

Understanding Environmental Literacy in America: **And Making it a Reality**

*What Ten Years of NEETF/Roper research and related studies tell us
about how to achieve environmental literacy in America*

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Foreword:

In the course of a lifetime, an individual will accumulate environmental knowledge from a combination of schools, the media, personal readings, family members and friends, outdoor activities, entertainment outlets, and a wide range of other professional, parental and personal experiences. For a few motivated individuals, this can eventually add up to true environmental literacy. But, for most Americans, it falls far short of this larger goal. These people accumulate a diverse and unconnected smattering of factoids, a few (sometimes incorrect) principles, numerous opinions and very little in-depth understanding. Research shows that they also have a fairly high and mostly inaccurate opinion that they know more about the environment than they actually do.

That is why 45 million Americans think the ocean is a source of freshwater, 120 million think spray cans still have CFCs in them though banned in 1978, another 120 million people think disposable diapers are the leading problem with landfills when they are about 1% of the problem, and 130 million believe that hydropower is America's top energy source, though 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 Roper data show a steady pattern of environmental ignorance even among the most educated and influential members of society.

This condition is becoming less acceptable and more perilous to society. We are moving beyond a 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 a shift toward the prevalence of problems that are caused by individuals and smaller businesses and institutions, today's experts are less well positioned to address tomorrow's environmental needs without a lot more help from the general public. A stronger public understanding of environmental science and related issues is a growing necessity and comprehensive environmental education is the only answer that makes complete sense. But can we get there?

To arrive on time, our leaders will need to understand far more about what, educationally speaking, works and what does not. To the education novice, for example, what seems to be *education* is really mostly *information* and therein sits the main environmental literacy problem we face today.

Information that is or seems factual on its surface can, by virtue of its superficiality, end up fitting into a false belief and further confusing a comprehensive understanding of a principle or issue.

So we need to improve education on the environment. We need to grasp its original promise and make it work. We need to build more support for stewardship through more solid environmental education and even mitigate some of the adverse effects that such major information sources as the media can have on true environmental literacy. This report is about sorting out this complexity in a way the nonexpert can readily see and do something about.

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Acknowledgements

This report started originally as a quick and easy attempt to recap some key findings of 10 years of NEETF/Roper research. Hah! From there, it grew and grew. It is in draft form and still has a way to go. So, please feel free to comment or recommend important information or research that was missed.

David Lintern of NOP World (producers of Roper reports) in New York deserves a lion's share of credit for this report. NEETF could not have asked for a better Roper partner than David. In addition to helping design and test the survey instruments, David, over the course of ten years, often wrote and edited drafts of the reports 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 need to acknowledge the important design work that Dr. Lynn Musser, Ph.D. provided in 1997 when we converted the ongoing NEETF/Roper survey to an actual report card on environmental knowledge. It was her expertise, hard work and patient encouragement that made the report card a reality. Francis Pandolfi, former NEETF chair surely deserves acknowledgement and thanks for starting this survey research effort while at *Times Mirror Magazines* and assisting with Times Mirror's conveying the survey 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.

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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 has recently written an important "field guide" to the environmental education movement; and Dr. Tom Marcinkowski of Florida Tech. who strongly and effectively challenged us to focus on using more existing research, getting basic models and definitions down more accurately and thinking 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.

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

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

Understanding Environmental Literacy in America -- Introduction:

A Belief Followed by a Question

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 overarching environmental problems, we will need a public that understands them and can address them at their source. It seems natural and intuitive to believe the many complex environmental issues we face in America today need to be addressed through a sound base of education. Most of us can actually visualize it working! We can envision homeowners who recycle and reduce their use of polluting products in the kitchen, laundry, garage and garden. We can see manufacturing plant and shop workers who are more careful about their use of electricity and their disposal of waste. And we can see business managers who are running cleaner operations and purchasing and selling more environmentally beneficial products. We can also envision community leaders who are skillful at balancing development and transportation plans with the public needs for open spaces, trees, wildlife, clean water, exercise and fresh air.

Many Americans share an abiding belief that we need environmental education. One can hardly go to a public forum on environmental issues without hearing a passionate call for increased public 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 seems to come from the ease by which visions of a cleaner, greener and more balanced future occur to so many.

But, then comes that nagging *question*. Can environmental education ever really accomplish such a far-reaching vision? Does it actually work? Is there reliable evidence that environmental education can produce measurable results? The simple answer is yes. The chapters in this report elaborate on how and in what context. Basically, though, competent and well-applied environmental education can help America 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. But there are many nuances and provisos to this statement. They are also addressed in this report.

We can sum up what environmental education needs most by pointing out a simple truth: 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 apply knowledge while information simply makes one aware of a topic and stops there. Ironically, it seems that many of those who have a powerful vision of widespread environmental literacy are unable to relate to this difference, and therein sits environmental education's principal stumbling block. Those who are often the most anxious for a change in public environmental understanding are prolific information providers.

Ironically, they often lack skill as educators. They publish checklists and guidebooks, give public addresses, issue press releases, produce films and obtain media coverage, issue attractive posters and more. But these attempts at education lack expert pedagogy and fall short of what creates actual environmental literacy. This inexpert “dabbling” in environmental education is not all bad. It produces widespread environmental awareness but it has nowhere near the desired result of fostering stewardship. If we converted the resources we now spend on pushing environmental information into a much deeper commitment to education, we could break a cycle and realize the larger vision. This report is also about how to understand and break that cycle.

This report starts by exploring the status of American environmental knowledge and ends with what a commitment to real environmental literacy would involve. It is based in research from many disciplines and looks at environmental education as a lifelong “pre-K to gray” – undertaking. The foundation for this report rests on primary research conducted over a ten-year period through our partnership with Roper, a major international survey research firm and part of NOP World. This research also examines some rudiments of attitudes and behaviors and important relationships among them.

Chapter 1 summarizes what we know today about the state of environmental knowledge in America and gives us an idea of the current baseline.

Chapter 2 examines the powerful influence that the media exerts on environmental knowledge and education and challenges the professional environmental education community to come more to grips with how greater depth and more understanding of causal relationships can be incorporated into the public’s understanding of the environment via the media.

Chapter 3 reveals what we can piece together about how environmental information and education is actually delivered to the public – young and old.

Chapter 4 covers important research on the nature and reasons for a remarkably high level of public support of environmental education.

Chapter 5 looks at what we know about the character and state of true environmental literacy respecting youth in America – what is its definition and what actually brings it about. This chapter also looks at the vital question of what impact environmental education has or can have on encouraging long-term environmental stewardship.

Chapter 6 assesses how both environmental knowledge and environmental literacy affect adults and what the research reveals about changes in stewardship behavior within the general adult public and in smaller but important leadership segments including Roper’s True Blue Greens, Environmental Information Seekers and the community Influentials.

Chapter 7 provides a summation of research on how environmental education programming helps students with improved performance in other academic subjects and overall learning skill. It recognizes that, for environmental education to compete with “core” school subjects and achieve a similar standing, it must offer measurable academic benefits as well.

Chapter 8 describes the long-term economic value of environmental education and literacy and suggests how it can support America's shift toward sustainability.

Chapter 9 contains recommendations for a plan of action that, when implemented, would dramatically improve the state of environmental literacy in America and beyond.

By linking our years of NEETF/Roper research to other studies that assess the efficacy of environmental education, we hope we can contribute significantly to a broader understanding of the field. This task is not easy and some may have difficulty with our efforts to connect public or commercial survey research with more controlled academic studies of environmental literacy as measured through key variables. We have tried to point out the boundaries and limits of their interactions.

Ultimately, we want to help environmental education research and view this effort as pointing out significant research gaps that, if addressed, would help take environmental education to the next level and fulfill its ultimate promise.

If environmental education should have an immediate target, it may be hinted at by recent Roper research that looks at moving toward an environmentally literate public through what Roper labels as "Influential Americans." They are defined as the 10% of Americans who are most active as leaders in their communities. They are also America's "thought leaders" and are 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. By educating the Influential Americans, we can leverage wider public environmental education.

Summary:

Understanding Environmental Literacy in America

Aware? Yes: But Hardly In-the-Know

This study finds that overall awareness of simple environmental topics is reasonably high nationwide. It also finds a very strong nationwide belief in the value of environmental education. This offers an encouraging point of departure for our wider examination of an otherwise somewhat disappointing state of American environmental knowledge and literacy.

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

- Just 32% of Americans have basic awareness of environmental topics
- All but 20% are heavily influenced by incorrect or outdated environmental myths
- Just 12% can pass a basic quiz on awareness of energy topics

The reader should note there is little difference in knowledge levels between the average American and those who sit on governing bodies, town councils and in corporate board rooms. There is good evidence, however, that the public can indeed learn about the environment and complex environmental and ecological relationships. But most of the evidence we have today indicates we are nowhere close to succeeding due to shallow, disorganized and inadequate education on the environment.

This also indicates that members of the public will not be prepared to assume what will surely be increased environmental responsibility in the coming years. It seems our many years of reliance on a cadre of trained environmental experts within companies and government agencies that are equipped to handle our worst environmental problems for us are at an end. From now on, many of the leading environmental problems we will face, ranging from water quality to ecosystem management, will require as much focus on smaller individual actions, small business practices and community-based decision-making as on regulating and monitoring our largest public and private institutions.

Media Magic, Myths and Misapprehensions

More children (83%) get environmental information from the media than from any other source. For most adults, the media is the *only* source of environmental information. Environmental educators have two big problems as they work on creating more widespread environmental literacy in America. Unfortunately most think they have just one. The first, and most obvious, is how to bring enough sound environmental education programming into the general education realm to

make a real difference. The second, and less understood, is how to come to grips with the powerful hold the media has on public environmental awareness and its sometimes negative effects on environmental literacy. The issue with the media is one of depth more than of accuracy. The popular news and entertainment media are particularly well suited to provide impressive but largely superficial information on environmental subjects. In current practice, the media is poorly positioned to provide in-depth education. This means they provide a steady flow of awareness-building information that sometimes confuses the public and seldom ever truly educates. Sometimes the misapprehensions it fosters can grow into persistent and incorrect myths. Educators need more understanding of how to align media coverage with principles of education and to reshape parts of the media so it does not actually disrupt what can lead to actual environmental literacy.

Environment's Chances in Education's Mainstream

As the environmental education field has strived for increased educational acceptance and mainstream positioning, it has become replete with evidence of educational and academic efficacy. The conclusive studies that will offer ultimate proof may still need to occur, but the growing weight of the evidence is impressive. In addition to having developed and institutionalized well thought-out educational approaches, the field has also discovered it can produce higher-performing students, improved test scores, quality character education and even contribute to later career success. In fact, there is so much good news coming out that environmental educators and researchers these days can hardly agree on what strategies to adopt first.

The EE field has worked diligently toward becoming a “core” educational subject mostly by infusion into related subjects and disciplines. There is no fully conclusive study on exactly how far EE has gone in achieving core subject status, but the signs are it has not yet arrived. Moreover, it does not seem to have 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 recent decline.

Ironically, a number of newer studies have shown that environment-based learning programs with suitable depth, duration and rigor actually boost standardized test scores and argue 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.

E-Literacy Producing Environmental Stewardship

While there are frequent and persistent questions about whether environmental education “pays off” and encourages measurable environmental stewardship, there is also a compelling body of evidence that says it works. The disclosure and public absorption of this evidence will be expedited by greater

understanding of the distinction between how environmental *knowledge* affects behavior and how environmental *literacy* affects behavior.

For environmental *knowledge*, this study finds that a higher level correlates significantly with a higher degree of pro-environment behavior. But increased knowledge alone has real limitations. Increased environmental knowledge works best for simple, easy-to-do behaviors such as consumer decisions or saving water and electricity. These are vitally important and can be measured. In Chapter 5, we propose a new economic index that would value even these minimal efforts at over \$75 billion annually. We note that such actions respond to environmental knowledge but only because they require a minimal disruption on 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. NEETF/Roper data offers some samples of quantitative research findings showing the effects of higher environmental knowledge levels on pro-environmental behaviors:

- 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

This same study applied some correlations analysis that found the high-knowledge group to be twice as likely to have a high composite environmental behavior rating and to be 26% more likely to have a positive attitude toward the environment.

This report also finds that environmental *literacy* (as defined in Chapter 5) results in more persistent and lasting impacts on pro-environment attitudes (affect) and behavior. Real changes usually emerge from educational strategies that give the student a sense of involvement and ownership. Hands-on activities are a reliable approach for this as is student-directed learning. It is also important to teach the student how to obtain and apply their environmental knowledge through such measures as investigative learning and implementation instruction. The problem EE often faces is that most environmental education in our schools has too few of these dimensions and is in danger of being more of an "information only" enterprise. Teachers need to be trained on these more sophisticated forms of student-directed instruction.

An important evaluation of the Investigating Environmental Education Issues and Actions Program (see Chapter 5) found, for example, that in a test of actual environmental knowledge, 38% of the IEEIA students achieved a score of 80% or higher, 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 coming together and focusing on bringing EE 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 and large numbers of learning facilities, natural acres, field experts and nonformal institutions in this effort. Some of this will involve working with the formal educational establishment and some of it will require optimizing the effect of a vast array of outdoor and indoor environmental education resources. There is a sense, among the most hopeful, that this nexus or interface between the formal school-based education systems and the environmental “system” of informal, hands-on learning centers and places is where our best hope for the future lies.

Influencing Influential Americans

For those skeptics who wonder if measurable results really ever come from environmental education programming, recent research also detailed in this study offers answers and tremendous hope. It shows that the environmental literate person is anywhere from 5% to 90% more likely to engage a set of pro-environment activities than a person who is not educated on the environment.

In addition to seeking measurable impacts on a majority of the adult public, certain Roper-defined 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 target groups of U.S. community leaders. The largest of these groups (20%) of adults are Roper Environmental Information Seekers. Some 35% of this group are likely to perform pro-environment behaviors compared to 23% of the general public. Another, smaller group (10%) called the Roper True Blue Greens, according to Roper are a significant group that “walks” the environmental “talk.” As would be expected, this group shows high levels of pro-environment behaviors. Importantly, this group has a nearly one-half overlap with the Influential Americans group (also 10%). But they 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. At 53%, True Blue Greens are twice as likely as the general public to have purchased environmentally friendly products in the past two months. Accordingly, environmental information seekers (51%) and community Influentials (46%) have recently purchased such products.

With regard to environmental attitudes, the 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. 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.

The Percentage of Influentials who are *moderately* or *very* interested in a topic:

- News and Current Events 96%

▪ Environment	92%
▪ Fitness and Health	87%
▪ Nature and Animals	87%

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. 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.

Chapter 1

American Environmental Knowledge Today

In April of 1970, environmental education received its greatest endorsement ever. The first Earth Day helped galvanize public enthusiasm around cleaning up the planet and correcting some 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 a thoughtful, organized and scientific way. Such an education would ultimately equip future generations with the knowledge and skills to mitigate, or even avoid, the perils that could threaten the physical environment, the long-term economy and human health. Most would agree that, since the 1970s, the older generation has consistently hoped that the principles for managing a cleaner and safer environment could be instilled in future generations. But how are we doing?

The field of environmental educators has its own special, if not unique, place in the realm of public education. Before we get to that though, environmental education labors under a powerful, persistent misperception. Many members of the U.S. public incorrectly see the field as a direct educational extension of the nation's environmental activist movement, but 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 important learning opportunity. Environmental education is a rich mixture of teaching strategies, subject matter, interesting learning locations and multi-disciplinary complexity. Unlike many arms of education that focus on imparting knowledge and stopping there, environmental education pursues a powerful mix of deep understanding tied to the ability to apply what has been learned. This fuller approach is what the experts call "environmental literacy" and is defined in some detail in Chapter 5.

Professional environmental education has burgeoned in the past three decades and become enormously 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.

So, the question is: 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?

These are questions we began to explore in 1997 when we first converted our ongoing survey/research partnership with Roper into a direct gauge of the environmental knowledge within the adult public. We felt that by quizzing adults of all ages we could get an idea of what impact the popularization of environmental education actually had since 1970 and perhaps make the case for more scientific study of this question. The time for such an assessment is overdue and has been called for by many educational professionals.

Roper officials were initially cautious about directly assessing adult's 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, Dr. Lynn Musser, then from the University of Maryland and who later went on to the Congressional General Accounting Office, 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. 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 reliably counseled us on the need to aim the questions at the average intelligent adult and 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?*

Or...

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

1. *promote flooding;*
2. *help clean water before it enters lakes, streams, rivers, or oceans;*
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 25-30 years of growth in environmental education and media coverage, members of the public could readily point to the most significant environmental principles and related problems and indicate a rough understanding of their causes. We also wanted to see if most people knew what could be done about these problems and to gain some rudimentary insight into the relationships among attitudes, levels of environmental knowledge 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 have not measured progress against these benchmarks, but probe at a much more general level.

When the results came back in 1997 we received our first view of a broader trend in environmental literacy. The quiz results 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 our ensuing years of research, we further discovered that the public fails to understand the principles underlying many of the major environmental subjects discussed in the media and, importantly, 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 to develop new strategies for creating more vital and viable environmental literacy in America.

NEETF/Roper knowledge studies by year

- 1997 – Basic environmental literacy
- 1998 – The influence of myths and misapprehensions
- 1999 – Readiness for the issues of the future
- 2000 – Basic environmental literacy reprised
- 2001 – Energy literacy

In addition to recapping five years of NEETF/Roper research, we are also incorporating the findings of similar but independent studies into this report. These include additional work by Roper through its well-known Green Gauge Report, and other study findings by environmental education, education, and social science researchers. We hope to create a fuller perspective on the state of environmental knowledge and skill in America. Importantly, we are correlating findings on public environmental knowledge to how EE affects people’s views on the environment and their own actions.

American E-Knowledge: NEETF/Roper Quiz Results 1997-2001

Each of the NEETF/Roper studies from 1997 through 2001 found that Americans have low levels of knowledge on basic environmental facts, 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). While it may be true that overall environmental consciousness has risen over time, lack of sound and detailed environmental knowledge is the stark reality. In most ways, this lack of detailed knowledge parallels other school-taught subjects such as the physical or life sciences. But, because environmental education has such a strong focus on ultimately being applied in the real world, low knowledge levels are one indicator of lack of later stewardship success.

Over the years, the NEETF/Roper report cards assessed environmental knowledge from several perspectives. The 1997 and 2000 studies, for instance, assessed *general* environmental knowledge. The knowledge-based questions in these two studies fairly easy by most standards found that just one in ten adults in the U.S. receives a grade of “A,” answering at least 11 of the 12 questions correctly, and that two-thirds failed the quiz. As will be discussed below, men and women diverged in their results on the quiz.

The NEETF/Roper Basic E-Knowledge Report Cards

The 1997 and 2000 studies are particularly telling because the questions were pre-tested and were designed to ask about subjects visible in the media during the preceding 12 months. Each of the NEETF/Roper surveys sampled 1,500 adults and was designed as a set of multiple-choice questions administered by random telephone interview.

National Environmental Report Card – 1997 and 2000				
Subject: Environmental Knowledge				
Student: The American Public				
Grade		Percentage of Total Sample Receiving Grade	Percentage of Men Receiving Grade	Percentage 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)	Fail	13%	13%	13%
F (7 or fewer)	Fail	55%	45%	65%
Overall passing grade		32%	43%	21%

Figure: shows the percentage of Americans correctly answering each question for the 1997 and 2000 quizzes.

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. While few people, statistically-speaking, passed the overall quizzes, several questions elicited high and encouraging response levels. Low success rates on several other questions caused us to look more carefully at public understanding of more complex environmental relationships. Several years of probing public knowledge on these points have provided insight into a pattern of higher levels of public knowledge on simple, one-step environmental issues and a considerable drop-off in levels of public comprehension of the 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.

Related and similar statewide studies in Minnesota and Pennsylvania had similar results. The Pennsylvania study (2000) was modeled after and almost identical in its results to the nationwide NEETF/Roper studies of 1997 and 2000. The Minnesota study also had nearly identical results but people from Minnesota showed an ability to score higher on questions related to energy generation, water pollution and climate change issues. Still, only 35% of Minnesotans passed overall the quiz.

Figure: Percentage Answering Basic Knowledge Questions Correctly

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 for the exact wording of the questions.

The NEETF/Roper *Energy* Report Card:

In 2001, we thought to elaborate on our understanding of basic environmental knowledge and focused the NEETF/Roper report card questions on the important subject of energy. With energy issues having been so prominent in public discussion over the previous year we incorrectly assumed we would find higher levels of energy knowledge in the adult public than we found in 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. Just 25% passed if the threshold were lowered to six or more correct answers. 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 public correctly answered an average of just 4.1 of the 10 energy questions.

Figure: NEETF/Roper 2001 Energy Report Card Results:

America's Energy Report Card 2001				
Subject: Knowledge of Energy Issues and Problems 2001				
Student: The American Public				
Grade		Percentage of Total Sample Receiving Grade	Percentage of Men Receiving Grade	Percentage 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%

* = Less than 0.5%

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.

Figure: Percentage Answering Energy Knowledge Questions Correctly

Content of Energy Knowledge Question (2001)	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

An Unexpected Age Profile:

A person speculating on the state of environmental education today would probably assume that younger people, ages 18 to 34, would know more about the environment than older people. Their logic: those most recently in school where formal EE has been around since the late 1970s, would know more. Instead we find that environmental knowledge has an unexpected relationship to age. Both the 1997 and 2000 studies found that Americans aged 35-54 and not those aged 18-34 are more knowledgeable about the environment.

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 in Chapter One, obtain their environmental knowledge from many sources jobs, friends, television, etc. This is true for most adult learning. However, the slightly higher knowledge in the older people made us wonder about a possible weakness in current environmental education of school children. The NEETF/Roper survey questions examine basic knowledge of issues considered to be of public importance and selected from a range of environmental topics. While we can only speculate on what might be missing from K-12 environmental education we can see from other data that there may be too little being learned in school. It may also be that what actually gets through to the student is too scattered or episodic and out of sequence to build a durable base of knowledge and a critical mass of environmental literacy. Our 2000 study results:

Age Group	Mean Number of Correct Answers
18-24	7.0
25-34	6.8
35-44	7.5
45-54	7.5
55-64	6.8
65 or older	5.8

As with knowledge of the environment, knowledge of energy issues has the same relationship with age, where Americans age 35–64 are also the most knowledgeable, followed closely by those aged 18–34. 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).

2001 Energy Knowledge Results

Age Group	Mean Number of Correct Answers
18-34	4.1
35-44	4.3
45-64	4.3
65 or older	3.7

The energy issues evidencing the largest differences between the various age groups are: 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 are no significant differences by age group.

The explanation of age group differences may not be a simple matter of an ineffective environmental education system, but may also be due to a difference that the Roper Green Gauge 2001 finds 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 environment as compared to just 55% of children. Children, it seems, have slightly more focused environmental interests with 75% saying they are interested in nature and animals. More evaluation is needed to isolate the variables that will offer improved insight to the lack of environmental knowledge.

Kids Teaching Parents?

Checking in on a common public perception about environmental education, we also looked for more than anecdotal evidence that adults with children in the home would have a higher level of environmental knowledge than adults without children in the home. Some studies of parent awareness of smoking issues, for example, have shown that children were a factor in building knowledge. Although this may also be true of the environment, five years of NEETF/Roper data

consistently 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 even though other studies - such as the 2001 Roper Green Gauge - show that some parents will themselves identify children as a source of environmental information. Parents and non-parents continue to perform virtually the same on the 1997 and 2000 NEETF/Roper quizzes (7.0 correct answers vs. 6.9).

NEETF/Roper data indicate that children do not seem to play a major role in passing on energy knowledge to their parents either. Parents (4.3 correct of ten) and non-parents (4.1 correct) perform statistically the same on the 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. To counter this somewhat, Green Gauge data in 2000 and 2001 report between 11% and 16% of adults saying their children are a source of information on the environment.

Environmental Knowledge and Education Levels

The NEETF/Roper studies find that the most significant single factor in whether people have environmental knowledge appears to be their level of education. In the 2000 study, 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.

Basic Environmental Knowledge 2000

Education	Mean Number of Correct Answers
High School or less	5.8
Some College	7.6
College Grad or more	8.6

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 – a key to future environmental literacy.

The most significant factor in whether people have knowledge of energy issues and problems also appears to be level of education. Americans with less than a high school education average just 3.7 correct answers of ten. This compares to 4.4 correct answers for those with some college education and 4.9 among those who graduated from college.

Education and Energy Knowledge 2001

Education	Mean Number of Correct Answers
High School or less	3.7
Some College	4.4
College Grad or more	4.9

The energy issues that show the largest differences in number of correct responses between college and high school graduates are: the 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 than those with a college degree to correctly answer the question concerning the U.S. industry that increased its energy demands the most in the past ten years, by a 42% to 34% margin. This is the only topic showing this pattern; for the other nine questions, higher education levels equate with higher proportions of correct answers.

Regional Environmental Knowledge Differences

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. Other Roper data show that Westerners spend more time outdoors or engaged in recreational activities than other Americans and this could point to one reason for the knowledge difference. In Chapter 5 we discuss how environmental education that includes field study and outdoor experiences is particularly effective.

Education and Environmental knowledge 2000

Region	Mean Number of Correct Answers
Northeast	6.9
Midwest	7.0
South	6.5
West	7.6

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.

Some Supporting Research on Environmental Knowledge

On a national scale, the NEETF/Roper report cards are informative but not wholly definitive of the scope of environmental knowledge. They do help us gain insight. We can also draw some assurance from the fact that most other studies examining environmental knowledge have had similar findings. The National Geographic Society's Education Foundation and River Network, in 2000, conducted separate studies of children's and adult's knowledge of rivers. Those studies found a similar lack of knowledge of the subjects that were addressed in the NEETF/Roper studies.

National Geographic, River Network Study:

Figure: % answering incorrectly

Male = M, Female = F

	All	M	F
<u>Adults</u>			
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
<u>School Children</u>			
Most water pollution comes from industrial sources	89	88	84
A watershed is also a wetland because it gets flooded	59	53	63
Runoff causes more pollution than industry facilities	67	65	68

The adult survey sampled 750 U.S. residents by phone and the children's survey sampled 250 children ages 9-13 by phone. The survey was conducted by Penn, Schoen and Berland Associates of Washington D.C. Margins of error are 3.6% for the adult survey and 6.2% of the children's survey.

The E-knowledge "Gender Gap"

There is a significant gender-based difference between the NEETF/Roper quiz responses of men and women in the studies. This signals a special challenge for those working to increase environmental literacy nationwide. Those who regularly engage in survey research and polling know that women consistently register a few points higher in support for environmental protection than men. But when it comes to environmental knowledge this "gender gap" is reversed.

The NEETF/Roper studies show that gender has considerable bearing on the number of correct responses to the questions. In the 1997 and 2000 NEETF/Roper studies, men averaged 7.75 correct answers while women answered an average of 6.25 questions correctly. 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).

Gender	Mean Number of Correct Answers
Male	7.75
Female	6.25

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%).

As noted, though men possess greater environmental knowledge than women, women show significantly more support for the environment over the economy, more support for further air and water quality regulations, more support for laws to protect endangered species and natural areas, and seem to have higher expectations of environmental education.

Examination of the studies' demographic data shows that men and women in the survey sample have the same levels of education. This is particularly true of the age groups younger than 45 years. In rough terms, 50% of the adult public goes no further with their education than high school. Another 25% acquire some college and the remaining 25% finish college. The main difference between men and women from an educational perspective may actually be knowledge of and involvement in the scientific and technical fields. National trends show that 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 somewhat outperform women on the NEETF/Roper environmental knowledge tests. We did note while designing the 1997 study that in focus groups of environmental science graduate school students (too small a sample to be statistically valid), women and men performed equally well on the quiz.

The gender disparity in environmental knowledge was no different when the NEETF/Roper study addressed energy subjects. Men in our 2001 NEETF/Roper study performed better than women on energy knowledge questions. Men average 4.6 correct answers (of 10 questions), while women answer an average of 3.7 questions correctly. When we look at the responses of those who received a "passing grade," the difference is more pronounced: 15% of men received a passing grade, while only 6% of women passed (7 or more correct answers).

Gender and Energy Knowledge 2001

Gender	Mean Number of Correct Answers
Male	4.6
Female	3.7

The issues with the largest differences between males and females are: the way most electricity in the United States is generated (47% vs. 25%), the 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 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 and 33% of men had heard of biodiversity vs. 19% of women.

The knowledge gender gap may begin to form early. In a 1995 study by A. Mark Haddon at Towson State University in Maryland, an examination of the environmental knowledge, attitudes and behaviors of 251 high school seniors in Anne Arundel County found that males scored higher on average environmental knowledge but females reported a higher average on awareness and behavior. The study offered no explanation for the differences. The study also found that both male and female 10th graders evidenced more environmental knowledge than those in the two higher grades, and indicates this may be linked to greater emphasis on environmental education in the high school curriculum having just been introduced at the 10th grade level.

The National Science Foundation Advisory Committee on Environmental Research and Education points out that 80% of all students decide before entering high school to opt out of professional scientific pursuits. The NSF also indicates that this statistic is even higher for girls. The report identifies environmental education as a learning tool to make science more relevant and appealing to young prospective scientists. This could mean that the higher environmental interest of women may actually be a useful leveraging tool for addressing the national problem of youth turning their backs on the sciences.

Additional research could help environmental educators determine if high levels of female support for environmental conservation and lower levels of environmental knowledge can be brought together in a dynamic way. As indicated by the NSF and others environmental education supports science education in at least two ways. First, it is multidisciplinary and helps the learner make connections that are important to science understanding and, second, it provides a real world context for the application of many science concepts.

There is a wealth of anecdotal evidence that environmental issues are considered relevant and thus more interesting to students. As noted, this may point to an estimable educational opportunity for those seeking to increase youth participation in the science professions.

Overblown Self-Reported Knowledge

Since 1993, the NEETF/Roper studies have asked respondents how much they feel they know about the environment. Since 1997, with the addition of the knowledge quizzes we have been able to compare the *perceived* levels to the *actual*. The 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 the reality.

Despite 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). 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).

Figure: Sampling of Self-Assessed Knowledge of Environmental Issues and Problems by Year

	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?

In addition to *environmental* knowledge, most Americans overestimate their *energy* Knowledge too. In 2001, the NEETF/Roper research asked people to rate their knowledge of energy issues and problems. The results show that three Americans in four rate themselves as having “a lot” or “a fair amount” of knowledge about energy, but just 12% passed the quiz. And the quiz finds that just one in 100 adults in the U.S. receives a grade of “A,” answering at least 9 of the 10 questions correctly. This gap between real and imagined knowledge could stand in the way of Americans’ realizing a more energy efficient future. NEETF/Roper research on the relationship between knowledge and behavior indicates a willingness on the part of Americans to save energy.

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 popular media such as newspapers and television have provided Americans age 35 to 64 with the information they believe makes them 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 of an attitudinal measure as a measure of actual knowledge.

The overall lack of depth of adult American environmental knowledge has important implications for our ultimately reaching levels of true environmental literacy nationwide. In chapter 5, we discuss several definitions of environmental literacy. They all begin with a foundation of deep environmental understanding. The NEETF/Roper report cards indicate that such a foundation is not present in America today with, perhaps, the exception of a small percentage of the public.

Chronic "Causal Disconnect:" Big Hurdle for the Future

The report of the National Science Foundation's Committee for Environmental Research and Education (2000) points out that "environmental scientists and engineers increasingly consider the interplay of physical, biological and social factors," when it comes to assessing environmental risk and problems. Environmental education experts point out that effective environmental literacy consists of comprehension of these relationships more than the mastery of facts. Real environmental literacy thus is about understanding how one piece in a moving system affects another and about an individual's ability to sort out those connections.

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 1990). Researchers Monroe and Kaplan (1988) pointed 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.

One of the most significant findings throughout the NEETF/Roper study data, however, is how 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 electrical use affecting the quality and temperature of the atmosphere. In an examination of causes and possible consequences of climate change, one youth study found that an appreciation of the mechanism of global warming by the retention of solar energy takes time to become established over secondary education. (Boyes and Stanisstreet 1993). They found that while children are 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 is inherent in the ages of the students themselves and their capacity for higher order thinking. While NAAEE/Environmental Literacy Council research shows that as many as 61% of teachers cover environmental subject matter, 83% of elementary school teachers teach EE but just 44% of high school teachers teach it. The significance of this is that studies show that older students have more developed higher-order thinking capacity and skill and are more able to absorb complex environmental subject matter. (Myers and Stanisstreet 1999).

As with many fields based in the physical sciences, there are countless environmental facts that come to bear on learning about an environmental system. A lack of knowledge of facts is not in itself a

huge problem. The National Geographic/River Network study on river knowledge demonstrates quite low levels of factual knowledge around waterways. Consider the following responses to multiple-choice questions:

National Geographic, River Network Study
Figure: Knowledge of Data Concerning Rivers and Streams

% answering correctly		
Fact	Children	Adults
Largest river (Mississippi)	24%	56%
Number of rivers (250,000)	0%	0%
Gallons of water consumed daily (100 gal.)	2%	1%
Washing machine avg. gallons (30 gal.)	0%	2%
Toilet flush avg. gallons (5 Gal.)	5%	3%
10 minute shower (50 gal)	1%	1%
% of wetlands lost (50%)	0%	2%
% of freshwater fish species endangered (30% of fish species)	0%	2%

Few would be surprised that more than half of American adults can tell you the Mississippi is our largest river. But while low levels of correct response to all the other questions in the study may have surprised the researchers a bit they did not surprise most environmental educators because the environmental field is so broad, complex and multi-disciplinary.

The International Social Survey Programme, a collaborative of leading academic institutions in 22 countries conducted a study of public understanding of some broader scientific and environmental facts. Unlike the National Geographic study that asked for specific answers in a multiple choice setting, these questions were placed in a true/false format that raises the opportunity for a correct answer. The 1993 study by Phillip Gendall, Tom W. Smith and Deborah Russell asked seven environmental questions. U.S. respondents had close to the lowest average with an average of 4.2 answers correct but were about even with East and West Germany. Americans were, however, only somewhat lower in their scores than people from Great Britain, (4.5) New Zealand (4.7) and Norway (4.6).

While a command of information and technical data helps, the goal is not to become an “environmental encyclopedia.” Environmental education can be more about imparting understanding of important causal relationships – what might cause air and water pollution, the ramifications of recycling, what contributes to species loss, and more. 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. As noted above, these patterns are not unusual for any science-based field. But, if environmental science and management are to stay in step with the public, the basic steps and interactions must be effectively imparted.

Environmental scientists and experts don’t always help with public understanding either. Too often they assume that the public easily grasps what they consider rudimentary relationships. Consider the

common use among experts of the term “watershed.” In public policy discussions of water quality at the federal, state and local levels, the term “watershed” is used with frequency. It 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.” In this format, a total of 41% of Americans were able to identify the true meaning of the term. But, significantly, 35% were unable to venture a guess even when presented with the options.

When considering that many 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 the public needs 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. A 1998 focus group assessment by River Network of community leaders in New England and the Midwest actually indicates that the 41% number elicited using the multiple-choice format of the NEETF/Roper report card may be deceptively high. Not one of the group participants could, without prompting, define a watershed.

Another related water term that relies on understanding of some 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 a public understanding that rain water washes pollution sitting on the ground into streams, lakes and bays. The Roper/NEETF research indicates low levels of comprehension of this process.

Given the popularity of the term and the importance of the issue, The National Geographic study probed public awareness of this term. It found:

		All	M	F
percentage familiar with term	Children	15	18	13
“non point source pollution”	Adults	14	18	11

Sometimes, when deciding on a course of action, it helps to be able to think ahead. For example, on an issue as important as energy conservation, we find that people do not seem to be in touch with the reality of how long it really takes to build a power plant or drill for oil. Some of the public appeal for developing new energy sources may come from thinking that these sources would be available sooner than is actually possible. Oil exploration, dam building, and power plant construction all take time – from five to fifteen years. Scientists and technicians agree that the quickest way to address short-run energy needs is to conserve fuel and electricity. Just two in five Americans (39%) recognize this, however.

A Georgia Southern University study offers considerable hope on the ability to impart causal relationships and also sheds some light on the e-literacy gender gap discussed below. In this study of those taking a science course, researchers found that of 76% of the students 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 while 73% agreed the course would help them become more responsible citizens. While 68%

agreed that they had improved ability to analyze environmental science problems, just 41% felt that they knew how to solve problems. No significant differences appeared between male and female students.

Another encouraging study was conducted in 1993 by researcher, Tina Grotzner. It examines children's understanding of complex causal relationship in natural systems. It finds that children develop the best understanding of such systems when the teaching includes complex causal models as compared to linear models. There is also a clear age-related ability to pick of causal relationships – once taught they can transfer to other topics.

An important study of Ohio adults 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 presented. The Ohio study finds that people can reason-through the answers even with the modicum of information presented in a multiple-choice question. Carr, Mancini and Morrone (1999). The study found, for example that people grasp that: increasing population increases the potential for pollution, mosquitoes can, over time become resistant to insect sprays, crop rotation decreases the need for pesticides, and when natural predators are removed the number of deer in an area will increase.

Each of these studies supports the simple idea that the environmental education can impart important cause-and-effect relationships best when they are specifically taught and creative models are used. This seems to indicate that a greater emphasis on teaching basic environmental principles and using environmental education benchmarks would help address as weakness in environmental literacy. In Chapter 5, the importance of a greater focus on benchmarks will be reinforced.

Chapter 2

American Media's Mixed Impact on Environmental Literacy

The formal field of environmental education has never quite come to grips with how to respond to the undeniable power of the media as both a positive and negative source of environmental information and knowledge. The common view among environmental educators, for reasons explained in chapter 5 is that the media does not supply much actual *education* and is really the most powerful form of environmental *information*. This means that environmental educators tend to focus on education programs and to mostly ignore how the media affects baseline public environmental knowledge. By contrast, organizations and agencies 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 and see less value in more deliberate pedagogy.

The NEETF/Roper data seem, throughout, to indicate that the media's impact on environmental knowledge should be taken more seriously and not ignored or underestimated by professional educators. That is because the media supplies a steady stream of sometimes complex and sometimes oversimplified environmental information to a public that sits upon a fairly sketchy and unreliable base of environmental knowledge. One study explains this by comparing the effect of television vs. classroom instruction. Those students who reported using television as a source of information actually showed greater knowledge about Global warming but also held more misconceptions. Students who reported learning most about the Greenhouse Effect from school showed fewer misconceptions. (Boyes and Stanisstreet, 2001)

It is not that the media is supplying incorrect information, but rather each individual assimilates sound-bytes and information in their own unique way and according to their own unique worldview. The cognitive scientist will identify these pre-existing views and "knowledge structures" and we all have them. The assimilation on 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

As discussed above, the complex field of environmental literacy often struggles with public tendencies toward oversimplification. This can cause people to harbor many incorrect assumptions. Some of these can be unsettling to those in pursuit of environmental literacy and some may even be humorous. NEETF/Roper data find, for example, that forty five 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, CFC's 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 with paper products being the larger problem).

As with other science-based fields, people hold fast to some unbelievable notions about the environment. Critics of environmental education have gone so far as to say that these mistaken ideas are the result of some form of environmental zealots' plot. But, the truth is much more interesting. While there is no conspiracy to mislead the public, there are a number of powerful forces at work between how people hear about environmental conditions and how they absorb the information.

In an attempt to measure how much Americans *really* know about the environment compared to what they *think* they know, 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 of the multiple-choice questions 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 has been visibly covered in the media over the past year.

We discovered how powerful some myths are. Of the ten multiple-choice questions in the 1998 survey, the myth answer is given most often in seven cases. In fact, in three cases, a *majority* of Americans give the incorrect myth response:

Figure: Percentage Giving Myth Response

Content of Environmental Knowledge Question	Percentage Who Gave Myth Response
The goal of paper recycling programs	63%
Leading cause of entanglement	56%
Leading cause of childhood death worldwide	55%
Most common source of water pollution	47%
Primary source of oil found in rivers, lakes and bays	40%
How most electricity in the United States is generated	38%
How the United States disposes of spent nuclear fuel	34%
Only current sources of CFCs in the United States	32%
Greatest source of landfill material	29%
Definition of a watershed	11%

Despite the fact that two-thirds of the American public report knowing at least a fair amount about the environment, large numbers actually subscribe to environmental misapprehensions. Moreover, for several issues, those who think they know the most are the ones who are most likely to believe the environmental myth. 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% of those with a fair amount of knowledge

and 24% of those with only a little or practically no environmental knowledge. This pattern also holds true for the greatest source of landfill material.

The exact origins of these environmental myths have not been carefully studied but their very nature provides us with clues. There appear to be some strong contributors to the myths and misperceptions. Most significant to this process could be how media-based information delivered in sharply focused messages hits home with members of the public. They hold on to the sound bite and their own cognitive structures and preexisting knowledge participates in a sort of mental “editing” that gives a myth some added durability. If we read between the lines, the NEETF/Roper data indicate that there are at least four ways the myths become widespread and accepted. They include:

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. Simultaneously this image burned itself forever into the American mind. Reinforced by similar examples of industrial pollution, the nation galvanized around environmental clean-up for factories, sewer plants and other large pollution sources. In the ensuing thirty years, a number of new pollution sources moved to a higher ranking. Perhaps because of the power of longstanding images of industrial pollution, a majority of study respondents are not up-to-date on these changes.

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 (47%) think the most common form is waste dumped by factories. 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 to prevent it and how to clean it up. 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.

The Main Source of Oil into Rivers Lakes and Bays

It has been 15 years since the oil tanker Exxon Valdez ran aground in the Prince William Sound in Alaska. It 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 the U.S. Environmental Protection Agency, many millions of gallons of petroleum still find their way into the rivers, lakes and bays of the nation each year through simple ignorance and thoughtlessness. And, while there was a time 30 years ago when much of this petroleum came from American industries. Today, individual vehicle users contribute most of this petroleum. The oil itself comes from people changing car oil and dumping it down a nearby storm drain or pouring it into the ground. Mid 1990s estimates were that more than the amount of oil spilled by the Valdez is dumped monthly by

individuals. Just 16% of the American public knows, while 40% believe the oil 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 see larger 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 must also come to understand they are now the number one oil pollution source, if this concern is to be resolved.

Myth Process 2 – Persuasive, Powerful Consumer Campaigns

When the media picks up on an information campaign involving the potentially harmful environmental effects of a consumer product it can also have a lasting impact on public knowledge. Importantly, 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 and, over time, through some subtle form of mass perception shift, the product is re-designated as *the* main problem. Here are some illustrations from the 1998 study.

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. This public awareness campaign produced profound public sensitivity to the CFC spray can 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.

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 this "snipping" practice is vivid evidence of how the public can be mobilized around an environmental issue (particularly, it seems, one involving consumer practices) 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 the survey respondents. 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 they would if left outside where they could possibly harm wildlife.

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 threat to over-stuffed landfills. This comes in part from yet another media-based consumer awareness campaign, in the early-to-mid 1980s, that identified diapers as a significant environmental 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 landfill material and efforts to reduce waste of all sorts should continue. But, newspapers, boxes, packaging and office paper should be clearly understood as the greatest single source of material and thus, a necessary focus of reduction, reuse and recycling programs.

Myth Process 3 - Visible Public Debates That Go Unresolved

Yucca Mountain and Nuclear Fuel Waste

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. There are, for example, 105 nuclear power plants in the United States generating 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. These 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, so they are kept on site at the power plant. The 1998 survey found a total of 34% of Americans believe that the spent fuel rods are safely stored in a deep underground facility in the West. Just 17% correctly know that the rods are stored temporarily on site and are monitored. Significantly, 35% say they do not know what happens to the spent fuel.

SUVs and Average Gas Mileage

In the past ten years the average number of miles per gallon of gasoline achieved by vehicles in America has decreased. Just 17% or one in seven adult Americans knows this. The popularity of larger vehicles such as the sport utility vehicle, or 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

Electricity and the Iconic Dams of the West

The surveys found that 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 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.

CARE Packages vs. Water Purification

Many adult Americans grew up learning 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. But, as our knowledge of science has increased, the role of the environment in worldwide loss of life has become one of the most critical and the least understood of any of the significant environmental myths addressed in *The 1998 National Report Card*. Public health officials around the world have, for example, documented millions (40%) of all childhood deaths each year are the result of microorganisms and other pollutants in water supplies. These lead to gastrointestinal disease which in turn leads to dehydration and starvation. But, only 7% to 9% of the American public understands this. Instead, we speculate that a majority of Americans (55%) have been influenced by harrowing public reports of famine and starvation in the world and believe it is a lack of food rather than contaminated water that causes most childhood deaths. 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. In 1998, the U.S. State Department identified environmental pressures and related resource shortages and disease as the leading cause of instability in many parts of the world.

Figure: Percentage Giving Correct Answer

Content of Environmental Knowledge Question	Percentage Who Answered Question Correctly
Definition of a watershed	41%
Only current sources of CFCs in the United States	33%
How most electricity in the United States is generated	27%
The goal of paper recycling programs	24%
Greatest source of landfill material	23%
Most common source of water pollution	22%
How the United States disposes of spent nuclear fuel	17%
Primary source of oil found in rivers, lakes and bays	16%
Leading cause of entanglement	10%
Leading cause of childhood death worldwide	9%

Nuances of the Gender Gap for “Myth” Subjects

Among the demographic subgroups, men and women are equally likely to give the incorrect myth answers to seven of the ten questions. This, again displays 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, versus 26% of women; and

- Greatest source of landfill material—more women (34%) believe the myth than men (24%).

Figure: Seeing the Truth Through Environmental Myths by Gender

	Total	Gender	
		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

Self-Reported Knowledge and the Myths

While in some cases *high* self-reported environmental knowledge corresponds with *high* belief in environmental myths, those who say they know a lot about the environment do give the correct response more often than the other knowledge subgroups for six issues. For example, though just one-third of all Americans in general can identify the only current sources 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.

Figure: Seeing the Truth Through Environmental Myths by Self-Reported Environmental Knowledge

	Total Correct	Self-Reported Environmental Knowledge		
		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

However, those who say they have 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.

Education Levels and Myths:

Formal education has a mixed impact on responses to the ten questions. For two items, “primary source of oil found in rivers, lakes, bays” and “greatest source of landfill material,” as educational level increases, the percentage giving the myth response decreases. However, for two other items, “leading cause of entanglement” and “how the United States disposes of spent nuclear fuel,” the percentage giving the myth response actually increases with level of education. (For the other issues, results are not affected by level of education).

Figure: Seeing the Truth Through Environmental Myths by Education

	Total	Education		
		High school 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

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

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 the table on the following page, 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.

Though level of education had a mixed impact on belief in environmental myths, 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.

Environmental "Myth" Vs. 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 mostly caused by factories.	Still a factor, but land run-off is the number one problem now

The above review of myth processes might lead one to see the media as more of a menace to environmental literacy than a source of support. But, the media offers a number of opportunities to strengthen environmental education. In Chapter 5, for example, the impact of watching a television documentary was examined and determined to have some significant effects on adding to environmental literacy.

Another promising and mostly underutilized part of the media is television weather-casting. In his work on TV Weathercasters as Prominent Science Communicators, Professor Chris Wilson of the University of Texas explores an untapped area of scholarly study. His hypothesis is that the television weather caster is America's most visible science communicator. In a survey of weathercaster activity he found that 47% of the average weathercaster's day is spent developing computer graphics for the weathercast. Actual weather-casting takes just 36% of his or her time. Moreover, 15% of the weathercaster's time is spent on community service.

The Critical Interplay Between Free-Choice Learning and the Media

When environmental education moves from schools to less "formal" venues, professional educators have considerable comfort with museums, zoos, aquariums, and nature centers but the media often leaves them vexed. The strength of the media in providing environmental information is undeniable. But, the above explanation of myths also shows how ungainly it can be as an actual tool complex learning. Two recent sets of studies may provide a partial answer.

First, the professionals at the Institute for Learning Innovation near Washington DC have developed a focus on education that takes place outside of school and occurs over a lifetime. As noted earlier, they believe that only a small percentage (3% to 7%) of what people learn in a lifetime takes place in schools. The rest occurs through a mix of intensified interest in a particular subject or out of some necessity. The idea that people engage in high quality learning throughout their lifetime on subjects that matter to them is important and has particular relevance to environmental education. The Institute clearly recognizes the opportunities that exist for high quality learning in such interesting places as museums or zoos.

But, a second set of studies, indicate the media could present a significant opportunity for free-choice learning. The 2000 through 2002 Roper Green Gauge reports have identified a set of people they call "environmental information seekers." More than 50 million Americans show a higher level of interest and activism in seeking out information about the environment. Their main source for this information is the media in its broadest context – news, documentaries, stories and the Internet. These environmental information seekers represent about 20% of America and trend toward being community leaders, educators and highly educated. What is most critical about the "information seekers" is that Roper finds fully 44% of the nation's "Influentials" or community leaders are also environmental information seekers.

	Info Seeker	vs.	Total Public
More likely to perform pro-environmental behaviors	35%		23%
Percentage amount more willing to pay for Pro-environmental versions of products	9.5%		5.7%

Several recommendations in this report look at ways to employ the media as a more organized and effective backdrop for environmental learning. Roper indicates that the environmental information seekers are serious enough in their environmental interests to benefit from such efforts. Some of these are explored in the recommendations and 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.

Chapter 3

Americans' Acquisition of Environmental Knowledge

One way to describe environmental education's current condition 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 and, despite its popularity, is still mostly considered an educational "extra" – grafted on to some core syllabus as an enhancement. At the outset of this discussion we should note, however, that there is, as yet, no comprehensive scientific overview of the exact status of environmental education in America and such an overview would be of huge benefit to the effectiveness of the field.

Generally speaking though: a) there is not enough environmental education getting through to the American learner, whether child, adult or teacher, and b) it is not delivered in a way that achieves adequate depth and progresses year-to-year in forming a long term basis for environmental literacy. This discipline of proper depth and concept- building is what the professional educator knows as "scope and sequence" and is not employed as widely as it should be.

Instead, EE's learners are often subjected to instruction that is of inadequate depth and mostly out of sequence. They are receiving smatterings of environmental knowledge rather than a deeper knowledge of underlying principles. And, as noted earlier, they are applying these informational tidbits to their own, individualized understanding of the world. The results, described in the following chapters, can be alarming. 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.

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, burgeoned in both the formal and informal arenas, and stands ready to achieve much higher levels of effectiveness. This chapter describes what the combined impact of environmental *education* and related *information* looks like in America today within the limitations of current studies and anecdotal evidence. As noted, a more detailed and reliable assessment is surely needed to clarify deficiencies and strengths and point toward delivery solutions.

Environmental Education of American Children

What is, perhaps, most amazing about the environmental education of children in America is how many people contribute to it. The field has a core of thousands of trained professionals working to provide basic environmental instruction. They are working diligently to bring about comprehensive knowledge and skill in environmental science and problem-solving. But the field also has millions of avid but relatively untrained or under-prepared “dabblers.” Again, that is the main reason why environmental educators are quick to differentiate true environmental *education* from environmental *information*. These dabblers mostly offer American children and adults an unrelenting stream of the latter. Much of this information is important and accurate, but it is often superficial or incomplete. Some of it can even be overstated or wrong.

In the news, for example, he or she may hear about climate change policy discussions and later see a televised speech by an elected official explaining a political position. The ensuing information stream may then contain a scientist discussing, even warning 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 he or she 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 no event 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. For some, all this is “education” but, from an educator’s viewpoint, it is downright confusing and an opportunity to truly educate the public about an important public discussion has been missed.

An environmental educator wants to help people learn to competently navigate such disaggregated and contradictory information by instilling a more comprehensive and grounded approach to learning. A classic and highly regarded definition of sound environmental education comes from Hines, Hungerford and Tomera (1987). They maintain that environmental education is really about going beyond the mere imparting of information to: a) a working knowledge of environmental issues, b) specific knowledge of approaches to address those issues, c) the ability to make appropriate decisions, and d) possession of certain affective qualities (attitudes) that make them pay attention to environmental conditions.

In their foundational survey assessment on understanding Environmental Literacy in the United States (1997), McBeth and Volk point out how in 1994, the North American Association for Environmental Education elaborated on the definition of environmental literacy. It uses the following categories: a) affective qualities, b) ecological knowledge, c) socio-political knowledge, d) knowledge of environmental issues, cognitive skills, additional determinants of environmentally responsible behavior, and environmentally responsible behavior. The professional EE field, as the contemporary thinking on the attributes an environmentally literate person should possess, accepts these expanded categories originally coordinated and developed by Dr. Bora Simmons, of Northern Illinois University.

The environmental education professional approaches his or her craft with this definition and with the idea that most other educators should too. But, most of America's 2.5 million K-12 teachers are considerably more casual in their thinking about EE.

This is unfortunate, according to Dr. Thomas Marcinkowski of Florida Tech, who points out that school is one place where each element comprising true environmental literacy can be addressed and taught in a controlled educational setting. One common public assumption is that school children receive all their environmental education from teachers who are well versed in environmental subject matter. People assume most teachers grasp and can impart the causal sequences of complex environmental issues and conditions. But, how do most kids actually receive environmental education/information?

Some 32 states have environmental education programs, but a 1998 survey showed that less than a total of \$7.3 million was directly budgeted for them. Ruskey, Wilke, and Beasley, (2001). Of these states, 15 require an educational component in K-12 curriculum, but only four states include pre-service environmental education training as a criterion for teacher certification. The importance of this training for EE is discussed further in chapter 5.

NEETF and Roper asked, in 1994, how most students learn about the environment through a survey of school children. We asked kids where they got environmental education and information. They responded:

Television	71%
School	54%
Family	30%
Newspapers	27%
Zoos, aquaria etc.	18%
Movies	17%
Commercial ads	11%
Kids magazines	11%
Radio	10%
Product packaging	8%

Note: In 1994, the Internet was not included as a choice.

Despite the pervasiveness of television as a source of environmental information for most school children, the survey found that 54% of them identified school as a major source. Because school is a place where students can learn about the environment in a more disciplined way, we would hope to eventually increase the percentage of schools offering organized environmental education.

Fifteen years ago, even the 54% was a much smaller number. There are indications that the quality of instruction students receive through schools is richer than that provided through the media, even though the media is a source named by more students. This was not always the case. In a longitudinal study from 1979 through 1987 researchers found that schools had scored high, but it was not until the end of this period that they were identified as the most influential source. Fortner and Mayer (1991).

In 1992, researchers Ramsey, Hungerford and Volk described three main ways this change had come about and how most environmental education takes place. The three forms are: a) "infusion," such as the building 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. Science texts, miscellaneous environmental education materials and supplemental teacher training programs are the three primary sources used for environmental education by teachers. The study found that 61% of public school teachers say they include environmental topics in their curricula.

The study also found that nearly half of all K-12 teachers indicate they teach environmental education during the school year, but most teach fewer than 50 hours per year. A number of professionals speculate that the true measure is half that amount. A 2002 study of 1,500 North Carolina Teachers, for example, found that a majority (54.5%) reported they use environmental education in the classroom from 1% to 24% of the time. Again, it would seem the actual is closer to 1% than 24%. That is because when these same teachers were asked how frequently they used environmental education training in the classroom, just 15% said “daily,” while a majority said “monthly” or “occasionally.”

Even though more than half of 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, Wilke and Beasley, (2001).

The 1994 NEETF/Roper study of children supports this. Respondents were asked where in school they learned about the environment. They said:

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%

The overall percentages of the ways kids receive environmental education and information have not changed much since 1994 with the exception that parents now seem to be more involved in a child’s environmental education. Roper’s 2002 Green Gauge Study, for example, independently examined where school age children get their environmental information. Their responses:

Television	72%
Parents	51%
Teachers	49%
Friends	39%
Newspapers	30%
Radio	25%
Magazines	11%
Internet	9%

Though schools in the United States score numerically lower than the media as sources of environmental information, the deeper level of instruction schools provide likely helps to balance that off. This is supported by several studies. Boyce and 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.

The North Carolina study of teachers found that when teachers were asked what environmental education tool they preferred, 28% said books, 26% said lesson plans and 20% said videos. And, some 15% said they preferred the Internet.

Learning about the environment is variable and not static. There is considerable evidence, for example, that informal venues for child learning are increasing in importance. The evidence includes increased educational expenditures from museums, zoos, aquariums and nature centers that have adopted more education focus in recent years. It is also true that the Internet is increasing as a source of environmental information and education for children.

Environmental Learning by American Adults

A majority of adults, particularly those older than 35, did not have much environmental education in school. About half of those in the age group of 18 and 35 had a form of organized EE in school. The same media-driven information stream that affects young people affects adults even more. Although adults may have a more mature capacity to soak up and process the environmental information they receive, they must do so without the guidance of thoughtful instructors. Moreover, the media is, by far, the leading source of environmental information for adults. For a profile of adult sources of environmental information, the Roper Green Gauge report lists the following as the "major" sources of environmental information for adults:

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

The 2001 Green Gauge report finds that most adult Americans rely mainly on traditional media sources to satisfy their environmental information needs. Importantly, relatively few are inclined to go out of their way to seek out information and most information gathering happens in a fairly arbitrary manner.

The 2003 Green Gauge report finds that, in the face of a down-turned economy and more pronounced security concerns, fewer Americans are educating themselves about the environment. About 52% (down 9 points from 2002) say they often or sometimes read and article or watch a TV show or some other source of environmental information. One of the greatest specific declines in 2003 was the number of people turning to newspapers for environmental information. At 48% this statistic is also down 9 points.

The promising news may be that segments of the public are more avid in their pursuit of environmental information and this may suggest the value of more targeted strategies for educating the larger public. The Roper Green Gauge Studies, as noted earlier, delineate a specific group of some 20% of American adults as “environmental information seekers.” These individuals are much more active in obtaining and absorbing environmental information. The membership of this group of information seekers overlaps significantly with two other target groups Roper has identified in its research. The first group Roper calls “Influentials” – a term it has trademarked. These individuals comprise about 10% of the adult population and are our active 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. The “Influentials” were, for example, the first to take up the use of home computers and set a trend that millions followed. The “Influentials” also set the pace for adopting and promoting organized youth sports that eventually made a political “demographic” out of soccer moms.

A related class of people that Roper also tracks in its Green Gauge studies is labeled as “True Blue Greens.” This group likewise comprises about 10% of the population and has a nearly 50% overlap with the “Influentials” group. Roper likes to say that True Blue Greens “walk their environmental talk.” This contrasts; for example, with a much larger group of adults (33%) it calls Basic Browns in its Green Gauge reports. They seem to never support environmental causes. 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. Most definitely they represent the core of the larger group of 20% of adults who are “environmental information seekers.” More about how the five major Green Gauge environmental classifications impact learning, behavior and environmental stewardship is contained in Chapter 5.

There are some important differences between the “environmental information seekers” and others in the way they obtain information about the environment. For one thing these seekers read more. Newspapers (rather than television) are their leading source of environmental information. Secondly they pay much more attention to information coming from environmental non-governmental organizations. Thirdly, nearly one third consider the Internet to be a source of environmental information. Main sources for environmental information seekers:

Newspapers	64%
TV	61%
Environmental groups	50%
Radio	38%
Internet	29%

“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. John Falk head of the Institute for Learning Innovation (ILI) near Washington DC, thinks schools are a vitally important learning venue but, on average, deliver just three to seven percent of the average person’s education over a lifetime. He and his colleagues

spend time examining how people continue to avidly and efficiently learn throughout their lives. They point out that there are stunning examples of what they call “free choice learning” everywhere around us. Consider: the next-door neighbor who, at age 40, decided to learn how to fly a plane; the lawyer who, in retirement, has become 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, through a compelling display causes one to do more research on the subject.

Falk et al. believe people are not only naturally curious but have avid learning responses to nearly anything that galvanizes their interest. These catalysts can be positive or negative but what they generate cumulatively over a lifetime is the majority of a person’s best learning. The significance of this insight into “free choice learning” for adult environmental education lies in how we eventually address the interests and needs of Roper’s class of environmental information seekers.

Understanding the power of free-choice learning can help us to 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, the message is clear that school is a good way but just one of many ways to pursue baseline environmental literacy.

Chapter 4

American EE's Popularity and the Reasons for It

As we were preparing for the 1997 NEETF/Roper Report Card we wondered about a timely question of the day. Around that time there was much debate in the public media about whether environmental education had, in reality, become co-opted by environmental advocacy organizations and reduced to a thinly veiled campaign to convince children to become pro-environment activists. Despite longstanding, diligent efforts by bona-fide environmental education organizations to foster EE materials and instruction of the highest scientific and educational integrity, there are usually enough gaffs provided through the media, private publishers, or even the occasional actions of overzealous teachers to fuel the debate. Along with that discussion came a frequent claim by proponents of the “co-opting” view that parents were “upset” about their children receiving environmental education. Our researcher, Dr. Musser, offered a wise response to this claim – “let’s ask the parents what they think,” she said. And that is what we did.

Level of Parental Support for EE

We found that adult Americans, including parents, overwhelmingly want environmental education for school children. Prior to conducting the research we thought a majority would be supportive but the 1997 NEETF/Roper study found that fully 95% of adults and 96% of parents support the practice of teaching school children about the environment. In survey research there are few undertakings that receive such a high level of support. We were both pleased and encouraged. But, even though this constitutes a home run in survey research terms, we needed to know more about what such a high level of support actually means for the prospects of environmental literacy and what might be causing it.

Intuition would indicate that EE’s “idea of origin” – preparing the next generation for a more challenging environmental future – would be why many adults would support it. We assumed that they generally want children to live in a better world. But, to further investigate EE’s enthusiastic support, the 2000 NEETF/Roper Survey included several follow-up questions about the possible effects that environmental education may have on school children. The data also show that Americans believe the benefits of environmental education to extend beyond the classroom, and that an appreciation and understanding of the environment creates well-rounded children who are better prepared to be part of society.

The Reasons for Support

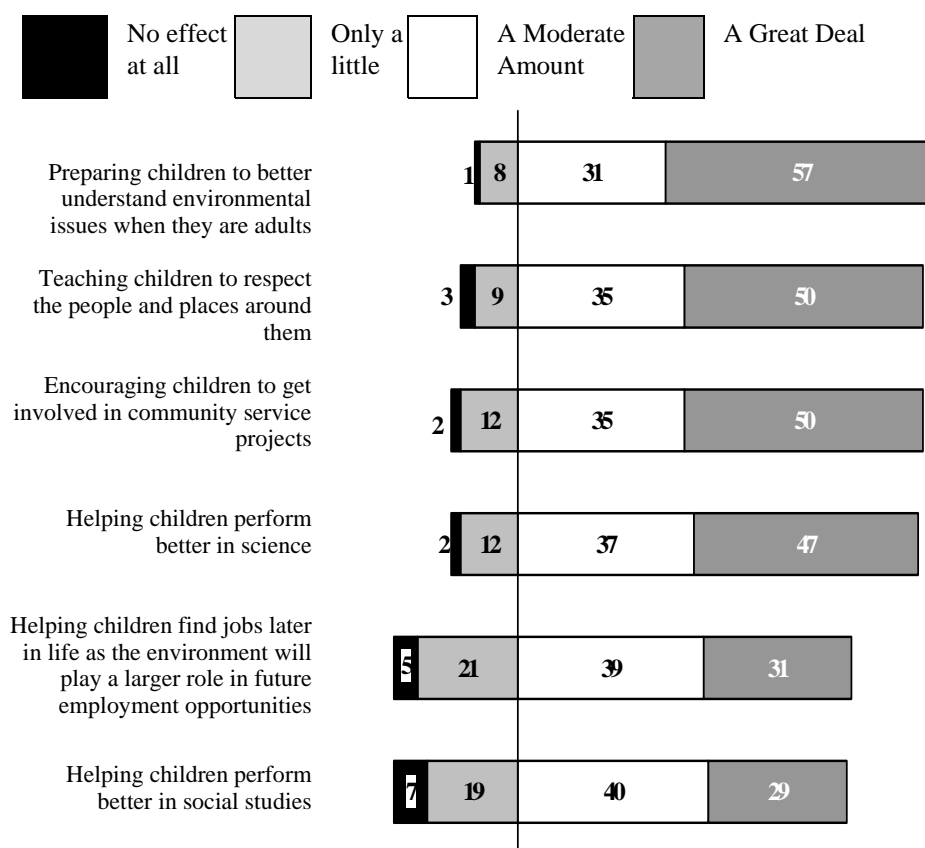
Predictably, a main reason to have environmental education in school, according to 87% of those surveyed is environmental. They see EE as having either a *great deal* or *moderate* effect of helping children to better understand environmental issues when they become adults. Almost as important, however, 85% of American adults think that environmental education contributes to a young

person’s thoughtfulness, consideration and character in kids 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. This is a subject discussed in Chapter 6.

Similarly designed statewide studies in Minnesota (90%) and Pennsylvania (95%) showed similar levels of general support for environmental education for school children. Moreover Roper’s annual Green Gauge survey has twice corroborated these findings about the perceived value of environmental education. In 2000 it noted that 75% of adults say learning about the environment in school should be as important as math or English and in 2001 that 77% agreed with just 20% disagreeing.

REVIEWER’S NOTE: GRAPHICS WILL BE CORRECTED AND FINALIZED

Figure : Expected Effects of Environmental Education



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.

Support By Gender

As with many environmental subjects, gender is a key consideration in assessing attitudes regarding the effects of 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 environmental education in schools has a *great deal* of effect on young people. This is especially true for two of the effects: 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 possible 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). It is worth reminding the reader that the NEETF/Roper studies show that women consistently evidence greater support and concern for the environment than men. While we can only speculate on what deeper motivations underlie parental support of environmental education, the NEETF/Roper data may at least provide some indication that EE helps children learn science, function better socially and may even impart some community leadership skills.

Parenting and EE

There may even be some parenting philosophy and social psychology connected to how people perceive the effects of environmental education. Researcher, Diana Baumrind has defined several child-rearing models, (published in 1983) which describe parents in their relationships with children. Her “authoritarian” model is about parents who concentrate on controlling behavior, preserving order and minimizing give-and-take between child and adult. Baumrind feels this does not encourage independence or spontaneity in children. By contrast in her “authoritative” and “harmonious” models she sees a pathway to optimal competence in developing children. Her research on these models indicates that parents expect mature behavior from children. They expect them to follow rules but still to be independent and individualistic, and to recognize the rights of others. They also see value in open give and take between child and adult. These attributes are all reinforced in sound EE programs.

Baumrind’s harmonious model has the added attraction for parents of supporting a worldview that places people in harmony with nature as compared to the more classic 19th century philosophy of human domination of nature. Such a “domination” theory is held by many of the parents who subscribe to the authoritarian model of child rearing. What once was seen as the natural order, however, has undergone some alterations in the 20th century and become a more widely accepted environmentally friendly paradigm. And while research discussed in chapter 5 shows this may not translate to actual changed behavior, it does seem to support parental will for children to be educated on the environment. Even under Baumrind’s authoritarian model, parents may feel that the future has so many unknowns that children deserve basic environmental education to prepare for unanticipated environmental dangers that are too remote to be forecast.

Whether they are parents, or not, most Americans do not want environmental education to end with graduation. They are believers in some level of education and training for people of all ages. There is, for example, strong support for governmental and corporate involvement in environmental education 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, “private companies should train their employees to solve environmental problems.” Americans appear to want environmental education on the national agenda, and want government agencies and corporate America to be involved in educating adults about the environment

Chapter 5

Environmental Education and Stewardship in Our Youth

Organized and widespread environmental education originated with a nearly unique (for the formal education arena) focus on the future and applied stewardship. This leads to what those, who have fairly conservative views of education, worry is really teaching “activism” to our students. It is the same thing, by contrast, that most professional environmental educators see as the whole point of environmental education -- teaching applied skills and long-term environmental stewardship. Much of the discussion about what is appropriate to teach application-wise seems to turn on whether the observer personally agrees on the action being taught. There is widespread normative agreement, for example, that it is acceptable to teach a student about nature through tree planting or imparting common sense 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 condone such activities as second graders writing letters to Congress by rote. Still, there is a feeling by many, including most adults that issue awareness; skill and application are a necessary part of the overall EE picture.

Even in its best light, most evaluators see American Education as too passive and non-participatory. Most school students are largely confined to the classroom to learn through lectures. Educators who see value in EE are drawn to how it helps students become more active in their own education and can be tailored to be student-directed. So the original idea seems to hold up from the educational as well as the environmental viewpoint. Three decades ago, the accepted thinking was that if we could educate a generation 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 some fundamentals on how the younger generation could avoid or at least mitigate the environmental mistakes of their elders. The shortcoming to this thinking was there was too little comprehension what a great educational challenge infusing such stewardship thinking really implied.

Early Efforts: A Mile Wide and an Inch Deep

It seems that 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, water bodies and more.

Through the 1970s and into the 1980s there was a proliferation of well-intentioned environmental education programs and materials. Such an abundance of EE activity continues today but with a stronger involvement from bona-fide and professionally developed EE programs. Still, schools and teachers 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. These 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 Appendices 3 and 4.

Maria Lane's Planning Forum Article (1996) suggests there is a positive relationship between environmental awareness and knowledge and attitudes and behaviors but, though it is statistically significant, it is not strong. NEETF/Roper data examine such relationships and consistently find that awareness has an effect on stewardship but does not, in itself, go far enough to bring about lasting change. Dr. Thomas Marcinkowski of Florida Tech points out the conceptual problem of expecting awareness and knowledge to produce behavior change. He sees a weakness in the otherwise logical construct that knowledge affects attitude and attitude affects behavior. In his research and that of his colleagues, these relationships are much more complex, involve more factors and dictate much more carefully designed educational approaches.

Response: A Formula for Greater Depth and True "Literacy"

As early as 1978, at a conference in Tbilisi, observant environmental educators assembled to work up a more fitting and useful definition of environmental literacy that would begin to frame a correct definition of environmental education that would also suggest a focus on deeper learning, skill development and stewardship.

A decade later a review of research in 1987 by Tomera et al. and in 1990 by Hungerford and Volk reached some important conclusions about the difference between environmental knowledge and deeper environmental literacy:

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

As noted, in 1990, Hungerford and Volk added to their thinking about the creation of true environmental literacy in the following way:

“ It appears that [environmental education] can maximize opportunities to change learner behavior in the environmental dimension if educational agencies will:”

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; ie., attempt to develop an internal locus of control in learners.

E-Literacy: Nailing Down What Works

These principles have successfully held up under considerable scrutiny and testing over the years. As noted, they are reflected in the guidelines for excellence by the North American Associations for Environmental Education and are borne out in numerous examples of subsequent research. They are a useful filter in understanding and, importantly, predicting whether and environmental education effort can lead to true environmental literacy and to stewardship behaviors.

In a seminal 1998 survey study of how well we are doing in creating true environmental literacy and stewardship, Trudi Volk of Southern Illinois University and Bill McBeth of the University of Wisconsin, examined 32 different studies of environmental literacy. Twenty of them assessed a single component of environmental literacy, six measured a combination of two literacy components, five measured three variables and one assessed four variables.

The variables assessed as a percentage of the 32 studies were: affective attributes (75%), ecological knowledge (9%), socio-political knowledge (6%), knowledge of environmental issues (47%), cognitive skills (none), additional determinants (3%) and responsible behaviors (19%). Eighteen of the studies included adults and six included college or university students. High school students were in ten of the studies and elementary or middle school students were in six studies. Seventeen states are reflected in the studies.

The Volk - McBeth research survey summarized how different instructional and learning approaches affected the variables.

1. Traditional courses: Two investigations (Wilson and Tomera, 1980) examined what impact environmental cases studies being added to traditional high school biology courses had on attitudinal variables. While there were slight shifts in a positive direction, the differences in pre and post measurement were not significant. Another study, (Adams Thomas Newgard and Cooper, 1987) found significant attitudinal changes related to four animals used to illustrate examples in 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 -- assessed in the Volk-McBeth study are particularly noteworthy because they evidence such a high percentage of significant impact on the variables. Of the 18 variables examined studied under this instructional approach, 15 made a significant difference and one evidenced mixed or questionable results.
3. Instructional units: defined educational units on subjects such as energy, water conservation and recycling evidenced significant differences in five variables examined and mix results in two with none showing no significant difference.
4. Supplemental magazines and instruction in the classroom: This approach was found to be the least effective, having had a positive effect in two cases but no significant effect or mixed results in six others.
5. Field trips and out-of-class activities: these activities evidenced a significant effect in six of nine instances.
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: evidenced positive impacts in five instances, mixed results in three and no difference in two.
9. Television documentaries: found that, in two instances, knowledge was improved but attitude was not clearly affected.

What the survey found overall is there is too little understanding of the status of comprehensive environmental literacy and the studies that were done focused on attitudes and knowledge. Research into responsible behavior indicates a more complex interaction among attitudes, knowledge, cognitive skills and psychological characteristics. Such sophisticated research will tell us more about the impact of environmental education on stewardship.

The Power of Investigation

Volk, Hungerford, Ramsey and Peyton 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 scales, 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 what the creation of environmental literacy should be all about.

In 2002, the IEEIA Program 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. Findings include:

1. In a t-test of critical thinking, the IEEIA student scored 14.18 as compared to 10.86 for the non-IEEIA students.
2. Other IEEIA vs, Non-IEEIA comparisons were: Knowledge of issues (2.84 vs. 1.24), ecological foundations (10.55 vs.7.86) issue analysis (9.24 vs. 4.32).
3. In a test of actual environmental knowledge, 38% of the IEEIA students achieved a score of 80% or higher and 76% scored 60% or higher. Just 25% of non-IEEIA students scored 60% or higher.
4. Some 75% of the IEEIA student reported they had taken an environmental action as compared to 43% of non-IEEIA students.

Researchers also found that the IEEIA program had a significant positive effect on reading and writing skills. Oral communications, use of technology, retention and other factors that will be discussed more in Chapter 6.

From the environmental literacy and stewardship standpoint, however, the Molokai study also suggests the importance of social context. Such a context produces sophisticated knowledge and modeling in an authentic and constructivist context. There is significant research that grounding environmental education within a community will help enhance the educational experience and ground the learner in stewardship. Without such grounding, the education will remain abstract, beyond the experience of the learner and inconsistent with cultural norms. Ultimately it will be irrelevant. Berger and Neuhaus (1977), Siemer (1997).

Importantly students in the IEEIA program improved their critical thinking and problem-solving skills, they improved their knowledge of ecology, they proved to be more familiar with important environmental issues and they had an enhanced ability to analyze issues including the key players, salient positions, underlying beliefs and values. Most important of all, perhaps, the students in the

program were better able to identify actions appropriate for issue resolution. This specific knowledge is missing from many EE programs and the IEEIA program is designed to guide the student toward his or her own learning of these skills.

The IEEIA program developers are not naïve 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 called for teacher training for the highest level use of curriculum and materials.

So the question remains: does environmental education improve the environment? Some environmental advocates express outright frustration over what they perceive to be nebulosity about EE's true and measurable impact. The IEEIA program and other sound environmental education approaches would suggest that these skeptics need to broaden their view and have more patience with a well-crafted process and have some faith that many positive outcomes are probable.

Ironically, these same people, whom one might expect to be most supportive of environmental education, can be its harshest critics. For them, the bottom line is: does EE make the water cleaner, the air cleaner, save wildlife, reduce toxins, or beautify the nation. In reality Americans are varied in their responses to most environmental challenges many will take action and many will not. Still, the body of research tends to show that an individual with a sound base of environmental literacy and suitable skills development is anywhere from 5% to 90% more likely to engage in a set of pro-environment behavior.

The bottom line: a base of environmental education developed through scientifically sound instruction and with an emphasis on skill-building has the effect of causing a significant number of individuals to change in the way they feel and behave toward environmental resources. Well-presented environmental education works to ramp up pro-environment behavior particularly if that instruction has incorporated significant hands-on experiences – often outdoors.

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. It is worth stating again that the evidence assembled in this report indicates that most of what passes for environmental education is not anything of the sort, but that can be fixed with a greater commitment and further research.
- Second, if it *is* done right, the average person is more likely to take regular positive actions depending on the task's complexity, level of ease or difficulty, whether they feel they are acting alone, and if there is a link to something else that person values. NEETF estimates that this is (modestly speaking) worth some \$75 billion a year in measurable environmental benefits.

- Third, the people who are most active in our society and get out there to 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.

If environmental education has shortcomings it is there is too little of it and its delivery needs to improve and become better organized. What follows is an examination of what current research tells us about the tremendous potential of environmental education to change the way people react to the resource demands of the planet.

We note 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 e-literate people will take more simple actions such as saving water and electricity. And, for a core of leaders, EE will also lead to more involved actions such as volunteering, contributing to a conservation organization and other activities that involve commitment. The following pages explore how much.

The Importance of Learning Outside the Box

In this instance the “box” is the American classroom and “outside” means outdoors, in nature or in the community. There are a large number of case-specific studies, examining attitude shifts brought on by environmental education and related outdoor or outside the classroom activities. Some of these focus on an immersion experience in the wild. Examples of these are documented by Dr. Steven Kellert of Yale University in a seminal 1998 survey study, Dr. Kellert has identified several studies that show how tying the learning experience to the outdoors influences people (mostly youth in the studies) to feel positively about environmental conservation. He uses examples from Outward Bound, the National Outdoor Leadership School (NOLS) and similar immersion type programs as evidence that exposure to learning in the outdoors affects people profoundly and can even be life-changing. The Kellert study finds that a large majority of outdoor program participants experienced changed attitudes toward the environment.

Common findings were that from 70% to 80% of program participants developed more favorable feelings toward the environment. 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. The Kellert findings also indicate that the outdoor education experiences positively affected behavior. Kellert (1987) has stated 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.”

Some have argued that the students in these programs are naturally predisposed to pro-environment attitudes and behaviors. To an extent, this is true but a 1995 study by Porter et al. examined responses from 288 students at the National Outdoor Leadership School (NOLS), confirmed that while incoming students tends to be relatively ecologically-minded to begin with, they still experience positive changes with respect to the environment. For NOLS the goal is to convey what

it calls “minimum impact ideology” in its core curriculum. Consistent with definitions of true environmental education, the survey found that this conveyance works best if it is the specific subject of a debriefing after a NOLS outing. This, again, points out how important it is to focus some of the education of what can be done and what skills are needed to do them.

Another less wilderness-oriented example of the impact of outdoor experiences on values is a study by Dresner and Gill (1994) that found pre teen campers’ awareness and enthusiasm for environmental conservation went up significantly after a summer nature camp. Camp experiences seem to be a common point of reference for adults in value formulation and memorable experiences. They likewise often teach skills about environmental conservation.

A 1996 ERIC Digest Report by Curt Schatz points to the importance of the outdoor experience as a tool of learning by comparing outdoor environmental education to guided outdoor recreation. It finds that, to the extent the two approaches can be compared, the results are roughly the same with respect to environmental awareness. There is a significant increase in environmental awareness for both. This likely means that weaving environmental education into the outdoor recreation experience will have amplified results with respect to knowledge.

There are also some interesting experiments on the effect of visual presentations on attitudes. A study of sixth graders in Ontario (Eagels and Demare 1999) found a correlation in children who watch nature films and read about nature with stronger environmental attitudes. Similarly, Zimmerman (1996) cites several studies that show a relationship between knowledge, attitude and behavior. He concludes that knowledge attitude must be impacted to alter behavior and makes an interesting case for the use of television as a powerful way to affect both attitude and knowledge. Other evidence, however, cautions us to worry that over exposure to television and computers might also lead to isolation and passivity.

The Promise of Place-Based Education

In a 2004, book on Placed Based Education, David Sobel of Antioch New England Graduate School both reinforces and challenges some widespread conventional thinking on environmental education by calling for a rethinking of some of the underpinnings of what many people consider “environmental” education. He is concerned that the longstanding emphasis of environmental education on the natural environment is too limited. In his plan for achieving environmental literacy and other forms of literacy through place-based education, he believes that the built environment, history, cultural and similar human concerns are crucial too. He sees the interactions among various human and natural environments as shaping each other and feels it is important to educate people of all ages on these interactions.

Importantly, Sobel feels that a focus on placed-based learning comes with more emphasis on the here and now rather than the distant future. He also sees a valuable modern trend in environmental education which he calls “speciation.” This is a trend where many new and more specialized approaches to educating on the environment are being tried and refined. These speciation approaches move beyond set curriculum and syllabi and certainly challenge what he thinks of as current education policy’s “mandated educational monoculture.” They draw from real dimensions and diversity in the learner’s life. He thus feels America has a wonderful potential to form and

elaborate upon a strong new pedagogy of place that offers a framework based on the connection of school to the larger community.

Sobel states that place-based learning is a dynamic and relevant model for learning that places learning *within* rather than *alongside* of the world. It is another outstanding 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 place-based education enhances academic achievement and that will be discussed further in Chapter 6. There is a need for more research on the impact of place-based education on environmental stewardship but Sobel points out some interesting studies that support its influence on stewardship. These include a 1989 study by Marguerite Harvey of 850 schools in England that found students who were exposed to undeveloped, vegetated school grounds showed higher scores for the enjoyment of pastoral or natural environments. It also lessened a student's sense of human domination of nature. This impact on affective qualities in students indicates a noteworthy potential to reinforce stewardship. Sobel also identifies a 2000 Texas study that shows similar student reactions to a schoolyard gardening program.

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 right along with it. 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. The U.S. Department of Education reports that most major school districts now 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.

The Washington DC area-based youth organization Earth Force specializes in building this community service requirement into actual educational curricula on the environment. In the course of developing its service learning curricula, Earth Force finds the environment is the leading subject for middle school service projects. It 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, a park clean up, tree planting, invasive species removal, local recycling, water conservation and the like. A seminal 1995 Prudential study verifies this finding that several years ago the environment was one of the three most popular subjects for community service.

At the Huntingdon Middle School in Pennsylvania, the NEETF Promising Programs report finds that environment-based service learning has a profound effect on student motivation and willingness to pitch-in within their community. 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 about education. The students in 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.

The Four Corners School of Outdoor Education in Monticello Utah established a Canyon County Youth Corps Service Learning program for youth between the ages of 16 and 23. Some 25,000 young people have gone through the program. Groups undertake public land restoration projects while learning life skills and environmental stewardship. The program has been highly successful in combining employment, academic improvements and community service in an environmental package. Environment-based community service's popularity may be due to its combination of short-term tangible projects, physical outdoor work and variety of opportunities.

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.

One significant concern of education leaders in America is widely described as a break down in "character education." In *Character Education in America's Schools* (Akins et al, 1999) the authors call upon schools to become more deliberate in character education by setting up instructional units that focus on activities involving cooperation and respect. That is because educators and parents worry that our schools are not challenging students enough to become community-minded or to develop more respect and responsibility toward the people and places around them. Some leaders have offered solutions such as school prayer while more popular approaches have settled on compulsory community service requirements.

From an educational perspective, character education in schools, according to Akins et al., grows out of a continuing series of useful interactions and 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.

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).

In the Dowdell Middle School in Tampa, Florida, for example, surveys revealed that students engaged in the School’s comprehensive environment-based service learning program developed a heightened sense that “obeying the rules” is important. 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.

In the 2002 NEETF report on Promising Programs, the State Education and Environment Roundtable reported that 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. At the same time, 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 increasingly struggling with academics.

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 standardized test results have shown marked improvement in all disciplines including writing. Importantly, the first ELOB team at King achieved instant results in student school behavior. They immediately saw 50% fewer discipline problems and improved attendance and student engagement. Parental involvement rose from 1% to 27% and King’s performance on the Maine Educational Assessment (MEA) has improved in all areas – reading, math, science, health, social studies and arts.

In another example from the Promising Programs report, the American Honda Education Corporation founded the Eagle Rock School in Colorado in 1993 as a haven for high school students who struggle in traditional academic settings. Some of these students suffer from problem 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 and finds that the program creates 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.

Another related response to the need for improved character education has been a profusion of after school programming. Statistics show 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 “latch key kids” (children home by themselves until a parent gets off work) whose parents would welcome inexpensive and educational alternatives to their sitting 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.

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. 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 Projects 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 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 heir habitats. Importantly the connection these students have with the Parks is more extensive and regular than the occasional field trip that many schools offer. Educators at the Heritage Project find that the many hands-on experiences they offer greater student motivation to learn and get involved. Nearly three-quarters of local students have become involved in the Heritage Project and 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 through the program. Also, an increasing number of parents are becoming involved.

The SEER study, Closing the Achievement Gap, (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.

At the Hotchkiss school in Texas there was a 91% reduction disciplinary referrals among the students in the environment program and in Little Falls School in Minnesota the students in the environment program comprised just 28% of discipline problems though they represented 46% of student body.

Environmental education is not in the same light as “tough love” or boot camp like programs through which some youth are held to the fire to shape up and learn proper behaviors. The evidence is, however, that it teaches many of the same lessons in a constructive way that supports communities, solid values and 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 6

Environmental Literacy and and Stewardship in Adults

Knowledge, Instructions, Action and Ease

The evidence that people will respond positively if they know what to do abounds. When paper supermarket bags were (for awhile) identified as beneficial for the environment (compared to plastic) their use increased manifold. When plastic six-pack rings were indicated 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, the public's willingness to take some personal steps on behalf of environmental protection was established.

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 much less inclined to take steps that will disrupt lives (Lane 1996). Interestingly, enough this simple observation also helps us to get to the heart of the discussion about whether people will take pro-environment steps on the basis of their own decisions or if they need prompting from laws, regulations and public policy. As discussed above, the link between knowledge and behavior is positive but not very strong. Social or community context is surely one of the key factors that can motivate people to take pro-environment actions. Recycling is a prime example of how a public policy of putting a box in people's homes and asking them to use it can bring about wide-scale behavioral change. Those who question the value of environmental literacy will often use recycling laws as an example of how EE alone cannot work. But in most circumstances, policy alone will not work either.

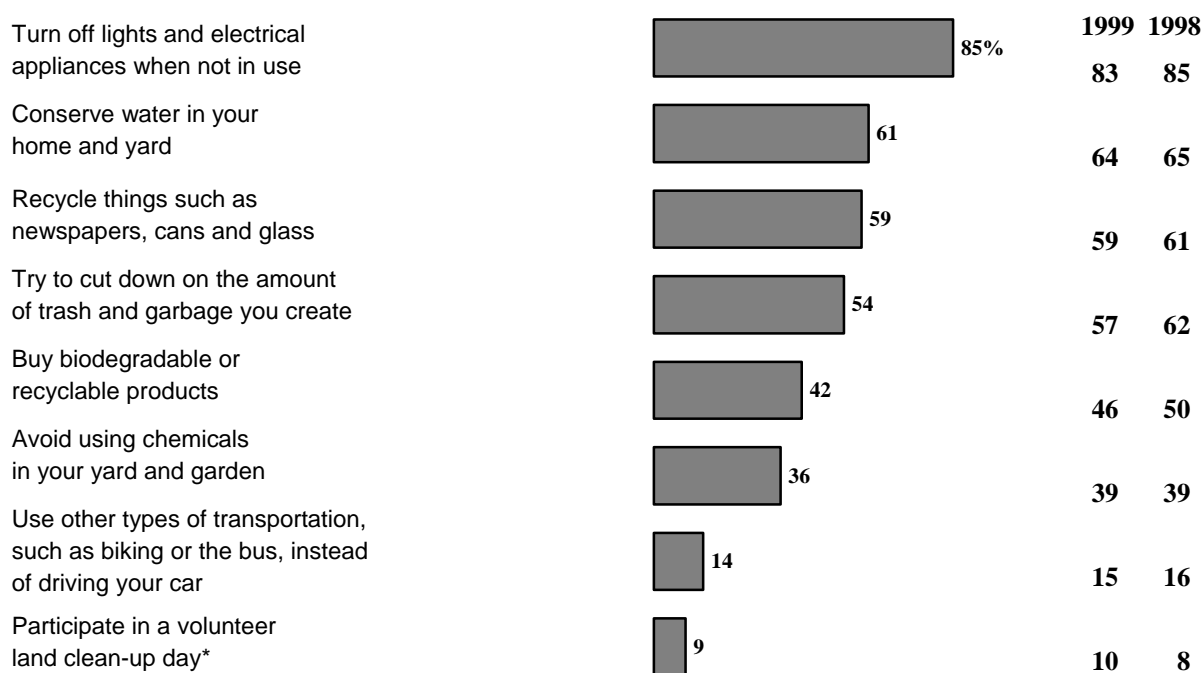
Specific environmental actions have the greatest potential for implementation. Researchers feel that the key to people taking personal responsibility has more to do with their feeling in control than other factors. For them, locus of control means access and convenience. The success of the curbside recycling laws is that they build upon these principles as compared to taking materials to local recycling centers where the issues of access and convenience are more attenuated. Most sound public policy theory is that institutions only change through some level of personal change.

NEETF/Roper research helps us get a handle on the status of environmental behaviors today. Almost every human activity effects the environment in some way. Some of these activities result in pollution, while others help to conserve the natural world. The 2000 NEETF/Roper Report Card study investigated some of the activities people can engage in to benefit the environment and indicates how these actions relate to beliefs and knowledge about 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.” As in the past, the simplest behavior tops 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 completely understood, but at least part of the motivation is 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 to 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. One (recycling) is also usually in a policy context.

Figure: Environmental Activities Done Frequently in Day-to-Day Life 2000



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?

It is easy enough to see why education programs that promote simple personal steps (such as turning off the water while brushing your teeth) can attract more participants than programs that suggest more involved activities (such as volunteering for work at a local park system). Compare this to the established definition of what constitutes effective environmental education and certain parallels are evident. Environmental education begins with knowledge but does not end there. According to Hines, Hungerford and Tomera (1987) it must also include specific knowledge of approaches, ability to take action, and ownership of certain affective qualities. This last item is very important. So, does environmental education and increased environmental literacy actually support

more personal action toward environmental conservation? The weight of the evidence says that, within certain parameters, it does.

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 and an inclination to point fingers at others, 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 traditional Green Gauge classification finding that about one-third of Americans are "Basic Browns" who are hardcore in their lack of support for the environment and rarely, if ever, support personal environmental conservation activities.

The 2001 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.

The 2000 National Geographic Society/River Network study of children asked them why they do not do more for *river* conservation. Some 33% said they did not have time and some 25% said they did not know how to help. The study did identify a 98% willingness to do things at home like taking shorter showers or turning off faucets while brushing teeth if the young people knew it would help protect rivers.

There are other factors at work too. These revolve around who has what responsibility for any environmental woes and may even reflect the deeply ingrained idea that most environmental problems are the fault of industry or municipalities. One common perception held by 47% of Americans is that large companies rather than individuals should take action. Some 51% of adults say that a few decisions by large companies have much more of an impact on the environment than the decisions of *millions* of consumers. This is at least consistent with the notion that people also tend to perceive industry as the main cause of such problems as air and water pollution. Some 36% disagree with this idea and feel that millions of decisions by individuals matter more.

There are limitations to this line of thinking, however. The 2000 Green Gauge report finds, for example, that just 18% of Americans agree that *only* corporations can affect the environment and that individual people cannot. Fully 76% disagree with this, indicating awareness that responsibility should be shared. Supporting this is the Green Gauge finding that while 35% of adults feel environmental pollution is such a big problem that there is little an individual can do about it, 60% disagree and feel the individual can make a difference.

Many people are discouraged, however, by what they may see as a hopeless situation. Some 33% of Americans, according to Roper, say they feel others are not sacrificing enough and there is little they can do by themselves. This helps to explain why a crisis situation can so readily mobilize people throughout the country to pitch in. In the year 2000 for example, California experienced frequent

electricity blackouts. Government experts estimated that the public, including small business, would, at best, contribute 2% or 3% in overall relief to energy demand through conservation. The Governor's "Kill a Watt" energy conservation program, aimed at individuals and small businesses, later found that the actual savings from a mobilized public education program was closer to 10% - far beyond original expectations. The public was made aware of the issue, told how to help and, importantly, had the sense that they were not acting alone. The results were stunning. The assurance that individual action can make a true difference is one key to the success of an education program that seeks an active public response. 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 help explain the success of recycling programs in addition to the fact that many are so strongly encouraged through local laws.

Another place Americans feel empowered and emboldened is in their consumer behaviors. Americans believe in the power of "voting with their pocket book." There is substantial and increasing evidence that environmental education can cause changes to purchasing patterns in people. For one thing, Roper data consistently find that respondents consider product packaging to be a significant source of environmental information. Moreover, people steadily express a willingness to pay modest premiums for environmentally less-polluting products. This is more true if some added benefit (such as saving cash) is also attached. Roper willingness-to-pay studies find Americans will pay 7% to 8% more for major appliances that benefit the environment and 5% to 6% more for environmentally sound autos. They 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).

While it is not necessarily the responsibility of teachers and schools to actively foster environmental stewardship, the larger environmental education community may want to place more emphasis on 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. The NEETF/Roper research indicates some public confusion over what actually needs to be done. It may also be true that people need to be constantly reminded. In our 2001 report on energy knowledge, for example, we recommended that a major energy "refresher course" would help to remind people of the needs and opportunities associated with energy conservation-minded behaviors.

In the Roper 2003 Green Gauge report there is data indicating that a tighter economy has lowered people's willingness to pay a premium for environmentally sound products by a point or two.

Who Will Act? -- The Roper Green Gauge Classifications

True Blue Greens – about 10% of the public likely to be most interested and active on the environment.. They have about a 50% overlap with the community leaders that Roper calls community “Influentials.” And a large percentage of them are regular “environmental information seekers.” 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.

Grouzers – about 18% of adults who are somewhat concerned about the environment and do some inexpensive nonintrusive 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.

Remaining 4% not classified.

Knowledge and Actions by Region

The region in which an individual resides is also a factor in participation in activities that benefit the environment. “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 the 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.

Figure : Environmental Activities Performed Frequently, by Region

	Total	Region			
		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

Though the pattern is not totally consistent, for several activities on the list there is a relationship between environmental knowledge and frequent engagement in the activity. 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.

Figure : Activities Done Frequently in Day-to-Day Life that Benefit the Environment, by Performance on Environmental Knowledge Quiz

	Total	Performance on Environmental Quiz		
		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

More education about the environment is necessary if Americans are to 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.

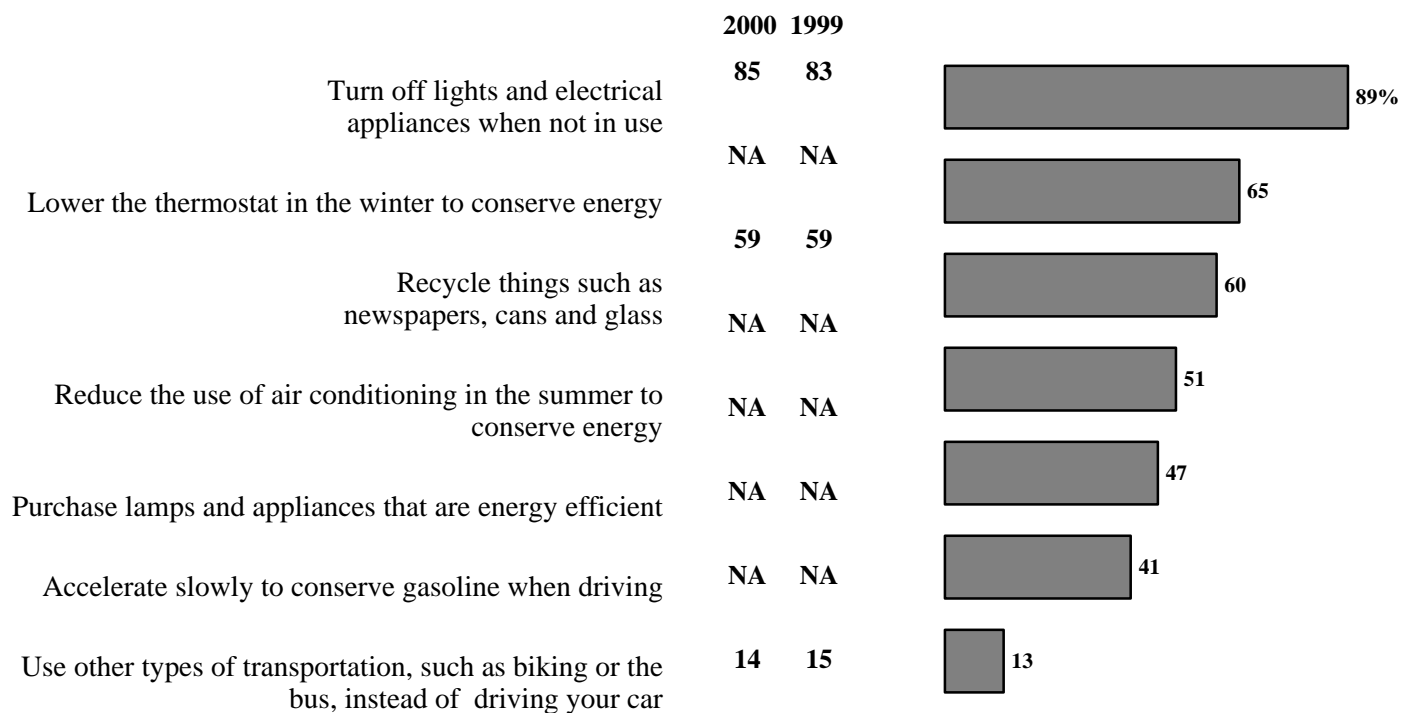
Energy Consumption and Conservation

Americans perform daily activities that benefit energy conservation. Asked how often they perform each of eight activities, a majority performs four “frequently.” The simplest energy-related behavior tops the list: 89% 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 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 is clear. Roper 2001 Green Gauge data indicate that saving electricity at home has the highest rating of activities done regularly with 65% support. And that activity is up 8% since 1996. The 2003 Green Gauge report supports this finding.

Two out of three Americans (65%) report that they lower the thermostat in the winter to conserve energy. As noted above, it is likely a combination of saving energy and saving money to leads people to lower the thermostat. A slim majority of Americans (51%) say they reduce the use of air conditioning in the summer to conserve energy. As with lowering the thermostat in the winter, Americans were not asked whether they turn down the air conditioning to save money. It may be a combination of saving energy and saving money to leads people to reduce the use of the air conditioning in the summer.

Importantly, the activities performed most frequently that conserve energy or benefit the environment 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).

Figure: Energy Conservation and Environmental Activities Done Frequently in Day-to-Day Life



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)

The state of Minnesota’s Report Card on Environmental Literacy, done with Hamline University, 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%). This is significant corroboration of the NEETF/Roper studies.

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%) indicated that they conserve water by turning off water when brushing their teeth. The researchers noted that, considering the knowledge and concern of Minnesotans on water issues, it was somewhat surprising that the percentage of adults who conserve water in this way is 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-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. On average, Minnesota adults would be 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, attitudes and behaviors. On behaviors for example:

Figure: Comparison of environmental knowledge score to environmental activities undertaken frequently by Minnesota residents

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%

To measure the relative correlations between environmental knowledge and pro- or anti-environment attitudes an attitude scale was constructed in the Minnesota study. The items were recoded to a three-point scale spanning anti to – pro-environmental and an overall average response to all component items was used to develop a cumulative scale. Findings:

Figure: Environmental knowledge grades and environmental attitude of Minnesota residents

Attitude scale	Knowledge grade	
	A (7-8)	F (0-2)
Low (1-1.99)	7%	13%
Medium (2 – 2.49)	38%	40%
High (2.50 – 3.0)	58%	46%

Minnesota's Study of EE's Impact

Most research indications are that it takes knowledge and some form of attitudinal adjustment to affect pro-environment behaviors. Such “attitudinal adjustments” often come from experiential learning. To measure and understand the relationship between knowledge and behavior, the Minnesota Report Card employed a second measurement scale designed using the same numerical pattern as the above attitude scale with comparable values and weights. Finding:

Figure: Environmental knowledge grades and environmental behaviors for Minnesota residents;

Behavior scale	Knowledge grade (A-7-8)	F (0-2)
Low (1-1.99)	7%	22%
Medium (2 – 2.49)	57%	60%
High (2.50 – 3.0)	35%	17%

In all, the Minnesota Environmental Literacy Report Card found strong positive relationships between attitudes and behaviors and environmental knowledge as evidenced in the responses to the quiz questions.

Researchers are quick to point out that correlations are not same as causation. But the Minnesota study is particularly helpful to understanding some of the implications of the NEETF/Roper data because of their underlying similarities. The chart below summarizes some of the more interesting correlations presented in the Minnesota study by making relative comparisons low-knowledge respondents to high-knowledge respondents.

Minnesota Study Findings
Correlations: Knowledge – Behavior – Attitudes

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***

The NEETF/Roper data contains similar correlations:

NEETF/Roper Study Findings
Correlations: Knowledge and Behavior

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**

A similar supportive statistical correlation was drawn in a Florida study “Measuring the Environmental Literacy of High School Students” by Margaret B. Bogan of Jacksonville State University and Jeffrey D. Kromrey of the University of South Florida published in the *Florida Journal of Educational Research*, Fall 1996, Vol. 36(1). On the knowledge assessment, the study found that overall student knowledge of the principles of ecology was very limited. The study did caution that these poor results might be, in part, a result of the length of time between the students’ completion of a biology course and the time of this assessment or even the possibility that the principles were supposed to be taught in the classroom but were not.

According to the study’s authors: “The findings of this research suggest a need for systematic, comprehensive assessment of the environmental literacy of Florida’s high school students to determine if the level of environmental literacy of the general population of high school seniors is as low as that suggested by this sample. If these results are verified by such an assessment, curricular alternatives can be generated and tested in an attempt to ameliorate this apparent level of illiteracy.”

Importantly, the study also looked at the relationship between knowledge attitude and behavior and found positive relationships.

Zero-order Correlations Between Subscales of the FELS

	Environmental Attitude	Necessary Environmental Behaviors	Active Environmental Behaviors	
Knowledge Assessment	.38**	.12*	.09	
Environmental Attitude		.60**	.26**	
Necessary Environmental Behaviors			.25**	
Active Environmental Behaviors				

Attitude Survey (ATT). For the 27-item ecological attitude subtest, the high school students obtained a mean of 102.05 and a standard deviation of 11.31. With the items on the ATT scored on a 5-point scale, the possible score range is 27 to 135. The obtained sample mean suggests that students, on average, have a positive attitude towards the environment.

Necessary Environmental Behaviors (NEB). The five NEB items were scored one through five, in a "strongly agree" to "strongly disagree" scale. The high school sample yielded a sample mean 21.54, and a standard deviation of 2.86. With a possible range of 5 to 25, these data indicate that the students in the sample value environmentally sound behaviors.

Active Environmental Behaviors (AEB). The self report on participation in environmentally sound behaviors contained five items, scored on a one to five scale identical to the scoring of the NEB. The AEB subtest yielded a sample mean of 16.68, with a standard deviation of 3.71. The average student response was only slightly higher than the neutral response (a score of 15 for the five items). Twenty-six percent of the students in the sample scored 14 or less on this subtest, indicating that they tended to not actively participate in environmentally sound behaviors.

NEETF/Roper data shed some light on the public’s openness to personal stewardship. With 300 million-plus people living in America, small across-the-board changes in behavior can have a huge impact. Unfortunately Roper research shows that people don’t always know what to do, and they often feel that small personal sacrifices won’t mean anything when compared to larger responses such as from a company or public institution.

The studies and data evaluated for this report show that the stresses we place on community and global environments would be greatly reduced with sound environmental literacy. The lack of large-scale personal responses to environmental problems shows in many quarters. Many of today’s leading pollution problems are, not surprisingly, the result of individual actions, personal consumer decisions and the activities of smaller as compared to larger businesses. As discussed several times in this report, there was a time when larger companies and government agencies 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.

In the 1980’s, a decade-long campaign to curb industrial pollution was taking hold. The rates of pollution by most companies and municipalities were coming down. Today, these sources may still have a long way to go to reach the long-sought “zero discharge” goal, but the overall trend has been toward improvement under a compelling aegis of laws and related government regulation. This has been reinforced by a growing recognition that good environmental performance is also good for the business bottom line.

The same cannot be said for individuals and the many smaller-sized businesses that have been proliferating over the past two decades since the personal computer age. For them the average 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, for instance, consumes 25% of the world’s energy.

These days the largest part of the U.S. economy and most of its jobs come from small businesses rather than large corporations. The managers of these smaller businesses, like any average American, lack environmental knowledge and are probably not taking enough steps toward a real program of environmental conservation. This all adds up to a huge amount of environmental impact by individual action in the home, in the car and in the workplace. It is likely that more will be required of individuals in the future rather than less. But will individuals respond? And will environmental education and literacy compel them?

Some Behavior Predictions Based on Knowledge

NEETF boils down this understanding of the behavior change to a few simple rules as follows:

- First, the behavior must lend itself to simple explanations and understanding. Specific education on environmental steps is an established precedent to widespread activity and so the actions that will correlate most with environmental education will be those where the connections are clearest.
- Second, to be truly widespread with over a majority of people participating, the pro-environment behavior is most likely as part of other ongoing activities. It is common sense, but as noted, there is a steep participation rate drop off between the class of pro-environment activities that are relatively easy to do and are part of some other engagement and those that are more involved and must be done for their own sake. Examples of the former include: saving electricity, saving water, saving gasoline, green purchasing and reducing trash.
- Third, people need to feel that others are pitching in too (some form of social context). The NEETF/Roper data and other data say, for example, that recent news events such as California and Northeast power outages address part of this equation by signaling that individuals who learn how to reduce electricity usage and cut energy needs will not be acting alone. Countering the sense an insignificant contribution is a key to motivating a mass of individuals. Another example is the success of the curbside “blue box” recycling programs in communities. The sense of collective action is significant.
- Fourth, it helps to save money through the activity. Many sound environmental practices do result in such savings. Electricity is a prime example, but so is water, car maintenance, and some forms of recycling. Even if the actual cost savings are not that high, it will still be a motivator perhaps because it appeals to being practical.

- Fifth, the protection of health is consistently identified as the top motivator for personal action to protect the environment. Health is discussed in detail in the next section of this report.
- Sixth, the greatest percentage increases in the *rate* of participation brought on by environmental education and outdoor activities are in more involved activities such as volunteering.

Toward More Informed Local Leaders

Each day across America, community leaders assemble in some official capacity and most often as volunteers. Some participate in PTA meetings, while others volunteer for school boards. Chambers of commerce and real estate boards regularly assemble, as do library boards, historic preservation committees, law enforcement advisory groups, hospital trustees and many others. The people on these boards and committees are both average and exceptional. They are real people who are usually chosen for their enthusiasm for the community, interest in a particular subject and their positive standing among their peers.

The NEETF Roper studies show that the environmental literacy levels of these community leaders is most likely at the same level as the general public's. Much of the NEETF/Roper data on environmental knowledge also suggests that the public does not know enough to judge how effective the government is at managing environmental affairs. At the local level, elected officials and land planners are relied on to make decisions that will protect people's investments in their properties and in the overall quality of their community. People also rely on these same officials to make sound decisions that will keep local taxes within the range of reason. It seems likely that the public assumes their community leaders are more environmentally literate than the average person. They may even assume a modicum of environmental expertise. In some cases this exists, but in most cases, it does not.

As noted earlier, the Roper Green Gauge indicates a significant overlap (as much as 50%) between the category of community leaders it calls Influentials and the category of environmentally-minded Americans it calls True Blue Greens. Both groups may have a modicum more real *knowledge* of the environment but both also seem to have higher levels of *awareness* of the existence of environmental problems. The 2002 Green Gauge 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, some 48% of Americans indicate they have purchased a product because it was labeled environmentally safe or biodegradable. This number is down 7 points since 2001 which Roper sees as a reflection of higher concern for homeland security and a more sluggish economy. Among those who have purchased such a product, 26% did so within the past two months. At 53%, True Blue Greens are twice as likely as the general public to have purchased environmentally friendly products in the past two months. Accordingly, environmental information seekers (51%) and community Influentials (46%) have recently purchased such products.

The similarity of response levels between True Blue Greens and Influentials portends well for future environmental stewardship at the community level and should be highlighted. Because of their central placement in the public conversation in their respective communities, the Influentials are an important intersection on public opinion. Roper compares them to (in computer terms) the “central processing units” in their communities. These people are not stereotype of the famous or high-ranking person in the community. They tend to be behind the scenes making things work. They are the people that others turn to for opinions, and they have restless and inquisitive minds. They are five times more likely to attend a public meeting or to join a local community organization. They are college educated; in midlife, childrearing years, upper to middle income and in positions of responsibility in the workplace. They are also much more gender balanced (50-50) than representative bodies in local, state and national government. This too portends well for the environment given American women’s traditional higher level of environmental support.

Influentials are early adopters. Fully 81% have personal computers (compared to 54% of the public) and 77% use the Internet (as compared to a 50% nationwide average). They are money savers who believe in conserving resources, and they think in the long term. They are also leading the way in the purchase of gas-saving automobiles such as the hybrid vehicles.

According to Roper, what identifies community Influentials the most is their local community activism. They are involved in life in its broadest sense and the community is part of that involvement. They have a clear sense that “things matter.” They also tend to be optimistic, and they believe in self reliance, exploration and ethics. They value a society where everyone has an equal chance and they believe in freedom of choice in one’s life. They also feel they have a responsibility to neighbors and community beyond what is required by law.

- 74% attended a public meeting on town or school affairs (16% for the total public)
- 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)
- 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.

When it comes to the environment, the 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. A majority (52%) believe 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.

Percentage of Influentials who are *moderately* or *very* interested in a 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 a topic:

▪ News and Current Events	76%
▪ Environment	57%
▪ Nature and Animals	55%
▪ Politics	51%

Importantly, a majority of the Influentials evidence a strong desire to learn about the environment and this is crucial to our communities. There are many local governments for which real environmental literacy could boost their capacity to maintain healthy and economically viable living conditions. The importance of the environment in planning a community can range from more attractive places to live to cooler temperatures on hot summer days. Studies by the Urban Land Institute and others indicate that land values rise significantly around dedicated public open spaces and that the quality of the environment and the amenities in a community are a significant factor in whether people and companies will move to the location. Poor environmental decisions made by community leaders will reduce the quality of air and water in the community and increase trash in landfills. Importantly, they are expensive. They increase tax burdens, cause unnecessary traffic, and lower property values. Studies by the Land Institute in Boston and others indicate a lack of awareness of how land use, transportation and other environment-based decisions are leading contributors to failing tax bases.

Examples of decisions where the stakes are high for community leader E-literacy:

Land use decision-making	Drinking source water	Agricultural management
Soil and water management	Toxics and solid waste management	Well head pollution
Transportation	School siting	

A Platform for 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 environmental field has not kept pace and has been largely predominated by middle class whites. Some feel this is due to the very subject itself, but findings throughout the environmental education field state otherwise. Many traditionally view environmental protection of nature, species and open spaces as the interest and concern of the middle class but the broader environmental field is vital in its importance and connection to people. Increasingly, 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 of education to manage health risks.

The State Education and Environment Roundtable has developed findings that indicate that environment-based education could become a significant tool for creating more cultural and social diversity in the constituency and career tracks of environmental management field. The SEER research since 1997 has not only found that environment-based education improves academic performance and learning across the board but does so regardless of socioeconomic or cultural factors. This is important. Environment-based education appears through SEER research to date so far to be a kind of educational equalizer. It helps with reading and science achievement and improves critical thinking skills.

The Dowdell School in Tampa, Fla. (discussed above) has a student body of equal proportions of black, Hispanic and Caucasian students. Performance improvements in all groups improved through the environment-based service learning programs.

At the Pine Jog Environmental Education Center in West Palm Beach, Fla., 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 and three 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% black 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, thus moving up .7 point on the FCAT scale. But the schools with a higher percentage of minority students improved 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.

In Washington DC, the twelve-year-old EnvironMentors Program matches (one-on-one) adult mentors 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% black and about 10% Hispanic. With system-wide, four-year high school graduation rates of 60%, the EnvironMentors students average a satisfying 98% graduation rate. And with an average of 10% to 20% of D.C. public school seniors even applying to college, the EnvironMentors students have a 90% collage acceptance rate. 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 to learn a set of skills that will help them tremendously in their efforts in higher education.

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 in its report on science careers finds that about 3% of those now in science careers are black compared to 11% of the overall population, and a similar proportion of those in scientific careers are Hispanic. 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 60%.

The Four Corners School in Utah (discussed above) successfully uses environment-based service learning to address academic and life skill improvement in Native American students and young adults. Some 90% of the school's students are Navajo. The Earth Conservation Corps, similar program in focused on black youth in Washington, D.C. and Native American youth in the state of Washington have had similar results using the environment as a theme for improvements.

Student exposure to the outdoors, the observation of environmental problems and contact with role models are all factors in people selecting environmental careers. (Sward, Marcinkowski 1999). Environmental education programs that provide such exposures and experience can become a significant doorway for minorities to enter environment-based professions.

Environmental Literacy and Better Health

The National Institute of Health's 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. 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 (and mostly unnecessary) environmental health exposures without much

awareness. Some examples include: gases from tens of millions of home and workplace wood and gas stoves; exposures of mobile home dwellers to chemicals and resins in building materials; people's exposure to fumes from home improvement products, carpet adhesives and formaldehyde insulation; childhood asthma triggers; asbestos; radon gas; and more.

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 them from pollution. This also shows up in such other statistics as the NEETF/Roper studies findings that there is majority 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.

Protecting health is also significant from an attitudinal standpoint. Roper data show that people may think that the importance of long-term environmental protection is preserving resource for future generations but that their shorter-term interests are more in individual and family health. 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.

When asked to consider laws for the protection of five specific environmental issues, Americans clearly rank two as more important than the others—water and air quality. Though 46% say 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. Other Roper data confirm this pattern, with a majority of Americans saying current laws to regulate the quality of the nation's air and the quality of the nation's 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. Still, these proportions have been stable since 1995, again an indication that Americans have settled into their opinions on environmental issues.

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 without much awareness. 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 additional 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. 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.

The NEETF/Roper data have found that overall public knowledge on the importance and realities of environmental health is low. Remember that just 7% of adults understand that the leading cause of worldwide childhood mortality is water pollution. The role of the environment in worldwide loss of life is one of the most critical and least understood of any issue in The 1998 NEETF/Roper Report Card.

Modest estimates are that Americans spend about \$1 trillion a year on health care. Experts also estimate that the majority of diseases (as much as 90%) are preventable. Exactly what percentage of

preventable disease comes from acute environmental causes is not known but at a modest estimate, with health-related environmental literacy, we could cut illness by 2%, saving about \$18 billion per year. Certain preventative steps would matter more than others in saving health care costs and improving health. Juvenile asthma is an example. Its rates are increasing; it has several environmental triggers; its treatment costs, particularly related to medications and hospital admissions, are high.

Quantifying Stewardship -- "E-literacy Domestic Product:"

Home electricity use in America costs about \$233 billion per year. Today, for a number of reasons including the need for more education, people are not saving electricity as they may have been 25 years ago. If environmental literacy 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 because it meets the other criteria. By estimating a 5% reduction (saving one watt of electricity out of 20 now being used), we are looking at an 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 here encouraged by improved environmental literacy regarding fuel efficiency and driving habits combined with an understanding of fuel consumption 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.

Environmental Knowledge Domestic Product (ELNP) *A Common Sense Index –*

Measuring the potential impact of baseline E-literacy in dollars per year.

Using the activities Roper data indicate Americans are mostly like to engage in or expand their participation. Emphasis is on direct savings to the public.

Subject	Amount or \$/year	E-literacy Quotient	Est. E-literacy Savings	Education Goal
Domestic Electricity Use	\$233 billion	5%	\$11.5 billion low	lower home heat raise AC temp usage bulbs & appliances
Gasoline Use	\$137 billion	5%	\$6.8 billion	Fuel effic. 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
Healthcare Cost	\$900 billion	2%	\$18 billion	hazard prevention home and office
			\$75.5 billion	
Recycling	64 million tons	10% increase	6.4 million tons	

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

Chapter 7

EE and Student Academic Improvement

In the preceding chapters we looked at how environmental education impacts real environmental literacy and stewardship. In this chapter we look at the impact of EE on *overall* student performance including their academic achievement. Before we begin, however, we would do well to discuss the distinction between environmental education that has academic achievement as a goal and that, which is aimed at environmental literacy but also has academic benefits. In an ideal world, education that is based in the environment and produces academic improvements in students would also strongly improve environmental literacy. But does it?

Dr. Thomas Marcinkowski has assessed this concern by differentiating school subject area outcomes (SSAOs) and environmental literacy outcomes (ELOs). There are clear overlaps between the two targets but Marcinkowski's distinction helps one understand important nuances to their differences.

Education that uses the environment as a way to advance overall academic performance in non-environment areas is sometimes referred to as environment-based education. It focuses on improvements in science, mathematics, language arts, social studies and more. Environment-based education can be directed at meeting state standards of learning and other aspects of what schools and school systems consider to be sound and effective education for students. Marcinkowski classifies these as SSAOs and they are the main the subject of this chapter.

He also points out that programs such as the IEEIO program, discussed in Chapter 5, may have environmental literacy as the target outcome (ELO) but the academic improvements the students exhibit are a by-product of the larger effort to create and environmentally educated student. He further points out that the manner in which the results of each of these programs are assessed is critical.

SSAOs are focused on the cognitive domain as compared to the affective or behavioral domains. This means there is attention paid to the knowledge and skill dimensions in SSAO assessment but little or no attention to attitudes or behavioral impacts. The intriguing overlap areas between environment-based education and the pursuit of environmental literacy seem to be in such areas as whether the pursuit of environment-based education also increases a learner's motivation and whether the pursuit of ELO's helps students retain information better as a result of learning through hands on investigations and whether such investigation skills also make students better test takers. There is an opportunity here to conduct broader assessments and evaluations that look at SSAO and ELO dimensions more holistically.

Impact on Science Learning

Leaders in the United States express considerable concern about whether we are losing our competitive edge in science and technology. Young people in America are generally expressing 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 points out that 80% of all students decide before entering high school to opt out of professional scientific pursuits. The report identifies environmental education as a heuristic tool for make science more relevant and appealing to young prospective scientists. So the higher environmental interest of women may actually be a useful tool in solving that national problem of youth turning their backs on the sciences.

The 1997 and 2000 NEETF/Roper studies found that 43% of men passed the general quiz and 21% of women passed. It is clear that gender has significant bearing on the number of correct responses to the questions. In those studies 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. Those educators willing to venture a guess on the reason for this gender gap think the answer may lie in the amount of science education received by men and women respectively. Today there are roughly twice as many men in science-related professions as women. This may help account for the differences. Other research indicates that environmental education is very useful in strengthening science education and exposing students to a richer science experience. There is wide agreement that America needs more home-grown scientists yet most students including a higher percentage of the female half of our student population pretty much reject science as a career option by the time they enter high school. Environmental education might help turn that around by encouraging and fostering more female scientists.

Significantly, women typically register a few points more positive attitude toward the environment and other research shows that environmental education is an ideal way to teach science and engender greater comfort with the subject.

The SEER study found that environment-based education stimulated science interest. Fully 100% of educators who observed thousands of children in these programs perceived improvements 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. And, 89% perceived improvements in systems thinking

- Independent data support these findings. In the Chariton Middle school in Iowa, for example, 50% of the students (boys and girls) enrolled in the environment program scored at least one grade higher. Some 28% of these students scored three grades higher.

- At the School for Environmental Studies in Minnesota students exceed state and national standards and are motivated and self-directed learners. In the ACT, the school's students scored 24.2 while the state averaged 22.5 and the national average was 21.1.
- 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.

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 appealing to women it may also be an appealing way to approach women's scientific education. In Texas, the Gililand School in Forth Worth employs a prairie restoration project as a way to integrate learning and to support science learning. Both male and female students evidence a sustained interest in science after completing the program.

Despite the common sense and widely held view that environment-based education improves science education, there is a need for more controlled study of this question. In one unpublished study, for example, researcher C. Clavijo (2000) investigated the relationship between 4655 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 prediction of test scores when controlled for previous achievement and socioeconomic status. While the study did not find a strong positive relationship between environmental education and high scientific achievement, it also did not correlate with low science achievement either.

This study points up two significant research needs for the field of environmental education and the environment-based education as well. First, there are not enough controlled studies in the overall field. Many of the studies discussed in this report evidence positive correlations but it is a different matter to nail down the exact causes for them. Despite fact that such a large and growing number of studies and assessments report high correlations, more controlled and evaluative studies would help better quantify causes and target improved instructional approaches and more focused strategies.

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. There are, for example, hundreds of doctoral dissertations and masters' theses that have barely seen the light of day since they were initially presented. These need to be collected and reviewed and their findings made part of the larger, accessible body of knowledge for the field.

Learning and Academic Progress:

Environment as a Subject Integrator -- EIC: The National Science Foundation sees environmental education and science as serving an important role in integrating disparate subject matter in ways students can both understand and apply. Isolated disciplines presented in a more confined classroom setting have documented weaknesses. They require new thinking and a challenge to educational delivery. The NSF values environment-based education for the positive effect it can have on learning around science and engineering.

The State Education and Environment Roundtable (SEER) has developed compelling evidence, research, training programs, and protocols for using the Environment as an Integrating Context (EIC). SEER research has been turning the EE world on its head by consistently demonstrating 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

- 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 9th graders in an EIC program in Washington averaged an overall 3.2 GPA compared to other a 2.6 average for other 9th graders in the school. 10th grade EIC students in the same school averaged a 3.0 compared to a 2.8 for the others.
- A Texas elementary school showed consistent higher performance in the Iowa Test of Basic Skills particularly in reading and language. While students in the environment-based education program performed above the national average, students school-wide were significantly below the national average.

In his 2004 book on placed-based education, David Sobel references the work by the State Education and Environment Roundtable as significant evidence that placed-based environmental learning improves the quality of student learning.

IEEIA: In its study *Molokai: An Investment in Children the Community and the Environment* (2000), researchers Cheak, Culen, Volk, Hungerford and Kim 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. In addition to classical environmental literacy outcomes (ELOs) the 38 fifth and sixth grade students who were studied in depth when compared to a control group were found:

1. To be using a wider range of reading materials and more difficult and challenging materials,
2. To be skilled analysts of complex issues.
3. To have improved writing skills,

4. To be more motivated learners and enthusiastically up to an academic challenge,
5. To have a better command of learning technology,

Other Programs:

A 2003 study by Oksana Bartosh of Evergreen University compared 77 pairs of schools throughout the State of Washington. Each pair was comprised on an “EE school” that had a formal EE program in place for at least three years and a “non EE school.” 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). The following results were found:

Test	Av. EE school score	Av. 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

The Bartosh study is extremely helpful because of its focus on conducting controlled comparisons. It is also helpful in its examination of important and frequently used standardized test scores.

A 2002 Promising Programs report by NEEETF, contains a case example of how a program that connects local schools to Minnesota Zoo advances achievement. Zoos and similar facilities are becoming stronger forces in quality education. At Minnesota’s “Zoo School” students gain the ability to draw connections between disciplines by pursuing a curriculum unified by the environmental theme. 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 study, 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. The 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.

In another example from the 2002 NEEETF Promising Programs report, the Gililand School in Forth Worth Texas uses project-based learning to improve student performance. In this case the “integrator” is the restoration of 28 acres of a former industrial dumping ground to a native prairie site. As students make progress toward full restoration of the native prairie, they learn important

lessons. Over 85% of Gililand students passed all sections of the Texas Assessment of Academic Skills (TAAS). This is well above the state average.

Improved language arts and reading

For many, the idea that environment-based education advances reading and language skills seems less obvious than it intuitively natural support of science learning or investigative skills. But educators observing students in environment-based programs report that 93% feel the children read and write better as a result of the exposure. And, 94% of them say the children in these programs communicate with each other much better.

- Independent data assembled by SEER from Dowling Elementary in Minnesota and 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 Iowa Test of Basic Skills rose from a 44 to a 53 average among students in the environment-based program.
- A NEETF review of other programs found that, for the Iowa test, in Kruse Elementary, Texas, students in the environment-based program had vocabulary skills of 2.0 compared to 1.2 for all the first grade. Students in the environment program also 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 while school-wide scores were 44 compared to national averages of 58.
- At Isaac Dickson Elementary School in North Carolina proficiency in reading advanced from 70% to 79% of the environmental program students in one year and writing scores advanced from 46% to 57% in one year
- Even 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.

In 2000, the State Education and Environment Roundtable completed another important study. In its California Student Assessment Project, it looked closely at the effect of using the environment as and integrating context (EIC) on improving standardized test scores. Its methodology was based on a “pairing” approach and focused on comparisons between students in the EIC programs of numerous schools and students in similar schools or control groups with similar characteristics. Great emphasis was placed on standardized measures and test results. The Bartosh study (above) used a similar model and had similar results.

- When these comparisons were made for reading and language arts for all of the schools in the study, SEER found that EIC student performed better than the “paired” students in 69 of 91 (76%) assessments that yielded numerical measures. In typical elementary school

- findings the 3rd and 4th grade EIC students performed from 4% to 9% better on reading tests.

Thinking Skill and Achievement Motivation

A draft 2003 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. In a controlled study, that tested several hundred student, researchers Julie Athman and Martha C. Monroe of the University of Florida, found that:

- Students in the environment programs at the 9th grade level scored 4.33 points higher on the Cornell Critical Thinking Test on a 76-point scale.
- The 12th graders in the study sample scored 5.54 points higher. The researchers attribute 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 and Facione, 1998), the study found no difference among 9th graders in the environment program and the control group but found that 12th graders scored 3.96 points higher on a 50-point scale.
- On a third test, the Achievement Motivation Inventory, 9th graders in the environment-based programs averaged 2.75% higher on a 100 point inventory and White 12th graders in the study averaged 8.56 points higher on the scale with the overall effect on positive motivation perhaps being limited by ethnicity.

The Florida results are preliminary but the relationships between environment-based programs and both critical thinking and motivation 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 (1998), SEER (2000) and NEETF (2000).

Chapter 8

EE's Long Term Economic Value

Tougher Balancing Ahead

The NEETF/Roper data identifies a positive relationship between a higher level of individual environmental knowledge and a sense that environmental and other societal interests can be effectively balanced. The concept that increased knowledge might also help a person see nuances and alternatives is not new. In the Roper data this is evident in responses on whether the environment and the economy can go hand-in-hand and in peoples' perceptions as to whether we need more environmental regulation or if current regulation has reached about the right balance.

As noted earlier, environmental management in American business, home and industry has been shifting from an emphasis on waste treatment and disposal practices to a more thoughtful integration into business planning and individual lifestyle. There has been a good deal of assessment in recent years to examine how it pays for businesses to be smart, up front, about ways to address environmental concerns. Continuing this trend will call upon our leaders and the general public to be much more knowledgeable and skillful on environmental management matters.

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

Examples of 30-Year Shifts in Leading Environmental Problems

1960's

Industrial and municipal
water pollution

Industrial air pollution

Major land developments
(Highways, airports, new towns)

Loss of notable species

Toxic waste from factories

Year 2000

Polluted run-off from the land

Autos, homes and smaller businesses

Localized but widespread sprawl

Loss of ecosystems

Chemicals at home and in agriculture

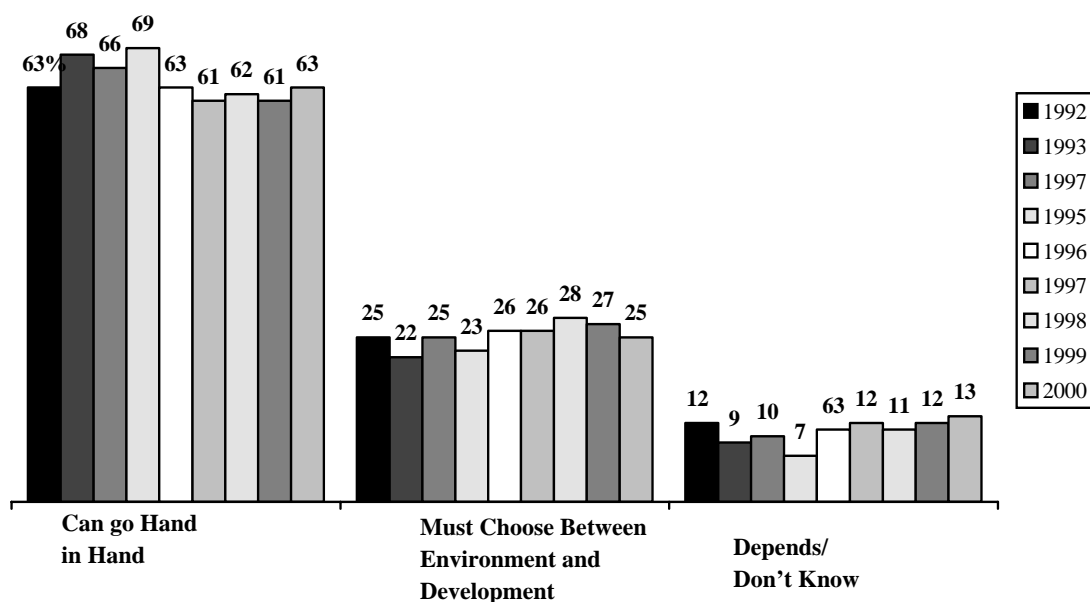
An Economy Bound to the Environment

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, we find that, as Americans become more optimistic about the nation's economy, they also become more optimistic about the quality of the natural environment. So, it is not surprising that the NEETF/Roper Studies find that the majority of Americans say that environmental protection and economic development can go hand in hand. These surveys show that Americans believe that protecting the environment and developing the economy can be addressed at the same time. Of those surveyed, two out of three agree with this option. Just 25% disagree.

As in the past, these attitudes are consistent among sex, age, and income demographic subgroups, varying only by education level and environmental knowledge: 59% of Americans, for example, with a high school education or less opt for the hand in hand choice, compared to 63% of those with some college education and 72% of those with a college degree. There is a similar difference between higher (\$50,000+: 67%) and lower (under \$20,000: 57%) income households.

Importantly, 70% of those respondents who were top-performers in the 12- question quiz (nine or more correct answers) presented in this survey feel the economy and environment can go hand in hand. This compares to 52% among the lowest performers (four or fewer correct answers) who say America can reach a balance between the two, and is one example of the relationship between environmental knowledge and belief in environmental balance.

Figure 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?

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 some 92% to 88% agreed from 1993 to 1996.

Five years of data were also gathered in the NEETF/Roper studies that asked if Americans preferred “conservation” to “preservation.” Both terms were defined with the idea of checking on where the public stands on a discussion that has been going on since John Muir and Gifford Pinchot had their historic public debate at the beginning of the 20th century over positions of nature “preservation” as compared to more active management through resource “conservation.”

NEETF/Roper found that the public generally preferred
The idea of conservation to preservation

1992 – 70% vs. 26%

1993 – 74% vs. 22%

1994 – 72% vs. 22%

1995 – 70% vs. 28%

1996 – 71% vs. 25%

We are not able to correlate these perceptions to levels of environmental knowledge because the NEETF/Roper knowledge studies started in 1997.

The SME Challenge

The face of American business has certainly changed in the past three decades. Most large companies operate under the scrutiny of government environmental agencies and they have professional environmental specialists to oversee their environmental performances. Although these companies have much more yet to do in environmental performance, their progress is being monitored and measured. What is not being measured is the environmental performance of the nation’s five million smaller businesses that are mostly beyond the reach of government regulation and scrutiny. These comprise half the economy and more than 60% of the nation’s jobs. These smaller companies have the farthest distance to go to improve their environmental performance. They do not, for example, have professional environmental staffs. Studies show that most of them do very little in environmental performance. Compared to larger operations, their numbers are increasing due to modern economic and technological factors. According to the U.S. Commerce Department, they also comprise most of the new jobs being created and represent some \$5 trillion in today’s economy. The good news is that most small businesses will gain economically by reducing their environmental footprints and improving their environmental performances. For some, this might mean the difference between staying in business or not.

To help small and medium-sized business (SMEs) to improve their environmental performance we will need strategies that can penetrate beyond the few who are most willing to be helped. Today, small businesses have the longest distance to go in making environmental improvements and they can only truly be reached through education and training.

There is growing evidence that an environmentally educated business manager will manage greater profits. Some of this margin will come from the natural cost savings that sound environmental management affords businesses. Some will also come from positive ways that businesses influence profits. Business executives who still subscribe to the philosophy that environment is merely an overhead item will be left behind in a modern economy.

At an average of 10% of gross business operating costs, small and medium sized businesses can use environmental practices to save overhead dollars. We estimate that a 5% reduction in overhead through education on energy, water and waste management, improved employee health, cleaner working conditions, recycling and more would save \$25 billion.

EE's Key Connections to Economic Growth

Leaner and Greener – environmentally educated business leaders can operate with lower business overhead and improved profit margins.

Going Green Downstream – Large companies can maintain environmental responsibility and product quality through environmentally educated suppliers.

The “Triple Bottom Line” – businesses of all sizes will be called upon in the future to include social and environmental factors in measuring their bottom line of success.

Global Markets – to participate in emerging markets throughout the world, companies will need to stay within environmental limits that minimize environmental impact and even keep it at zero.

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 inference 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. How well suited are Americans to understand the environmental challenges we face? How well prepared are we to take action and make the decisions we will be called on to make?

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. Not only are these issues difficult for the public to understand in their full complexity, but they are also largely beyond the reach of government environmental regulation programs. 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. Examples of “preparedness” issues we examined:

Most Common Reason an Animal Species Becomes Extinct

Surprisingly, this issue received the highest number of correct responses of any of the 10 questions. Over two-thirds (70%) of respondents correctly replied that extinction is most commonly caused by the destruction of animal habitats by humans. On this issue, however, knowledge does not necessarily appear to lead to support — for example, as noted earlier, endangered species regulation received the lowest amount of support among issue areas. (See Figure 7 on page 15.) For this emerging issue, then, the challenge will be to turn knowledge into action, so that people see wetlands and other animal habitats not as threats to private property but as a way to protect animal species from extinction.

Main Cause of Global Climate Change

Less than half of the American public realizes that the cars they drive and the amenity-rich homes in which they live contribute to global climate change through increased carbon emissions. Among the general population, a plurality (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. Only 45% of Americans realize that the cars they drive to work or for errands, and the electricity-happy appliances that they buy are responsible for carbon emissions that are bringing about global climate change. 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 associate 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 the federal and state level 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 and 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 or concern about global phenomena that do not impact all 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 knowledge of this issue than respondents in any other region.

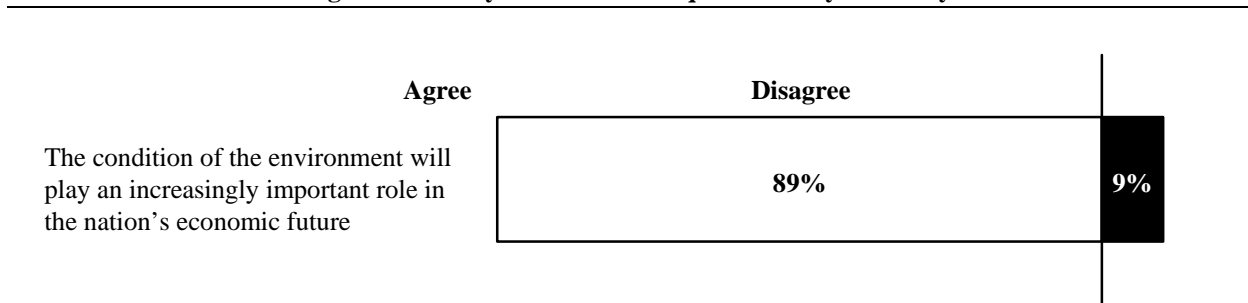
"Environmental catastrophe" in the next decade?

Concern about the planet's future remains high. A majority of Americans (56%) believe that we may be headed for an environmental catastrophe in the not-too-distant future. (Figure 12) This sentiment is reflected in the majority of Americans who agree 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." This attitude is statistically unchanged from 1998 and down three points from 1997, evidence that concern about the earth's environmental future continues but is not increasing. Interestingly, a full 40% of those who believe that environmental regulation has gone too far still feel that catastrophe looms in the next decade (vs. 65% of those who say current regulations do not go far enough). As in the past, women are 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. Concern about catastrophe decreases from 58% among those with a high school education to 50% of those with a college degree. Conversely, 46% of college-educated respondents disagree with the statement while 37% of high school grads disagree.

Healthy Environment/Sustainable Economy

In a NEETF/Roper question added for 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. The public overwhelmingly agrees “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.

Figure : 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.

We can only speculate on the reasons why nine 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 the perception that our economic future will be more interlocked with the environment is how 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 are also a few percentage points more likely to believe that the environment will play a larger role in our economic future.

Chapter 9

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 public resources that are spent each year on environmental information campaigns be re-directed 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 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 a 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 base of knowledge is not being built. While the data repeatedly show that schools are not the only venue for environmental information and education, it is evident that part of the problem is that students get too little EE for a foundation of E-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.

More Commitment to Research, Assessment and Evaluation

An important way to invigorate environmental education in today's school systems is to have more basic answers. The environmental education 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 there have been a series of calls for improved research, assessment and evaluation. While it is true there is a growing body of evidence that environmental education produces positive academic results (SSAOs) and significant environmental literacy results (ELOs) the gaps are also apparent. 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 precisely incorporated into the overall culture of the field.

The following pages mostly discuss implementation strategy and suggest some promising ways to increase the amount of environmental or environment-based education taking place in America but we should not lose site of significant information needs that remain. 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 – more definite answers for how much is occurring and in what locations and contexts.
- The field would also benefit dramatically from more evaluative and controlled studies of the complex relationships between certain types of environmental instruction and learning strategies and their associated changes in affect, skill and behavior.
- The field surely needs a thorough and up-to-date compilation and assessment 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 bonafide environmental literacy including more testing of programs such as the IEEIA and other of the more comprehensive approaches to environmental education
- We likewise need more controlled study of how EIC and other environment-based education programs support learning and overall school performance.
- And, the field must provide models, training and other guidance that will help practitioners make assessment and evaluation of program effectiveness routine rather than the exception.

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. Our recommendations:

- 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,
- An on-line clearinghouse of course and material reviews and peer assessment reviews.

Better Align EE With State Standards of Learning

The North Carolina Teachers study found that correlation of environmental education program activities to standard courses of study would (for 30% of all teachers) do the most to encourage them to encourage them to participate in an EE teacher training. Florida researchers Martha C. Monroe, Jeanette Randall, and Vicki Crisp say: “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:

- 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 an searchable inventory of grade-adjusted EE activities and mini-courses that reinforce science, language arts and social studies standards,
- Small grants through the EPA and the ED to support the alignment of leading existing environmental education programs with state and national standards.

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 students can both understand and apply. Our Recommendations:

- 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

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 points out that 80% of all students decide before entering high school to opt out of professional scientific pursuits. The report identifies environmental education as a heuristic tool for make science more relevant and appealing to young prospective scientists. So the higher environmental interest of women may actually be a useful tool in solving that national problem of youth turning their backs on the sciences. 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.

Optimize Emerging Arenas -- After School and Home Schools

One of the fastest growing parts of the K-12 education arena is in after school programming. The main reason for the growth in after school efforts is to provide useful and organized activities for

students in the afternoon hours. Some 30,000 schools according to the Department of Education now have after school programs and the number grows daily. The after school arena could benefit immeasurably from EE programming. The environmental education field can deploy its many rigorously developed and ready-made curricula that can be inexpensively applied to the after school setting. Our Recommendations:

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

Maximize Times of Higher-Than-Average Environmental Interest

As noted above, much EE is delivered in an episodic and scatter-shot manner. One of the most predictable “episodic” times for EE is around the time of the annual Earth Day observance in April. On Earth Day or the days leading up to it, 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 would be to have an official week of educational preparation for Earth Day – National Environmental Education Week – during which concentrated lessons on key environmental subjects could be taught for five lessons leading up to the Earth Day observance. These concentrated five-day programs would reinforce state and nationwide content standards. They would not be intended to replace a larger emphasis on environmental education in the schools. Recommendations:

- Support for A nationwide Spring-season Environmental Education Week,
- State education-related transportation funds increased for educational field trips,
- Funding for benchmarked preparatory short courses that facilitate greater education impact from fieldwork and outside environmental education activities.

Organize EE Content so it Progresses year-to-year

While our first set of recommendations looks at increasing the amount of environmental education taking place in the classroom, this second set of recommendations 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.

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, and more -- 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. Recommendations:

- 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,
- Bring about federal resource and environment agencies’ adoption of national content standards in their direct environmental education and environmental science programming,
- Federal Agency employment of routine effectiveness benchmarking and assessment in direct education programming.

State EE Benchmark Programs -- Several states have developed and adopted specific standards for environmental literacy and education and these are useful in addressing the “scatter shot” problems. 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. They 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 effect of environmental literacy in the schools.

As simple as these may seem, they provide carefully-thought-out building blocks for more sophisticated understandings at higher grade levels and lead to core environmental literacy. Recommendations:

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

A Stronger Earth Science Alliance

The field of science that, content-wise, has the most direct connection with much of what environmental education is about is the discipline of Earth Science. This discipline is widely accepted in the schools today but has a long way to go in achieving the same level of core science

status as 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 it could represent an approach that could help build a powerful new level of environmental literacy in America.

Educator Pre-service and In-Service training:

Many of the most effective environmental education programs require teacher to grasp environmental content and think differently about how to teach. Examples include: student-directed programs, investigations, subject integration field study and more. They are all valuable and powerful tools but few teachers receive much environmental education in their preparation for teaching careers. On-line 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 teach well, educators need orientation to the subject. For environmental education this is often missing. With only 13% of the schools of education providing courses on the environment, Many K-12 teachers start their careers with little or no environmental education. To address this shortfall, the University of Wisconsin Stevens Point, for example, offers a new on-line course entitled "Fundamentals of Environmental Education." The course is offered via the Internet for two undergraduate or graduate level credits. It can also be taken as a workshop, for those that are not interested in obtaining credit. The course is based on the "Guidelines for the Initial Preparation of Environmental Educators." Our Recommendations:

- Funding for on-line 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).

EE for Doctors and Nurses

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

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

EE for Community Leaders

The people, mostly volunteers, who oversee the management of many aspects of America's communities 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.

- Increased public support to NGO 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 support continuing education of local community leaders on environment-based issues

EE for Business Managers:

The heads of small and medium-sized businesses in particular need Web resources and basic training through community colleges, professional development and information programs such as those of the Small Business Administration.

- Provide public funding for the Small Business Development Centers to offer self-guiding orientation and training programs to client business leaders via the Web,
- Support the development of state-based business and environment Web portals and technical assistance programs designed to help companies of all sizes to improve environmental performance through innovations. Portal
- Encourage the adoption of environmental training programs and performance codes among trade associations

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 the weathercast to an environmental cast.

Education Training for Environmental Scientists and Specialists:

Experts from agencies and companies need to become better public communicators and educators. We often assume that because they have high levels of knowledge they can automatically communicate environmental content to the public. But they, too, need instruction on how to teach others.

- Provide the environmental and natural resource staff experts of agencies with basic continuing education on how to communicate with and educate the public on agency science and policy issues.

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

The larger environmental field has two extremely valuable assets to offer the K-12 world. First, it provides 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 – as venues for learning.

What is perhaps most remarkable about the many informal environmental education venues we have in the United States is how many of them have identified education as a prime mission and how many of them 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. The schools, however, need help making the connection with such “outside” venues. “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. 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. Our Recommendations:

- 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.

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 for most. This move toward education 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 as 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 study area 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 to be 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, a large percentage of American adults spend significant time on university, college and community college campuses. At these places students can be exposed to many practical experiences regarding environmental education and conservation. One half of all adults will spend some time on these campuses. And one fourth of all adults will spend several years on campuses as resident or commuter students. 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.

Placed-Based Models

A slightly broader than usual look at environmental education to include the social, economic and built environment can create a very dynamic learning environment for students that focuses on using a locale as a way to make schooling fit within a real community context. The emergence of place-based learning and the alignment of placed based learning goals and the capacity of environmental education curricula and practices to well into its mix is 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 are 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 reasonable education and pedagogy. Agencies that have large numbers of environmental expert staffs must devise ways to train such staffs at all levels of management to deliver quality educational programming.

3. Maximize Information Technology for EE delivery

There is a transformation that is taking place in the larger field and practices of American education today that 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 are, for example, assigning, receiving, completing, and evaluating 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 Foundation can help address the problem.

The NEETF/Roper studies and Roper Green Gauge studies show a trend toward the use of the Internet as a source of environmental information. Moreover, the Web is becoming a leading way teachers and students at most grade levels do research. The North Carolina Teachers Study found, for example that the Internet has reach top position as what the interviewed teachers see 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.

Environmental Education Self Help Web Portals

Through the creation of new Web portals or "gateways" we can capture and display key information on how educators can obtain the very best or most usable environmental education available today and can include such features.

- Public Funding for NGO Web portals
- Development of a Central federal agency resource and environmental education Web site similar to the First-Gov Portal
- Support for more teacher on-line refresher courses

On Line Training and Other Courses

The EE field 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 more on-line. But the field needs to become much more serious about the deployment of quality training and Web-based education.

Simulations and Investigations

The EE field has 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.

More Effective Media Tools

As noted earlier, America's most powerful environmental information source is the media. We are not being critical of the quality or amount of media coverage of the environment in this report. We are suggesting 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 but are without context. The result is that myths or misperceptions can arise and persist. Strategies that can help:

- Information Seekers: create a better understanding of who these people are and how they absorb information

News Graphics such as maps, schematics and diagrams:

Environmental news media coverage, whether electronic or print and whether short item or lengthy feature, needs to make much more use of maps and diagrams. All forms of news and media coverage would improve with the consistent 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.

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. Broadcast and news meteorologists can use their unique positions and skills to educate people on environmental conditions. Their combination of science expertise, common 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 to weather. This creates opportunities to learn interesting and important things about their local environment. Our Recommendations:

- 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.
- 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
- Environmental Literacy goals for broadcasters developed in concert with EE leaders for watersheds, air-sheds, related environmental science topics, and issues of regional concern

- News and data service that regularly delivers important “factoids,” graphics and storylines to weathercasters
- NOAA training of Meteorologists – enabling legislation for education and NOAA science -- funding for on-line courses
- Funding for an increase number of formal data and graphics partnerships between the media and public resource and environmental agencies.

Appendix 1

NEETF/Roper 1997 – 2000 questions:

Test Your Environmental Knowledge!

	% Response
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 <u>most common</u> 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 are projectable to the total 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 for 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

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Appendix 5

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Ordered by Date of Publication, 1969 - present

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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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 as follows:

Public Support for the Environment

Survey after survey reports that Americans feel high levels of support for environmental protection. How environmental literacy affects this support has several interesting twists. 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 their support for more government solutions to environmental problems.

As a usual matter, some ___% of Americans describe themselves as environmental supporters. Throughout the ten-year period, the NEETF/Roper studies and supporting data have shown high levels of public support.

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.” The answer is usually from 65% to 70% of the public who would choose the environment, compared to roughly 25% who would select economic development.

For the most part, this support has remained high and steady. It has, however, shown a few points of fluctuation during times when economic conditions are tougher. The regular recording of high levels of support is nonetheless comforting for those who enthusiastically endorse environmental protection. Roper researchers would caution readers to be aware that the balance of support shifts when other matters of importance to the public are woven into the mix.

Three years of the data, for example, varied the question about what one would choose by looking at the environment protection when compared to property owners’ rights.

In one example the question was framed as the protection of an endangered bird species vs. the ability of a logging company to cut down the trees in the bird’s habitat.

Bird species protection or logging company rights?

1992 – 68% bird – 23% company
1995 – 66% bird – 30% company
1996 – 64% bird – 30% company

The public varied the bird-example response only slightly from the more general question about choosing the environment or the economy. Perhaps this is due to a sense that company's rights are not as valued as individual rights in our society.

To test this, a second series of NEETF/Roper questions looked at the public's views on balancing protecting a wetland vs. the interests of a "destitute landowner's" right to sell land for construction.

Wetland protection or landowner's rights?

1992 – 48% wetland – 40% landowner
1995 – 45% wetland – 50% landowner
1996 – 43% wetland – 50% landowner

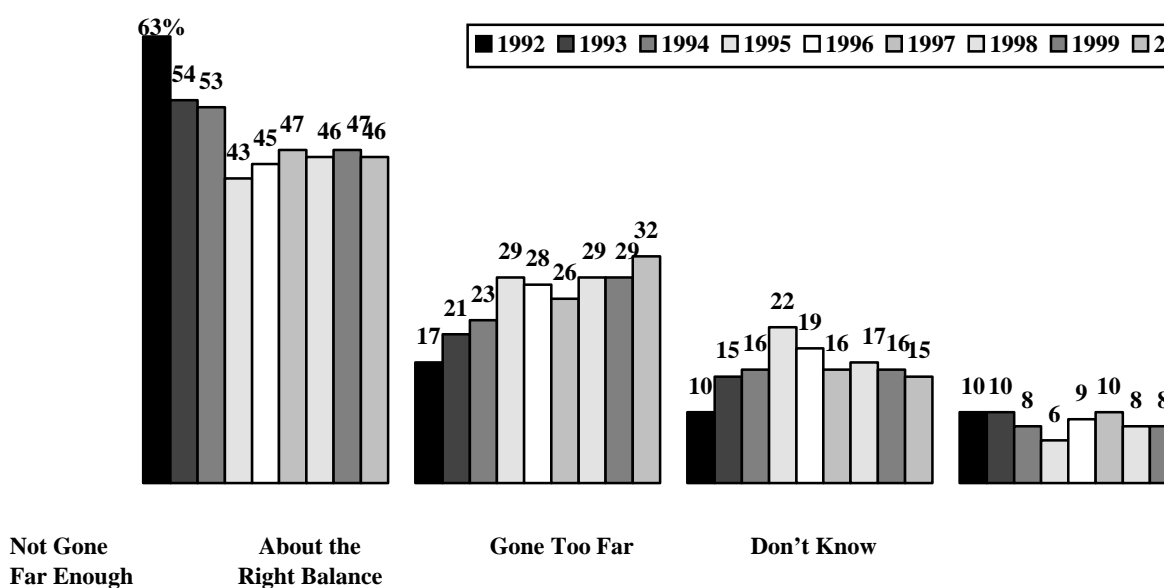
The infusion of the example of a destitute landowner shifted the balance away from the environment and perhaps shows the importance, in the public's mind, of finding ways that the environment can be aligned with other issues of public importance such as freedom, individual rights, family health and more.

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.

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 a large decline 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%. The plurality of Americans hold the "not gone far enough" position (46%), while one-third (32%) hold the view 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 is settled in these three positions.

Figure: Opinion of 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?

The most significant shift over a decade of data gathering came early in 1995 when the number of people saying they supported the “not gone far enough” position went from a solid majority to a plurality. The importance of this shift was the corresponding rise in the number of people who feel we have achieved the “right balance” in our laws and regulations concerning environmental protection. Viewers of this data often focus on the relatively small number of people who feel environmental laws and regulations have “gone too far” as an indicator that a majority of people support environmental regulation. Others are more conservative in their interpretation and feel the “right balance” people and the “too far” people should be added together. When that is done, the public’s view of the regulation pros and cons comes out as a statistical dead heat, which might explain the heated debates we see in this arena.

The environmental gender gap is again evident for this topic: 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 of 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.¹

¹ Roper Starch Worldwide Inc., *Roper Reports*, August 1998.

With regard to age, the percentage saying that laws for 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%). These results are in-line with attitudes relating to a choice between the environment and the economy.

Differences by gender and age toward environmental laws will need to be considered when enacting new laws or enforcing existing laws, as all Americans need to understand the benefits and consequences of environmental legislation.

Figure: Attitudes Toward Environmental Laws, by Gender and Age

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

From 1997 to 2000, however, the proportion of each sex or age subgroup giving the “not gone far enough” response is unchanged, evidence that Americans have settled into their opinions on this issue.

NEETF Roper findings on whether the public thinks more funding should be shifted to environmental programs.

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

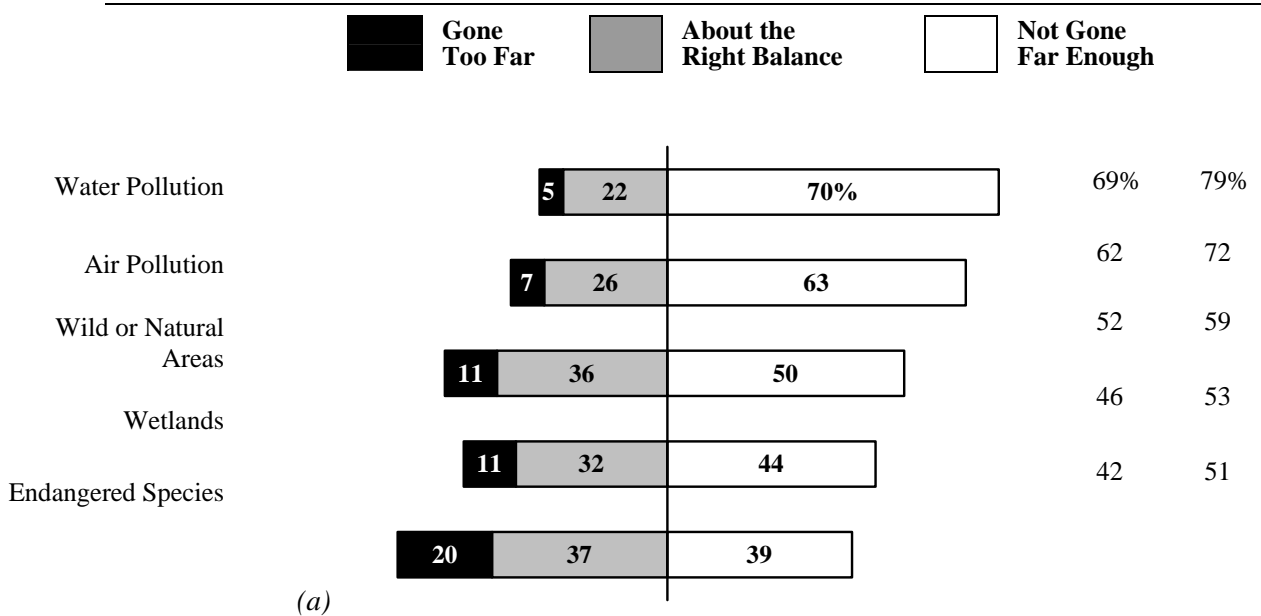
Public Motivation: Government Protecting the Environment to Protect Health

In America, the strongest support is for regulations is for the protection of water and air from pollution. When asked to consider laws for the protection of five specific environmental issues, Americans clearly rank two as more important than the others—water and air quality. Though 46% say 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. Other Roper data confirms this pattern, with a majority of Americans saying current laws to regulate the quality of the nation’s air and the quality of the nation’s 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. Still, these proportions have been stable since 1995, again an indication that Americans have settled into their opinions on environmental issues.

Figure: Current Regulation of Specific Environmental Issues



Question wording: Thinking now about some specific areas, at the present time, do you think laws and regulations for (INSERT ISSUE) have gone too far, not far enough, or have struck about the right balance?

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 and 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 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 for all five issues do not go far enough, while rural residents are especially likely to state 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 have struck about the right balance. These attitudes may relate to the relative impact 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), surprising 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.

**Figure: Trend Data: Water Pollution Laws ‘Do Not Go Far Enough’,
by Gender, Age and Region**

	Gender			Age				Region			
	Total	Male	Fe- male	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’	-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

Americans’ concern about insufficient regulations to protect water from pollution is supported by data in Roper’s annual Green Gauge report. When asked about the seriousness of 29 environmental issues, the top two are contamination of drinking water and water pollution from industrial waste.²

Air Pollution: Though still a majority opinion, Americans’ agreement that current regulations to fight air pollution do not go far enough is also decreasing 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.

² *Green Gauge 1999*, Roper Starch Worldwide, 1999.

**Figure : Trend Data: Air Pollution Laws ‘Do Not Go Far Enough’,
by Gender, Age and Region**

	Gender			Age				Region			
	<u>Total</u>	<u>Male</u>	<u>Fe- male</u>	<u>18- 34</u>	<u>35- 44</u>	<u>45- 64</u>	<u>65+</u>	<u>North- East</u>	<u>Mid- west</u>	<u>South</u>	<u>West</u>
	%	%	%	%	%	%	%	%	%	%	%
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’	-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

Misplaced Trust?

For state and national issues, people seem to want to feel that the government is reliably acting in their best interest. They may get cranky with the government for meddling in their lives, but they rely on the government to protect them from environmental harm. But lack of environmental knowledge can support unfounded reliance on the government as well. One overarching NEETF/Roper 1998 finding, for example, is that a majority of the people will assume the government is attending to its environmental health and safety needs even when it is not.

We asked Americans about 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. Here is what we found out about:

Figure: True/False Questions: Percentage Giving Myth Response

<u>Content of True/False Question</u>	<u>Percentage Who Gave Myth Response</u>
Government testing of industrial and household chemicals	65%
Testing of tap water for contaminants	59%
Government testing of bottled water	51%

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).

Agreement with the myth choice decreases significantly as education level increases.

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

<u>Content of True/False Question</u>	<u>Total Myth Response</u>	<u>Education</u>		
		<u>High School or Less</u>	<u>Some College</u>	<u>College Graduate</u>
	%	%	%	%
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

There are some subgroup differences in responses to the true/false questions compared to the multiple choice questions. For instance college graduates are more likely than those with less education to give the correct response for replacement of extinct species, government testing of bottled water, and government testing of industrial and household chemicals.

Figure: True/False Questions: Percentage Giving Correct Answer

Content of True/False Question	Percentage Who Answered Question Correctly
Government testing of bottled water	42%
Testing of tap water for contaminants	35%
Government testing of industrial and household chemicals	27%

The 1998 NEETF/Roper Survey's true/false questions looked at people's perceptions of how protected they are by government. In general, Americans who otherwise may question government involvement in private matters expect the government to protect public health and the environment. Highlights of the three true/false questions generally answered incorrectly demonstrate this reliance by the public.

-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, there are certain pollutants that 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 the survey research indicates that many people turn to bottled water because of a lack of faith in the purity of tap water.

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.

How Land-based Government Regulation Fares

Protection of Endangered Species: Support for the “current laws do not go far enough” position with regard to endangered species, perhaps the most contentious environmental issue facing the nation, has also been declining over time. Agreement that current regulations are insufficient to protect endangered species has decreased 12 percentage points since 1992. 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%). 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.

Perceptions of laws for endangered species protection 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, perhaps because it is often painted in economic terms.

Protection of Wild or Natural Areas: Opinions of 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.

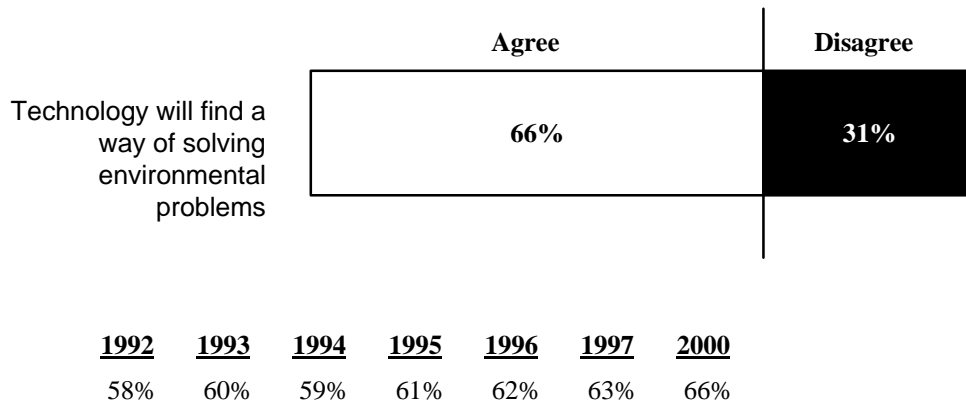
A majority of women (54%) support more regulations for the protection of wild or natural areas as compared to 45% for men. A similar point spread exists between urban residents (54%) and rural residents (44%).

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.

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 a 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.” While this shows some optimism among the public 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.

Figure: 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.

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 including the environment. Since the terrorism related events of 2001 and 2002, the environment has become a second-tier public issue having moved out of the top ten issues that Americans say they are personally concerned about. 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 6th-ranked public issue in America (behind crime, having enough money to pay bills, behaviors of young people, high prices and inflation and others) to the 12th-ranked issue in 2002. Terrorism, which did not have a ranking, moved to number one spot and relations with foreign countries moved from the 11th position to the 4th.

Energy concerns also dropped dramatically moving out of the top ten issues that concern Americans.

The 2002 Green Gauge continues to show that pollution is the top environmental concern chosen by nearly 60% of respondents but with the exception of the number of people listing “the Greenhouse Effect” as a serious concern (up four points), all other issues involving pollution and energy are down several points. Water pollution being listed as a serious environmental concern is down seven points and air pollution is down six.

The 2002 Green Gauge report also finds that fewer people are participating in environmental activities on a regular basis since 2001. The number of people frequently trying to save electricity in the home is down seven points to 58% and most other behavior categories are down a few percentage points.

The study also finds that the 35% of Americans who “pay attention to the environmental records of large companies” has dropped five points to 30%.

Importantly, though a majority (61%) of Americans are considered by Roper to be “information seekers” who “sometimes or often read an article, watch a television show, or use some other resource to seek out information about the environment,” the number doing so has declined six percentage points since 2001.

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 it is already evident that it is having a significant impact.