underlying science. News coverage, in particular, contains a steady stream of isolated facts and abbreviated messages that penetrate the public's mind without providing a context. The result is that myths or misperceptions can arise and persist. Strategies that can help:

- Targeting the 10% of the population that Roper labels "Influential Americans" might be an effective strategy for leveraging wider public environmental education. Influential Americans are leaders in their communities, and dependable bellwethers for shifts in attitudes and behaviors. They evidence a higher than average interest in the environment and are often active in environmental affairs within the community. Broadening the amount of real environmental education that is available to them would be an important step.
- Media coverage of environmental news – whether electronic or print, whether short items or lengthy features – needs to make much more use of maps and diagrams. All forms of news and media coverage would improve with more widespread use of instructive graphics. People, as a rule, have poor geographic knowledge and do not grasp many cause-and-effect relationships regarding the environment – pollution, flooding, fires, sprawl and so on. Consistent use of maps and diagrams would help.

C. Media Meteorology

We need to better deploy the nation's weathercasters in the coverage and explanation of environmental resource issues and their location. With adult public environmental knowledge at such a low level, we need more effective use of this particular branch of the media. More people turn on television news to see the weather than any other reason. This creates opportunities to teach interesting and important things about the local environment. Our recommendations:

- Obtain NSF support for an assessment of the effectiveness of weather-casting and associated Web sites as a tool for science education.
- Legislative support for the NOAA to increase the coordinated educational functions of agencies responsible for weather and the environment.
- Launch of a Professional Training Program of basic EE for weathercasters via continuing education and training courses through the American Meteorological Society (AMS) and its division of over one thousand AMS broadcast seal-holders.
- Creation of environmental literacy goals for broadcasters, developed in concert with EE leaders for watersheds, air-sheds, related environmental science topics, and issues of regional concern.
- Development of a news and data service that regularly delivers important "factoids," graphics, and storylines to weathercasters that incorporate environmental information.

- NOAA training of meteorologists, enabling legislation for education and NOAA science, and funding for on-line courses.
- Public funding for an increased number of formal data and graphics partnerships between the media and public resource and environmental agencies.

Conclusion

The pursuit of environmental literacy in America is widespread and popular but it needs to be ratcheted up a few more notches to become finally effective. The good news is that it surely will, and the foregoing chapters even lead us to a few final thoughts on where to go from here.

To begin with, the entire environmental education field needs to better understand how wonderful EE is when it is working well. We hope the reader has become sensitive to the idea that true environmental literacy arises from a deft weaving of an intricate education fabric. Knowledge must be deep, skills must be developed, and experiences made real for EE to work at its best. But the raw material and the necessary tools are all available for those who need them. Young people (and grown-ups too) basically love nature. They love being outside, they love learning about mysteries, and they love interacting with a world they can see, touch, hear, and smell. So despite our continuing academic cautions about the need for more data, for variable-controlled studies, for improved pedagogies, or for more extensive delivery systems, we are basically in the business of offering, and teaching about, wonder.

Real environmental education is also much more practical than most people may think. Somehow, our modern society likes to characterize things that are interesting or fun as "frivolous." It then holds them to that label regardless of the reality. The foregoing chapters paint a compelling picture of practicality. Consider how many hands-on learning experiences EE offers which ultimately translate into job skills, career skills, and people skills. Also consider how environmental education blends hard sciences with real social issues and teaches practical ethics. From an educational viewpoint, EE has consistently engaged the hardest-to-reach students. There are countless stories of how it has saved students, teachers, schools and even whole systems from intractable problems, decline, and burn out.

It also important to recognize how resilient environmental education can be in the face of powerful forces favoring consumerism, waste, and over-indulgence. Still, young people continue to show they care about the environment, about clean air and water, outdoor spaces, protected creatures, and healthy people. Modern forces of society often seem to conspire against nature through everything from product advertising to the seductions of indoor computer and video games. The discouraging part is that the average seven year-old can identify up to 200 corporate logos but cannot name the type of tree in front of his or her home. That same child may watch up to five hours of television each day and spend fewer than 10 minutes playing outside. The encouraging part is that the love of nature resides within that child, ready to come out if we can give it a chance.

Environmental education, done right, is about preserving the opportunity to let children have what most adult American adults enjoyed when they were young – relaxed and happy times in the outdoors, exploring and interpreting. However remiss we shall be in leaving behind an environmental mess for future generations, at a minimum we must conscientiously supply our children with the education and tools they will need to clean up the mistakes, and to rebalance the overarching relationship between society and the natural world in the years ahead.

Appendix 1

NEETF/Roper Questions, 1997–2000

Test Your Environmental Knowledge!

1

There are many different kinds of animals and plants, and they live in many different types of environments. What is the word used to describe this idea? Is it...

a. Multiplicity 6%
b. Biodiversity 41
c. Socio-economics 7
d. Evolution? 9
Don't know 36

2

Carbon monoxide is a major contributor to air pollution in the U.S. Which of the following is the biggest source of carbon monoxide? Is it...

a. Factories and businesses 25
b. People breathing 3
c. Motor vehicles, or 65
d. Trees? 3
Don't know 4

3

How is most of the electricity in the U.S. generated? Is it...

a. By burning oil, coal, and wood 33
b. With nuclear power 12
c. Through solar energy 2
d. At hydro electric power plants? 39
Don't know 13

4

What is the most common cause of pollution of streams, rivers, and oceans? Is it...

a. Dumping of garbage by cities 14
b. Surface water running off yards, city streets, paved lots, and farm fields 28
c. Trash washed into the ocean from beaches, or ... 4
d. Waste dumped by factories? 45
Don't know 9

5

Which of the following is a renewable resource? Is it...

a. Oil 12
b. Iron ore 4
c. Trees, or 65
d. Coal 6
Don't know 24

6

Ozone forms a protective layer in the earth's upper atmosphere. What does ozone protect us from? Is it

a. Acid rain 4
b. Global warming 27
c. Sudden changes in temperature, or 6
d. Harmful, cancer-causing sunlight? 54
Don't know 9

7

Where does most of the garbage in the U.S. end up? Is it in...

a. Oceans 5
b. Incinerators 4
c. Recycling centers, or 4
d. Landfills? 85
Don't know 2

8

What is the name of the primary federal agency that works to protect the environment? Is it the...

a. Environmental Protection Agency (the EPA) 72
b. Department of Health, Environment, and Safety (the DHES) 3
c. National Environmental Agency (the NEA), or 4
d. Federal Pollution Control Agency (the FPCA)? 6
Don't know 15

9

Which of the following household wastes is considered hazardous waste? Is it...

a. Plastic packaging 16
b. Glass 3
c. Batteries, or 67
d. Spoiled food? 10
Don't know 5

10

What is the most common reason that an animal species becomes extinct? Is it because...

a. Pesticides are killing them 8
b. Their habitats are being destroyed by humans .. 74
c. There is too much hunting, or 6
d. There are climate changes that affect them? 5
Don't know 6

11

Scientists have not determined the best solution for disposing of nuclear waste. In the U.S., what do we do with it now? Do we...

a. Use it as nuclear fuel 7
b. Sell it to other countries 3
c. Dump it in landfills, or 12
d Store and monitor the waste? 57
Don't know 21

12

What is the primary benefit of wetlands? Do they...

a. Promote flooding 7
b. Help clean the water before it enters lakes, streams, rivers, or oceans 53
c. Help keep the number of undesirable plants and animals low, or 7
d. Provide good sites for landfills? 3
Don't know 30

Correct Answers: 1b, 2c, 3a, 4b, 5c, 6d, 7d, 8a, 9c, 10b, 11d, 12b.

Appendix 2

Roper Methodology

Description of the Sample

Each of the NEETF/Roper studies is based on a nationwide cross-section of 1,500 adults, 18 years of age and older. Interviews were conducted by telephone each year. Results may be projected to the entire adult population of the continental United States who would be willing to be interviewed in a telephone study of this kind.

The margin of error due to sampling is plus or minus two percentage points at the .95 confidence level, although it is larger for the results of smaller subgroups of the public. For example, the sampling error is plus or minus four percentage points for results among the 480 or so adults in the sample aged 18-34. Previous versions of this study (known as the Times Mirror Magazines National Environmental Forum from 1992 to 1995) had a plus or minus three percentage point margin of sampling error.

Sampling Method

The basic sample was drawn at random from the adult population of the continental United States, excluding institutionalized segments of the public (such as those in Army camps, nursing homes, and prisons).

Households contacted for the survey were selected at random by a procedure known as random digit dialing, which ensures that households with unlisted telephone numbers, as well as those with listed numbers, are included in the sample.

All interviews were conducted during evening hours on weekdays and all day on weekends to ensure that both working as well as non-working segments of the population would be included.

Weighting Procedure

The demographic characteristics of the random sample were compared with the most recent Census Bureau estimates and corrective weights were applied to ensure proper representation based on age, gender, and educational attainment.

Percentages Not Totaling 100%

Responses were computerized and rounded off to the nearest whole percentage. As a result, percentages in certain charts and columns may sometimes total slightly more or less than 100%. Also, in certain charts and analyses, the results of those who said "don't know" or chose not to answer may have been omitted.

Appendix 3

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Appendix 4

Bibliography of Needs Assessments and Status Reports in Environmental Education

Compiled by Dr. Tom Marcinkowski, Florida Tech

Author's Note: While this bibliography contains a number of sources also listed in the preparation of this report, it provides an important developmental look at how EE research has evolved over the years. We are grateful to Tom Marcinkowski for assembling it.

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** NOTE: This list does not include needs assessments and status reports done by/for individual states. A growing number of such analyses and reports have been prepared/published (e.g., WI, FL).*

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Appendix 5

Selected Bibliography of Research Collections and Reviews: Environmental Education, Interpretation, and Communications

Ordered by Date of Publication, 1969 – present
Compiled by Dr. Tom Marcinkowski, Florida Tech

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Appendix 6

Related NEETF/Roper Data Trends

The NEETF/Roper report card series was initiated in 1993. For the first three years the surveys were conducted through the conservation programs of Times Mirror Magazines. At that time the survey focused almost entirely on public attitudes and perceptions and devoted little space to knowledge or behavior-related research. NEETF assumed responsibility for the survey in 1996 and, as noted above, initiated a scientific approach to assessing knowledge and behavior in 1997. NEETF also worked with Roper in 1994 to complete a survey of youth. Over the ten-year period this data has been collected and assessed, certain trends are worth noting. They are discussed in this appendix.

Public Support for the Environment

Survey after survey reports that Americans express high levels of support for environmental protection. Environmental literacy affects this support in several interesting ways. There are positive correlations between higher environmental knowledge levels and active support for environmental causes. But there are also correlations between lower education levels and support for greater government involvement in solving environmental problems.

American support for the environment has generally remained high and steady, although it has fluctuated at several points during tougher economic times. Roper researchers would caution readers that the balance of support can shift depending on how economic interests are presented in the question – e.g., whether they mention individuals vs. corporations, how rich or poor the economic interests are, etc.

In three of the surveys, for example, the question of economic development was framed as a choice between environmental protection and property owners' rights. When asked to choose between protection of an endangered bird species and the rights of a logging company to cut down the trees in the bird's habitat, respondents answered as shown in Figure A-1.

This is consistent with the usual 65-70% of responses favoring the environment over economic development. Contrast that, however, with a series of questions on protecting a wetland vs. the rights of a "destitute landowner" to sell his land for construction.

Figure A-1: Percentage of Americans Favoring Bird Species Protection vs. Logging Company Rights

	1992	1995	1996
Bird Protection	68	66	64
Company Rights	23	30	30

Sources: Roper, 1992 & 1995; NEETF & Roper, 1996

Figure A-2: Percentage of Americans Favoring Wetland Protection vs. Landowner's rights

	1992	1995	1996
Wetland protection	48	45	43
Landowner's rights	40	50	50

Sources: Roper, 1992 & 1995; NEETF & Roper, 1996

Introducing a destitute landowner into the question shifts the balance away from the environment (Figure A-2).

High Level of Support for the Role of Government

In many ways Americans love to hate (or at least mistrust) the government. But when it comes to environmental protection, they see the government as playing an important role. Indeed, a majority of Americans also think that more funding should be shifted to environmental programs (see Figure A-3):

Figure A-3: Percentage of Americans Favoring Shift in Funding to Environmental Programs

1992	66%
1993	59%
1994	63%
1995	56%
1996	58%

Sources: Roper, 1992-1995; NEETF & Roper, 1996

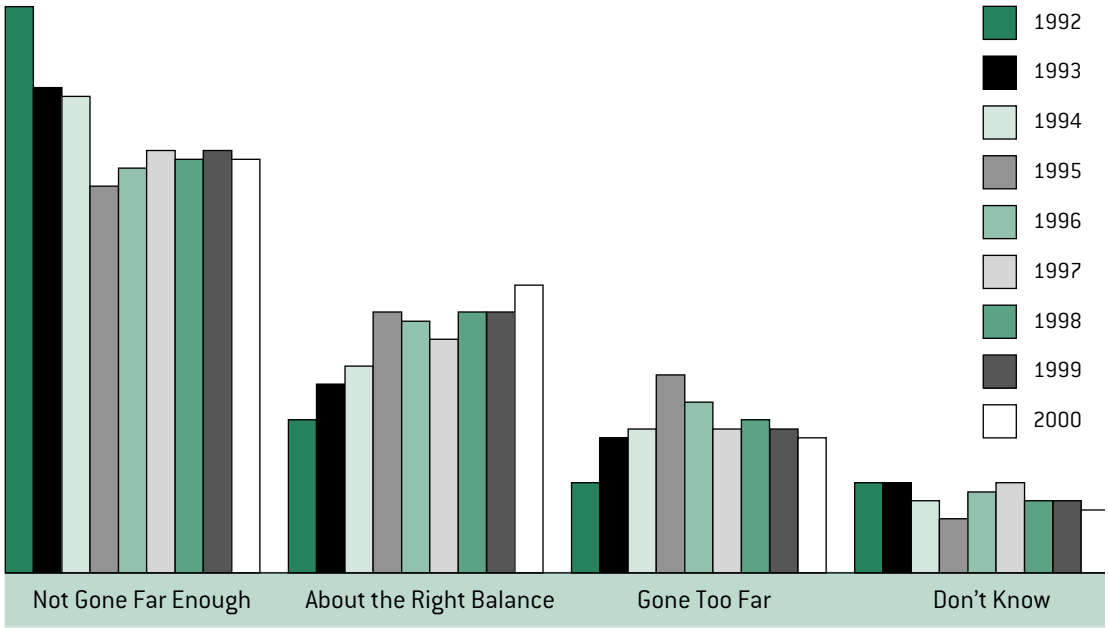
Much national debate occurs over the need for, and scope of, environmental laws in the United States. Laws regulating air and water pollution, protecting natural areas and wetlands, and conserving endangered species are often subjects of heated public discussion, as these laws have both environmental *and* economic impact. Most Americans feel that government — federal, state, and local — should have some responsibility for protecting the environment.

After significant movement toward the middle in the early 1990s, the percentage saying that environmental laws and regulations do not go far enough has remained steady for the past six years, holding at a few percentage points below 50%. (See Figure A-4.) A plurality of Americans hold the "not gone far enough" position (46%), while one-third (32%) believe that current laws have struck "about the right balance." Fewer than 1 in 5 adults (15%) say that current regulations "go too far." For now, the public has settled into these three positions.

The most significant shift over a decade of data gathering was a 20 percentage point drop, from 1992 to 1995, in the number of people saying government regulation had "not gone far enough. A corresponding increase occurred in the number of people who feel we have achieved the "right balance" (up 12%), and those who felt government had "gone too far" (up 12%).

Adding the "right balance" people to either side produces quite different results. When added to the "not gone far enough" group, a solid three-quarters of the country is in favor of

Figure A-4: Attitudes Towards Environmental Laws and Regulations



Question wording:

There are differing opinions about how far we've gone with environmental protection laws and regulations. At the present time, do you think environmental protection laws and regulations have gone too far, not far enough, or have struck about the right balance?

Sources: Roper, 1992-1995; NEETF & Roper, 1996-2001

at least the amount of environmental regulation we currently have, if not more. However, if the "right balance" group is combined with the "gone too far" group, then the public's view of environmental regulation comes out as a statistical dead heat (46% to 47% in 2000, as shown in Figure A-4), which might explain the vigorous debates we see in this arena.

As Figure A-5 shows, the environmental gender gap is certainly in evidence on the subject of regulation: Women (49%) are significantly more likely than men (42%) to say that current laws and regulations do not go far enough, while more men (20%) than women (11%) state that current laws go too far. (The two sexes are equally likely to say that current laws strike about the right balance: 32% of men and 31% of women.) Other Roper data confirms this pattern, with men more likely than women to say there is too much government regulation for subjects as varied as cable television, nuclear energy, fuel economy standards for cars, and the use of pesticides and herbicides. At the same time, women are more likely than men to say current laws do not go far enough for the disposal of toxic wastes, airline safety, prescription drugs, and the use of pesticides and herbicides.

With regard to age, the percentage saying that laws protecting the environment do not go far enough decreases from a majority among 18-34 year olds (51%) to 38% among those aged 65 and over. At the same time, the percentage holding the "gone too far" viewpoint increases from 9% among 18-34 year olds to one-fourth of those aged 65 and over (26%).

Figure A-5: Attitudes Toward Environmental Laws, by Gender and Age, 2000

Percent responding

Extent of Current Environmental Laws		Gender		Age			
	Total	Men	Women	18-34	35-44	45-64	65+
Gone too far	15	20	11	9	15	16	26
Not far enough	46	42	49	51	45	45	38
Struck about the right balance	32	32	31	33	33	32	25
Don't know	7	6	8	7	6	6	12

Source: NEETF & Roper, 2001

These results are in line with attitudes about the environment versus the economy.

Gender and age differences in opinions about environmental laws and regulations will need to be considered when enacting new laws, enforcing existing laws, or developing new regulations, as all Americans need to understand the benefits and consequences of environmental legislation.

Support for Individual Areas of Regulation

The strongest support for environmental regulations is for the protection of air and water quality. When asked to consider laws for the protection of five specific environmental issues, Americans clearly rank these two as more important than the others. Though 46% of Americans feel that environmental laws overall have not gone far enough, 70% say that environmental laws and regulations to prevent water pollution have not gone far enough. And 63% say the same thing of laws to prevent air pollution. By comparison, 50% believe current laws do not go far enough for the protection of wild or natural areas. For the other two issues – protection of wetlands and protection of endangered species – fewer than 50% agree that current laws do not go far enough (NEETF & Roper, 2001). Other Roper data confirms this pattern, with a majority of Americans saying current laws to regulate the quality of the nation's air and water do not go far enough.

It may be that the higher level of support for air and water quality programs, as compared to other issues, is due to the perceived adverse effect of bad air and water on human health. However, as with environmental regulations overall, support for the position that current laws do not go far enough has eroded somewhat for each of the five issues since the first National Report Card study in 1992 (see Figure A-6). Still, these proportions have been stable since 1995, again an indication that Americans have settled into their opinions on environmental issues.

As expected, opinions differ within gender, age, and community subgroups as to the efficacy of current laws for specific environmental issues. Here are some key patterns:

Gender: For water pollution, air pollution, the protection of wild areas, and the protection of endangered species, women opt for the "not gone far enough" option significantly more often than men (74% vs. 65% for water; 69% vs. 56% for air). At the same time, more men than women say regulations already go too far for the protection of endangered species, wetlands and wild areas, and air pollution. Men (27%) are nine percentage points more likely than women (18%) to say that current laws to prevent water pollution have struck the right balance, and nine points more likely to state that air pollution laws have struck the right balance (31% vs. 22%).

Age: Americans age 18-34 are more likely than those older than 65 to say current laws for the five specific environmental issues do not go far enough, while those 65 and over are more likely than the youngest adults to say current laws go too far for protecting endangered species, wetlands, and wild areas. Again, as the younger, pro-environment American population

Figure A-6: Attitudes Toward Current Regulation of Specific Environmental Issues, 2000, 1999, and 1992

Percent responding

Source: NEETF & Roper, 2001

ages, the not-gone-far-enough and the struck-the-right-balance positions will likely grow in popularity, perhaps changing the outlook for future environmental laws and regulations.

Community Type: Urban residents are especially likely to state that current laws on all five issues do not go far enough, while rural residents are especially likely to feel that regulations for protecting endangered species, wetlands, and wild areas already go too far. Rural Americans are more likely than urban Americans to say current laws to reduce water and air pollution strike the right balance. These attitudes may have something to do with the relative impacts that environmental regulations have on the jobs and leisure activities of rural and urban Americans.

Trends by Key Environmental Health Issue

Water Pollution: Support for the "current laws do not go far enough" position with regard to water pollution has been declining over time (-9 percentage points), a surprising finding in light of well-publicized reports of arsenic, lead, and other substances in drinking water supplies, and given that much research shows that water quality has a clear impact on human health. Agreement that current regulations are insufficient to protect water from pollution is decreasing most dramatically among four subgroups: Americans age 65 and over, down 21 percentage points; males, down 13 points; residents of Western states, down 11 points; and residents of Southern states, down 10 points. (See Figure A-7.)

Despite this erosion, there is still strong concern about the sufficiency of regulations to protect water from pollution, a conclusion supported by data in Roper's annual *Green Gauge* report. When asked about the seriousness of 29 environmental issues, the top two reported in Roper's *Green Gauge 1999* were contamination of drinking water and water pollution from industrial waste.

Air Pollution: Although a majority of Americans are still concerned that current regulations to fight air pollution do not go far enough, support for this position has also decrease over time, falling 9 points from 1992 to 2000. The decrease is most pronounced among two subgroups: Americans age 35-44, down 14 percentage points; and males, down 12 points (see Figure A-8).

Protection of Endangered Species: Of the five issues tested in the survey, the belief that laws to protect endangered species do not go far enough gets the least support (39%), and that support has been declining over time. Agreement that current regulations are insufficient to protect endangered species has decreased 12 percentage points since 1992.

Women (42%) are significantly more likely than men (36%) to feel this way, and urban residents (45%) are 10 points more likely than rural residents to feel that endangered species laws should go farther. At the same time, the proportion of all Americans saying these laws have now struck the right balance has increased 6 points, to 37%, since 1992.

Attitudes towards endangered species protection laws seem highly influenced by education and higher levels of environmental knowledge. While 42% of those with a high school education feel endangered species laws should go farther, just 36% of those with college degrees feel that way. Similarly, 47% of those who answered four or fewer questions in the survey's environmental quiz correctly feel species protection laws do not go far enough, while just 30% who answered nine or more questions correctly hold that opinion. This is the only issue exhibiting this pattern.

Figure A-7: Trend Data: Water Pollution Laws 'Do Not Go Far Enough', by Gender, Age, and Region

Percent responding

		Gender		Age				Region			
	Total	Male	Female	18-34	35-44	45-64	65+	North-East	Mid-west	South	West
2000	70	65	74	73	72	68	63	68	70	71	69
1999	69	65	72	71	69	69	64	69	63	73	67
1993	77	73	80	80	78	75	69	73	73	80	79
1992	79	78	79	80	81	71	84	76	77	81	80
Change in 'Do Not Go Far Enough' since 1992	-9	-13	-5	-7	-9	-3	-21	-8	-7	-10	-11
Change in 'Struck Right Balance' since 1992	+9	+11	+7	+5	+10	+8	+14	+10	+9	+7	+11

Source: NEETF & Roper, 2001

Figure A-8: Trend Data: Air Pollution Laws 'Do Not Go Far Enough', by Gender, Age and Region

Percent responding

		Gender		Age				Region			
	Total	Male	Female	18-34	35-44	45-64	65+	North-East	Mid-west	South	West
2000	63	56	69	71	58	58	63	60	61	64	65
1999	62	56	67	67	61	62	52	65	59	65	58
1993	71	68	73	76	72	68	61	75	63	74	69
1992	72	68	75	76	72	66	72	70	69	72	75
Change in 'Do Not Go Far Enough' since 1992	-9	-12	-6	-5	-14	-8	-9	-10	-8	-8	-10
Change in 'Struck Right Balance' since 1992	+8	+9	+6	+4	+13	+7	+6	+8	+10	+4	+12

Source: NEETF & Roper, 2001

Protection of Wild or Natural Areas: Attitudes towards regulations to protect wild or natural areas follow the pattern for environmental regulations overall: Women, younger Americans, and urban residents are the most likely to say current laws do not go far enough; while men, older Americans, and rural residents show greater than average support for the "gone too far" option (though this is still a minority view among these groups). Over time, the "not gone far enough" position has fallen 9 percentage points, while the "right balance" choice has risen 9 points.

A majority of women (54%) support more regulations for the protection of wild or natural areas, as compared to 45% for men. A similar point spread exists between urban residents (54%) and rural residents (44%).

Protection of Wetlands: For the most part, wetlands regulations also have the same levels of support as environmental regulations overall, with women, younger Americans, and urban residents the most likely to say current laws do not go far enough, while men, older Americans, and rural residents are above average in their support for the "gone too far" option. Since 1992, the "not gone far enough" position has decreased 9 percentage points, while the proportion saying current laws strike the right balance has increased 8 points.

Misplaced Trust in the Government?

Lack of environmental knowledge can lead people to a misplaced trust in the government's ability or efforts to protect them from environmental harm. One overarching NEETF/Roper 1998 finding, for example, is that a majority of people assume the government is attending to the public's environmental health and safety needs even when it is not.

We asked Americans whether they thought a) some agency of the government tested industrial and household chemicals for environmental safety, b) if tap water was frequently tested for certain contaminants such as pesticides, and c) if some agency of the government tested bottled drinking water. None of these statements is true. The results are summarized in Figure A-9 and discussed below.

Industrial and household chemicals are routinely tested and approved for safe use by the U.S. Environmental Protection Agency or other federal agency.

Two out of three Americans (65%) assume this statement is true even though it is not. Only 27% gave the correct response and 8% did not know. Those who live in the West have a clearer grasp of this fact, although 57% (still a majority) make the incorrect assumption.

Tap Water is routinely tested and filtered to remove contamination from livestock and pesticide run-off.

A significant majority of Americans (59%) thinks this statement is true. However, water utilities do not routinely test for these two forms of water pollution. Moreover, most water treatment systems cannot filter out these pollutants due to dated technology. Indeed, most of the water plant filtering systems in use in America today are unable to screen out chemicals and such chlorine-resistant micro-organisms as Cryptosporidium and Giardia. The testing of drinking water certainly takes place on a regular basis and water utilities are diligent in trying to provide safe and pure water to the public. But certain pollutants routinely get through the treatment systems and a majority of the public does not recognize this fact.

No government agency tests bottled water for safety and purity.

More than half of Americans (51%) believe this statement to be false. They think (incorrectly) that bottled water is tested for safety and purity. Just 42% of Americans know it is not tested by a government agency. This misapprehension is ironic because survey research indicates that many people turn to bottled water because of a lack of faith in the purity of tap water (NEETF and Roper, 1999a).

Unlike several of the multiple-choice questions, responses to the true/false questions do not vary by level of self-reported environmental knowledge. The percentage giving the myth response varies little by gender (only for government testing of industrial and household chemicals, which is higher among men, 70%, than women, 61%) or region (only for government testing of bottled water does one region—the South, 58%, stand out from the rest of the nation), while no consistent trends are evident by age (though 59% of those age 18-34 give the myth response for government testing of bottled water, compared to 51% overall).

Figure A-9. True/False Questions: Percentage Giving Myth Response

True/False Questions	Correct Response	Incorrect Response
Government tests industrial and household chemicals for environmental safety	27%	65%
Tap water is routinely tested for pesticide and livestock contaminants	35%	59%
No government agency tests bottled water	42%	51%

Source: NEETF & Roper, 1999a

Figure A-10: True/False Questions: Percentage Giving Myth Response by Education

		Education		
Content of True/False Question	Total Myth Response	High School or Less	Some College	College Graduate
	%	%	%	%
Government testing of industrial and household chemicals	65	66	69	60
Testing of tap water for contaminants	59	59	60	59
Government testing of bottled water	51	53	55	40

Source: NEETF & Roper, 1999a

However, agreement with some of the myth choices decreases significantly as education level increases. College graduates are more likely than those with less education to give the correct response for government testing of bottled water, and of industrial and household chemicals. (See Figure A-10 on previous page.)

Overall, these true/false statements and the public's response to them indicate high levels of faith in the government's protection of public health and safety, even when such faith is largely unfounded. Perhaps one of the most pervasive environmental myths of this decade is the notion that people are being protected when they are not.

Will Technology Save the Environment?

Throughout the 20th century, technology was often viewed as a panacea for society's ills. This belief has long been applied to environmental issues, in the hope that scientists or engineers will discover a way to slow global warming or find an organism that changes polluted water into potable water. Many Americans seem to be buying into this belief, as 66% agree with the statement, "Technology will find a way of solving environmental problems." (Figure A-11.) While this shows some public optimism that solutions to environmental problems can be found, it also shows that the public is turning outward, rather than inward, for these solutions. A mix of legal, technological, and educational strategies will be needed to solve environmental problems.

Though overall agreement is similar among men (67%) and women (65%), men are significantly more likely to "strongly agree" (26% vs. 17%).

Roper survey research now shows that in 2002 and 2003, terrorism trumped all other national concerns, with the environment moving out of the top ten issues of greatest concern to Americans. The percentage of people saying they are personally concerned about air and water pollution declined from 22% in 2000 to 14% in 2002.

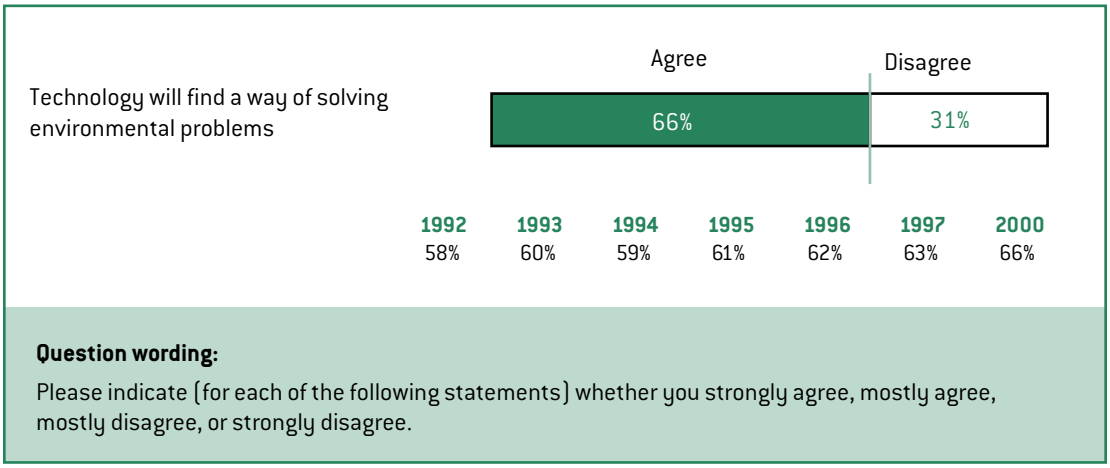
The *Roper Green Gauge 2002* report finds that concern over air and water pollution actually dropped from the sixth-ranked public issue in America (behind crime, having enough money to pay bills, behaviors of young people, high prices and inflation and others) to 12th in 2002. Terrorism, which did not have a ranking, moved to number one, while relations with foreign countries moved from 11th place to fourth. Energy concerns also dropped dramatically, moving out of the top ten issues that concern Americans.

When the concern is limited to environmental issues, the *2002 Green Gauge* continues to show pollution as the top issue – chosen by nearly 60% of respondents. With the exception of a 4% rise in the number of people listing "the greenhouse effect" as a serious concern, all other issues involving pollution and energy were down several points. Water pollution, for example, was down seven points; air pollution was down six.

The *2002 Green Gauge* also found fewer people participating in environmental activities on a regular basis since 2001. The number of people frequently trying to save electricity in the home was down seven points to 58%. Most other behavior categories were down several percentage points.

The study also found that a five percentage point drop in the number of Americans who "pay attention to the environmental records of large companies" (35% down to 30%).

Figure A-11: Will Technology Save the Environment?



Question wording:

Please indicate (for each of the following statements) whether you strongly agree, mostly agree, mostly disagree, or strongly disagree.

Sources: NEETF & Roper, 2001

Importantly, since 2001, the percentage of Americans who are considered by Roper to be "information seekers" – that is, they sometimes or often read an article, watch a television show, or use some other resource to seek out information about the environment – has declined six percentage points to 61%.

Exactly how the long-term concern about terrorism and homeland security will continue to affect public support for the environment and for environmental education is not fully known, but clearly it is already having a significant impact.

About The National Environmental Education & Training Foundation

Our mission: Building a durable foundation for environmental literacy

The National Environmental Education and Training Foundation is a private non-profit organization chartered in 1990 by the U.S. Congress to advance Environmental Education (EE) in America and abroad. Research shows that levels of environmental literacy in America are still inadequate to meet the environmental challenges facing the nation. To promote environmental literacy, we support rigorous scientific content; sound educational protocols; diverse and uniquely effective partnerships; and modern solutions to complex environmental issues. Over the last three years we have developed creative new approaches to meet environmental challenges in six areas:

'Classroom Earth' Campaign: Striving to double the number of environmental education hours K-12 school children receive each year. Our approach is to tackle the lack of environmental education in schools and children by increasing the capacity of educators.

The EnvironMentors Project: Providing mentoring support to urban youth. Our approach is to give DC high school students the tools and encouragement they need to accomplish their education, college and career goals with the support of a caring, adult mentor.

Field and Resource Education: Helping resource professionals become educators and volunteer managers. Our approach is to assist in volunteerism, by organizing significant volunteer events such as National Public Lands Day, and by facilitating the open exchange of knowledge and expertise among public environmental and natural resource agencies.

Green Business Network: Helping business managers run cleaner, more profitable businesses. Our approach to environmental literacy for business managers is to assemble the most useful information and tools available into well-organized web-based forms and education programs on the full range of business and environment topics.

Health and the Environment: Improving public health through the baseline environmental education of doctors and nurses. Our approach is to seek institutional change in the health care field through improved environmental literacy of doctors and nurses.

Weather and the Environment: Increasing public knowledge through baseline environmental education of TV weathercasters. Our approach is to bring environmental literacy into American homes through TV weathercasters. We have begun by joining forces with the broadcasters' section of the American Meteorological Society to advance a comprehensive program of education and information for the nation's leading weathercasters.

NEETF on the Web

www.NEETF.org Our general website contains helpful articles and reports developed through our programs. It is designed to reach community leaders, teachers, health professionals, business managers, weathercasters, and others. This site contains copies of our signature *NEETF/Roper Report Cards on Environmental Knowledge, Attitudes, and Behavior* as well as links to all our programs.

www.ClassroomEarth.org is our popular "best of the Web" gateway site that helps K-12 educators obtain the very best or most usable environmental education available today for school, home-school, after school, and informal education such as nature centers, zoos, and aquariums.

www.theeeworks.org has information you can use as an educator, community leader, business executive, or public official to explain the reliable results from environmental education to friends and skeptics alike.

www.EarthGauge.net A news and data service that will regularly deliver valuable "factoids," graphics, and story ideas to America's weathercasters on environmental topics.

www.EEWeek.org has a wide range of information relating to National Environmental Education Week, April 10-16, 2005.

www.EnvironMentors.org supports our urban youth mentoring program in Washington, DC, and contains guidance for one-to-one adult mentoring for student environmental science projects.

http://watershed.interactive-environment.com/main/ Developed and managed by our partner, StormCenter Communications, this site demonstrates how TV stations can incorporate environmental content into their weather reporting.

www.NEETF.org/Health/providers/pesticides.htm An online library for health care providers to learn about environmental risk factors associated with pesticides.

www.GreenBiz.com is a comprehensive business and environment gateway to the most useful and promising business environmental practices—compiled in one place and in a useful format.

www.ClimateBiz.com is a related web resource to GreenBiz.com and focuses on innovative steps companies can take to reduce emissions or to mitigate practices that might contribute to climate change.

www.GreenerBuildings.com A developing web resource that concentrates on the most effective strategies and tools for developing and managing environmentally sound buildings.

www.GreenBizLeaders.com Features hundreds of examples of how companies of all sizes and sectors integrate environmental responsibility into their operations in a manner that combines ecological sustainability with profitable business practices.

www.NPLD.com and **www.publiclandsday.org** This site supports National Public Lands Day—an annual volunteer work and education day for public lands that results in some 400,000 hours of volunteer labor for federal, state, and local public land agencies, as well as outdoor ethics education for volunteers.

COMING SOON

www.EnvironmentalHealthCare.org
a new health and environment competencies web portal.

www.CommmunityBiz.com
a new site for corporate social responsibility.

NEETF

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