Outreach That Makes a Difference

Target Audiences for Water Education – A Research Meta-Analysis

A study conducted for the National Extension Water Outreach Project.

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Summary

This Monograph describes a body of information that water educators can use to guide their work and to identify what questions to ask when considering work with a particular target audience. Fourteen different audiences are considered here in detail. This document compiles Best Education Practices (BEPs) for each audience. These will make it easier than in the past for educators to apply the most appropriate information when designing initiatives that build citizen skills and motivation to address complex water management scenarios.

The Monograph is one product of the *Water Outreach Education – Facilitating Access to Research and Best Education Practice* project, a USDA National Facilitation Project. The Water Outreach Project provides resources that water scientists and education professionals can use to tackle the challenging task suggested by the USDA Research, Education, & Economics (REE) strategic goal: "protect and enhance the nation's natural resource base and environment." These products assist professionals to choose and use appropriate education techniques and resources to deliver water management education programs.

Matching outreach initiatives with criteria geared to specific audiences enhances the likelihood that the actual effort will lead to the desired change. When developing an initiative, educators are encouraged to develop original information about each audience. But educators usually have little time or money, and inadequate training, for a sophisticated effort in audience profiling. We initiated this study, in part, to compile reliable information that educators can use to get started. We also wanted to know more about how research could help identify: which audiences are relevant; what information or skills each audience needs; what outreach strategy(ies) work best with each audience; why a particular strategy works; and what data have others compiled about the needs and interests of specific audiences.

Experience indicates that it is hard to find research-based recommendations about audiences of strategic interest to water educators. Water conferences provide access to numerous case studies, but do not lead either to a coherent body of information about education practices that result in a desired outcome with specific audiences, or to clear guidance for educators. Conservation and environmental education groups have summarized teaching and communications research to provide guidance that generally leads to desired impacts, but that offers only limited recommendations for specific audiences. (These groups include the Recreational Boating and Fishing Foundation, the American Fisheries Society, the North American Association for Environmental Education, the National Environmental Education & Training Foundation, and the US EPA Office of Wetlands, Oceans and Watersheds.)

The meta-analysis process described here, applied rigorous and documented procedures to identify and organize research-based information that can help water educators design initiatives that are more likely to produce impacts with specific audiences. The analysis focused on practices that have been shown to be more effective in studies of water and environmental outreach. The process identified a surprising number and diversity of studies available to guide water educator efforts. Study recommendations and products are based on findings reported in 96 research articles investigating 14 audiences of strategic interest to water educators. Farmers were the most widely studied audience and landowners the next most studied group. Based on the quality of research, we believe that the findings reported in this analysis and in related reference pieces are reliable.

The results provide evidence to support the promotion and use of specific education practices. Findings add audience-specific examples for classic education techniques; and they amplify information about how to most effectively accomplish various outreach strategies, both for specific audiences and for water education as a whole. They indicate that water educators have begun to develop sophisticated techniques that couple dissemination of significant information with citizen goals to achieve improvement in water management.

The study identified a number of needs. There is a need for careful attention to research techniques for judging outreach effectiveness. For example, we were unable to use results from several studies, due to their failure to carefully associate outreach impacts with specific audiences or techniques. While there is adequate diversity in research about impacts of water outreach, there is a need for more research about selected audiences and a need for research that more comprehensively addresses the complexity of the outreach effort for all audiences. In particular, educators would benefit from more studies about ethnic groups, local decision-makers, students in higher education, and volunteers. Educators could also use more audience-specific findings that describe effective use of "message delivery vehicles," "public participation," "support and motivation for professionals," and "evaluation." There is a need for more research investigating the effectiveness of web-based learning strategies. Finally, there is a need for research which highlights best practices for training policy makers, organization leaders, and agency administrators who promote or supervise water education and management activities, as well as facilitating their own groups' knowledge-development strategies.

This study points to the complexity of identifying and practicing effective outreach techniques which respect citizen decision-making processes, but lead to a more universal commitment to careful management of the water resource and its related human and natural ecosystems. But it also points to the strength of work in progress. Building educator skills in implementing effective practices will make a difference. Research that amplifies these results will increase understanding for *how* to make that difference.

Introduction

Water scientists and educators strive to address a demanding range of environmental management needs. They aim to provide citizens with information, skills, and motivation to maximize water quality and manage water quantity. But these outreach and instruction activities must also help build an infrastructure where citizens and leaders can link choices about potential actions to business, organization, or community goals. Ultimately, water users must embrace water management and improvement as their own goal.

This monograph describes a recent study conducted by the University of Wisconsin Extension – Environmental Resources Center (UWEX ERC) to provide educators with information about water user capacities and interests. Study results add resources to the tools educators need to build citizen capacity to address complex water management scenarios with the best information and skills. The work of the Environmental Resources Center is guided by the land grant university mission and Extension goals.

Background

Figuring out the role for education or outreach in addressing environmental management needs is a complicated and difficult job. To give an example, this is how our federal partner, USDA Research, Education, & Economics (REE), describes strategic goals that promote water education (USDA REE, 2003).

REE Strategic Goal 5 is to *Protect and enhance the nation's natural resource base and environment.* Objective 5.2 is to "develop and transfer the tools and techniques required to maintain or enhance the physical, chemical, and biological integrity of the Nation's watersheds and surface and groundwater resources". "Actionable strategies" include:

- Provide action agencies and farmers and ranchers with tools and techniques to reduce soil erosion, sedimentation, and nutrient and chemical loading, and improve drainage into the Nation's rivers and lakes.
- Develop science-based decision support systems for better management of riparian areas, wetlands, aquatic ecosystems, and stream corridors for the protection of watershed health and prevention of water quality degradation.

Objective 5.2 in the USDA Cooperative State Research, Education, and Extension Service (CSREES, 2004) strategic plan requires a similar investment in water education: *Provide science-based knowledge and education to improve the management of soil, air, and water resources to support production and enhance the environment*. This objective is further delineated by an "actionable strategy":

- Sponsor decision support systems for citizens and public officials to evaluate the environmental and economic impacts of policy options for sustainable renewable resource management.

University Extension programs enhance water quality and quantity by applying techniques outlined in these strategic objectives, such as those underlined above. Educators strive to transfer information, provide tools and techniques, and enable the decision process. But what does "transferring information" actually accomplish and how do we do it effectively? What does it mean to "provide" tools and techniques? Are educators under any obligation to ensure that techniques are used once they are provided? Any decision-process is multifaceted. Personal qualities, group dynamics, politics, economics, and social structure all play a role. What kind of decision-support system must educators design to address this level of complexity?

Research initiative

USDA CSREES funded a National Facilitation Project to increase the capacity of water scientists and education professionals to tackle the challenging task indicated by these strategic goals. The project, *Water Outreach Education – Facilitating Access to Research and Best Education Practice*, was designed to assist professionals to choose and use appropriate education techniques and resources to deliver effective water-management education programs.

The Project addressed a need to package more generally available information in a quickly accessible format and developed a number of resources that incorporate knowledge about the human dimension of natural resource concerns. These are available on the Water Outreach Web site. See Appendix A for a list of products.

Agency and non-profit organizations who originally advised us to request project funds also identified a serious gap. Organizations knew that water outreach work would be more effective if tailored to the interests of specific audiences, but there was little information readily available profiling these audiences or guiding this approach. As an example, Shepard (2002) identified a need for information about target audiences in order to more accurately evaluate water resource outreach programs.

In Shepard's survey of Extension national water program state coordinators, 34% identified a lack of information about behavior and/or management practice adoption rates at the start of a project as a barrier to evaluation. Over 50% planned to use one or more behavioral indicators to evaluate their programs. Shepard points out that to build capacity to make "evaluation a more common part of outreach programming . . . water quality coordinators felt staff needed (Shepard, 202, p. 7):

- Better understanding of when specific sociologic measurement is appropriate;
- Knowledge of what type of data can and should be collected; and
- The skills to choose reliable and appropriate methods for collecting sociological data"

A key activity for the Water Outreach Project, therefore, was to improve our information about strategic audiences. We need to identify:

- Relevant audiences'
- Information or skills need by each audience;
- The outreach strategy that works with each audience;
- Why the outreach strategy works;
- What data other research had already collected and published about the needs and interests of the target audience.

Discussion at a recent USDA CSREES national water conference echoed this concern about how to improve our effectiveness. The discussion focused on four broad categories, summarized in the *CSREES Water Road Map*: water quantity, water quality, human dimensions, and technology (USDA CSREES, 2005). The Human Dimensions category suggested the following priority research needs:

- Identify what motivates desired behavior change
- Research communication and education methods to determine the ones most appropriate for reaching specific target audiences
- Identify innovative and effective methods of communication that can be used to deliver science-based information that encourages personal responsibility and behavior change.

As evidenced by the number of studies reported in this Monograph and other recent efforts to distill social psychology research applications for environmental management, research that provides guidance for many of these questions already exists (for example see: Mackenzie-Mohr, & Smith, 1999; National Research Council, 2002). But with the exception of *Getting in Step* (MacPherson, C., & Tonning, B. 2003), which focuses on communicating information about water management, there are no readily accessible summaries of research about behavior change that focus on water management behavior, or presentations of research in a form useful to water educators[1]. The Water Outreach Project attempted to close this gap through a meta-analysis of existing research about

[1] A nation-wide need to maximize education resources and wisdom to provide a more consistent focus on the need to work to improve water quality has been recognized as a national goal for many years. These sample initiatives, each emphasized the need for research about targeted audiences, training, communication strategies, and local partnerships: a) A pre-conference education symposium at the 1996 National Watershed Conference sponsored by US EPA and the Water Environment Federation (Andrews, Hawthorne & Pickering, 1996); b) A 1998 national water educators meeting sponsored by the National Environmental Education and Training Foundation, the Groundwater Foundation, and the Council for Environmental Education (E. Andrews attended the meeting; no report currently available); c) *The Human Dimension of Watershed Management*, an interactive workshop presented at the Seventh International Symposium on Society and Resource Management (Shepard, O'Keefe & Nowak, 1998); d) A 1999 Clean Water Action Plan meeting to develop education goals (E. Andrews attended the meeting; no report currently available). The state-EPA NPS initiative, http://www.epa.gov/owow/nps/partnership.html, struggled with ideas for how to address the need and eventually developed the *Getting in Step* outreach campaign resource.

specific audiences of interest, and through compiling audience-specific best education practices identified through the analysis. This monograph reports methods and results of this study.

We begin this report by describing our focus on best education practices and our rationale for studying target audiences. We identify the target audiences we included in the study and our reasons for selecting particular audiences. Next, we describe the meta-analysis process we used to review education-practice research. We follow this summary with narrative and tabular accounts of our findings by target audience. Finally we provide analysis and critique of the findings and the research that generated them. The monograph ends with recommendations to researchers who plan to study target-audience specific education practices.

This monograph provides evidence to support the promotion and use of specific education practices, focusing on those that have been shown to be more effective in studies of water and environmental outreach and education. It cites and organizes education practices that have been corroborated by published research of their employment in various education programs around the country. Results indicate that water educators have begun to develop sophisticated techniques that couple dissemination of significant information with citizen goals to achieve improvement in water management.

Methods

Research selection

To accomplish the meta-analysis, we conducted an extensive review of research published from 1988-2004 to identify methods for water education and outreach that were shown to be *best* practices for educating specific target audiences.

Best education practices

Best education practices (BEPs) are clearly defined practices or programs that have been "refined through repeated delivery and supported by a substantial body of research" (Fedler, 2001, p.7). To call an education practice a best education practice is to say it is better than all other practices to which it has been compared using some standard or criterion of comparison.

The notion of "best" implies a hierarchy of comparisons. If there is a best education practice, there are also good and better education practices. To say a practice is "good" suggests a comparison to some criterion of goodness. To say it is "better" or "best" suggests that there are criteria for comparison and other practices that serve as points of comparison. To understand what is claimed in labeling an education practice "best," the ideas of good, better, and best education practice need definition. Table 1 lists the definitions of Good, Better, and Best Education Practices used in this project.

To fully specify the relative quality of a practice requires that its value be described in an educational context. Not only must the claim of "best education practice" be shown to hold

in comparison to other practices, the claim must also describe the audiences and contexts for which the practice is shown to be best. All claims that an education practice is a "good," "better," or "best" education practice require description of the following parameters:

- Relative to what
- With what audience
- In what circumstance

Table 1.
Definitions of Good, Better, and Best Education Practice used in this project.

Good Education Practice	An education practice that yields desired outcomes when applied under a certain set of conditions with the appropriate audience (after Holsman, 2001, p. 2).
Better Education Practice	A good education practice that has been shown; through research, critical reflection, or both; to be more effective in achieving desired outcomes than some other education practice or practices.
Best Education Practice (BEP)	"a program or practice that has been clearly defined, refined through repeated delivery, and supported by a substantial body of research" (Fedler, 2001, 7)

Target audiences

> *To effectively educate and serve the public, they [natural resource professionals] must understand who their public is, what they are seeking, and how to communicate with them* (Bainer, 2000, p. 37).

A target audience is a segment of the population with potential to effect desired change, a segment that is likely to be affected by the change, or both. Segmenting a market by specific audiences is considered an essential technique in the process of promoting, selling, and distributing a product or service. Segmenting audiences for the promotion of targeted behaviors is also central to development of social marketing strategies (McKenzie-Mohr & Smith, 1999).

The value of targeting an audience lies in: 1) identifying the particular benefits of and barriers to the targeted and competing behaviors for the specific audience; and 2) optimizing the message and method to best accomplish the educational objective, that is, to be most effective in effecting the desired change in behavior. Studies of teaching and of human learning, development, and motivation show that ways of thinking and learning vary among individuals and with variations in the context of the learning situation (American Psychological Association, 1997; Andrews, Stevens, & Wise, 2002; Holsman,

2001; Horton & Hutchinson, 1997; Knox, 1993; Merriam & Caffarella, 1999; Sgroi & Cavaliere, 1992).

Effective educators and outreach specialists tailor their education practices to best fit their audience in the context of the specific educational experience. Effective change agents target audiences that are most likely to turn what they learn into desired change. For both, effectiveness is enhanced by understanding the needs of the audience and understanding the situation from the collective perspective of the individuals that constitute the audience (Nowak, O'Keefe, Bennett, Anderson, & Trumbo, 1997; Obahayujie & Hillison, 1988; Stern, 2000).

To find those education practices that were shown to be good, better, and best for educating strategic audiences for water management, we reviewed research literature on water information, communication, outreach, and education programs for each of the twenty-one audiences listed in Table 2. We chose the audiences in this list from multiple sources. Some we selected based on previously identified needs that were listed in the original proposal for this project. Members of the Project advisory team suggested others. We identified the rest during our formative Study of Provider Needs (Stevens, Reilly & Andrews, 2002) and subsequent reviews of literature on water outreach and education. Our expectation was that few studies had identified and tested the relative effectiveness of specific education practices with these audiences. This proved to be true for some audiences, but other audiences were moderately or well-investigated.

Table 2.
Specialized Audiences Covered in Literature Review

Agricultural commodity groups	Loggers
Aquaculture producers	Neighborhood organizations
Business and industrial water users	Recreational water users
Environmental/conservation NGOs	Retailers of water recreation equipment
Farmers	Service clubs
Government agencies	Soil and water conservation districts
Households	Specific ethnic groups
Homeowners	Water-related recreational businesses
Landowners	Youth and college students
Land development businesses	Youth and college educators
Local decision and policy makers	

Literature search

We conducted our search for relevant literature in two-phases. The first was a learning phase. We developed search techniques of increasing power and sophistication, identified the more relevant and productive electronic databases, and refined and expanded the keywords used for our searches. Literature sources we used in this phase of our search were:

- References included in relevant books, book chapters, and journal articles
- The table of contents from the most recent ten years of journals on environmental education, Extension, and natural resource management
- Proceedings from conferences on groundwater, watershed, water resource, water quality, and non-point source pollution.
- Electronic journal databases available on the UW-Madison electronic library system.
- Reference recommended by our project advisory team and by water resource and education colleagues and associates in Wisconsin and around the country.

In the second-phase, we concentrated our search efforts on the databases that were most productive. We also continued to welcome personal recommendations for specific references. Table 3 lists the UW-Madison Electronic Library Databases we used in the two phases.

We searched the databases in the first phase using both single and multi-level, keyword search techniques. In the second phase, we used a refined variation of the multi-level, keyword search technique.

Table 4 lists the search terms used in the second phase of the literature search. The keywords in this list combine the search terms recommend by our advisory team with keywords refined from the responses of natural resource professionals contacted in our study of provider needs (Stevens, Reilly, & Andrews. 2002).

We searched the databases listed under Phase II in Table 3 using no less than twelve combinations of these keyword groups. The most restrictive search combined all six concepts as follows:

> (water* or river* or lake* or riparian or groundwater* or stream or streams) AND (educat* or outreach or instruct* or environmental educat* or pedagog* or technolog* transfer) AND (participation or citizen participation or public participation or social movement or civic engagement or civic empowerment or emancipation or emancipatory education or liberation theology or social responsibility) AND (best practice* or success* or effective*) AND (adult* or landown* or farm* or agricultur* or industr* or small industr* or small business* or retail* business* or industr* water user* or recreation* water

user* or decision maker* or homeowner* or household*) AND (evaluat* or assess* or study or studi*)

The least restrictive combined only two concepts, for example, water AND education:

(water* or river* or lake* or riparian or groundwater* or stream or streams) AND (educat* or outreach or instruct* or environmental educat* or pedagog* or technolog* transfer)

Table 5 shows the total number of references and abstracts identified and reviewed in the second phase of our search and a breakdown of the total by database. The databases in the second-phase searches returned a total of 89,738 references and abstracts (counting duplicate returns). We reviewed 15,082 of these references and abstracts (when abstracts were provided) to determine if the referenced literature met our selection criteria.

We filtered the literature in two stages. First, we selected the references that appeared to be topically relevant to our Project. Second, we selected the references from this subset that appeared to report on research that either evaluated education practices in a single case, or compared two or more cases to identify one practice as better than the other(s), or summarized research from multiple studies.

Most of the references did not meet any of these criteria. The following example of a rejected abstract shows why we rejected so many references given the specificity of our search terms. (Keywords are underlined.)

Abstract: Presents news briefs related to community colleges in the U.S. as of April 14, 2003. Arrest of Rafael Diaz, vice president at Brookhaven College in Farmers Branch, Texas, for conspiracy to money laundering; Participation of Chief Warrant Officer David S. Williams in the Army reserves; Resignation of Clyde W. Johnson as director of equal employment at Salt Lake Community College in Utah

We found 117 references that did meet our criteria. These are listed in Appendix B. Table 6 shows the distribution of these references among the target audiences. Farmers, as a target audience, attracted the greatest concentration of useful studies of outreach and education practice.

Table 3.
UW Madison Electronic Library Databases Used in the Two Phases of the Literature Search

Phase I (Winter 2002/2003 and Summer 2003)	**Phase II (Fall 2003 - Winter 2003/2004)**
Cambridge Scientific Abstracts	Cambridge Scientific Abstracts
Aquatic Sciences & Fisheries Abstracts (ASFA) (1992-2003)	Aquatic Sciences & Fisheries Abstracts (ASFA) (1992-2004)
ASFA 3: Aquatic Pollution and Environmental Quality (ASFA subfile)	ASFA 3: Aquatic Pollution and Environmental Quality (ASFA subfile) (1992-2004)
Pollution Abstracts	Pollution Abstracts (1992-2004)
Water Resources Abstracts	Water Resources Abstracts (1992-2004)
OVID - Current Contents (1993-2003)	OVID - Current Contents (1993-2004)
WebSPIRS	WebSPIRS
AGRICOLA (1992-2002)	AGRICOLA (1992-2003)
Agris (1991-2003)	Agris (1991-2003)
Biological Abstracts (1992-2002)	ERIC (1992-2003(6))
Biological Abstracts/RRM (1992-2002)	
CAB Abstracts (1992-2003)	
ERIC (1992-2002)	
Zoological Record (1993-2002)	
BiblioLine	
Fish and Fisheries Worldwide (1992-2002)	
Wildlife World (1992-2002)	
EBSCOhost - Academic Search Elite (1984-2002)	
ISI Web, Web of Knowledge (1992-2003)	

Table 4.
Concepts and Key Words Used in Phase II of the Literature Search

Key words used in the second phase of our literature search, grouped by category.
Concept 1: Resource (water* OR river* OR lake* OR riparian OR groundwater* OR stream OR streams)
Concept 2: Education (educat* OR outreach OR instruct* OR environmental educat* OR pedagog* OR technolog* transfer)
Concept 3: Participation (participation OR citizen participation OR public participation OR social movement OR civic engagement OR civic empowerment OR emancipation OR emancipatory education OR liberation theology OR social responsibility)
Concept 4: Best practice (best practice* OR success* OR effective*)
Concept 5: Audience (adult* OR landown* OR farm* OR agricultur* OR industr* OR small industr* OR small business* OR retail* business* OR industr* water user* OR recreation* water user* OR decision maker* OR homeowner* OR household*)
Concept 6: Evaluation (evaluat* OR assess* OR study OR studi*)
The "*" is a wildcard designator in most of the databases we searched.
Adding key words to a list using the Boolean "OR" broadened the scope of the search. Combining the concept lists using the Boolean "AND" narrowed the scope or made it a more selective search. A typical search would use these in combination

Table 5.
References Returned and Reviewed in Second Phase of Literature Search

Database	Number of references returned (counting duplicates)	Number of returns reviewed (counting duplicates)
AGRICOLA	2,469	1,379
Agris	11,837	3,554
Aquatic Science and Fisheries Abstracts (ASFA)	7,679	2,701
ASFA 3: Aquatic Pollution and Environmental Quality	2,109	1,281
Current Contents	52,213	2,050
ERIC	7,218	1,096
Pollution Abstracts	2,086	1,131
Water Resources Abstracts	4,127	1,890
TOTAL (with duplicates included)	89,738	15,082

Table 6.
Distribution of Relevant References by Their Application to Target Audiences

Target Audience	No.	Target Audience	No.
Adults [2]	1	Local decision and policy makers, [3]	4
Agricultural commodity groups	0	Loggers	2
Aquaculture producers	1	Neighborhood organizations	1
Environmental/conservation NGOs	0	Recreational water users	7
Farmers	41	Retailers of water recreation equipment	0
Government agency professionals [4]	4	Service clubs	0
Homeowners	8	Soil and water conservation districts	0
Households	11	Specific ethnic groups [5] [6]	1
Industrial water users [7]	6	Water-related recreational businesses	0
Landowners	10	Youth and college educators [8]	9
Land development businesses	0	Youth and college students [9]	11
		TOTAL	117

[2] Adults was not one of our original audience category, but we found one extension-education study that used university employees working in positions that ranged "from grounds maintenance to upper administration" to identify effective methods for conveying information to working people and retirees on environmental and public policy issues resulting from growth and development Iams & Marion (1991, page 1 of 4). Working people and retirees are a large percentage of the adult population in the United States. We read the results as applying generally to all adults.

[3] In subsequent tables and discussion, we refer to this audience as "Decision makers, local."

[4] In subsequent tables and discussion, we refer to this audience as "Government agency/University Extension professionals"

[5] In subsequent tables and discussion, we refer to this audience as "Ethnic Groups."

[6] We identified only one study that was primarily and exclusively targeted to ethnic groups. However, when analyzing the studies, we also considered two studies of Farmers and one of Recreational water users that also related to specific ethnic groups. As a consequence of this duplication, subsequent tables will identify four studies with application to Ethnic Groups.

[7] In subsequent tables and discussion, we refer to this audience as "Business/Industry water users."

[8] In subsequent tables and discussion, we refer to this audience as "Teachers."

[9] In subsequent tables and discussion, we split to this audience into "Students, higher education" and "Students, K-12."

Analysis

Meta-analysis procedures

Summarizing study information by categories

We considered different meta-analytic approaches to synthesizing our research findings in useful ways. A standard approach uses quantitative methods, like those described in Cooper & Lindsay (1998) and Wolf (1986), to capture patterns in results across multiple quantitative studies. This approach was taken by Hines, Hungerford, & Tomera (1986/1987) in their analysis of the relationship between education and environmental behavior. The studies we reviewed were not conducive to meta-analysis using quantitative methods. We chose instead to organize and discriminate our findings by narrative categories following on the examples of Fien, Scott, and Tilbury (2002) and Holsman (2001).

Fien, Scott, and Tilbury (2002) used a three-phase case-study process to evaluate World Wildlife Fund (WWF) education programs. Reflecting on the characteristics of thirteen successful programs from Africa, Asia, Australia, Europe, and South America, they identified fourteen program attributes that were necessary for WWF programs to successfully maximize education and conservation outcomes and accomplishments. Case-study findings were organized according to these attributes, which also helped the authors identify overarching recommendations.

Holsman (2001) developed an outline of methods and evaluation priorities through telephone interviews with aquatic education specialists in Region 5 of the U.S. Fish and Wildlife Service. Using the outline as a guide, he conducted a comprehensive search and review of literature on aquatic education methods to develop a distilled matrix of teaching methods for aquatic education with some basis of support in the research literature.

Once we elected to organize our findings using categories, we considered different frameworks. Drawing from established literature on education theory and practice and from the expertise of our advisory committee, we developed two detailed matrices for organizing the results of our review. One matrix provided a framework based on education practices; that used general bodies of education knowledge and discriminated the literature by frame of reference, components of learning, and learning management. The other matrix provided a framework for organizing the literature by audience and discriminating it by the practice and application of education programs beginning with program planning and implementation and ending with program evaluation and assessment. Our advisory team found both of these schemes too cumbersome, and recommended that we use a simpler approach. We eventually settled on a variation of the Holsman (2001) matrices because of their relative simplicity and record of successful use.[10]

[10] Holsman's (2001) framework was a modification of the framework used in Volk & McBeth (1997).

We modified some of Holsman's categories and added several of our own to accommodate the wider scope of our interests and research. Ultimately we evaluated 14 categories of information in our review of each study. Table 7 compares the categories used in Holsman to those used in this study. We converted the category, *Grade Level* to *Target Audience* to accommodate the other audiences listed in Table 2. We converted *Teaching Method*, to *Education Purpose & Behavior Change Method* to capture our interest in information, communication, and capacity building as well as education and outreach. We chose not to use *Method Variation* because information about variations in teaching methods was better captured by our *Education Purpose & Behavior Change Method* category.

We added eight categories not included in the Holsman matrices (see the Water Outreach Project column in Table 7). We added *Study Location* and *Resource Issue* because of potential implications of geography and topic on education practice. We added *Education/Outreach Theory* to preserve the connections between the recommended practices and their theoretical roots. We added *Education Provider* to capture potential differences in methods used by different providers when working with the same type of audience. We added *Concept Comparison*, *Research Purpose*, and *Measure* to provided even greater specification of the research on which we based our findings. We added the *Search Source* to provide a trail for those who wish to check or replicate our work.[11]

Appendix D displays a summary of our research for each of the 117 studies, across all 14 categories.

[11] This category proved to be only partially useful. As we entered information into our analysis matrix we referenced articles both by database and the search identification number. Like all trails, this one becomes harder to follow with age. Managers routinely add new references to maintain the currency of their databases. When selected in identical searches conducted even days later, new references will alter the search identification numbers of previously identified references. The more new references are added, the greater will be the discrepancy between current and original search identification numbers of older references

Table 7.
Comparison of Information Categories Used for the Literature-Summary Matrices in Holsman (2001) and the Water Outreach Project

Holsman (2001)	Water Outreach Project
• Supporting Reference	• Supporting Reference • Study Location • Resource Issue
• Grade Level	• Target Audience • Education/Outreach Theory • Education Provider
• Teaching Method	• Education Purpose and Behavior Change Method
• Type of Evidence	• Type & Quality of Evidence (research method) • Concept Comparison • Research Purpose • Measure
• Type of effects/Significant findings	• Significant findings
• Body of Literature	• Body of Literature • Search Source
• Method Variation	Category not applicable

Judging the quality of research

We used several schemes to evaluate and characterize the research methods that applied to education practices for each study. We started with the scheme used in Holsman (2001). This scheme distinguishes research from literature reviews, and describes research types using a 5-point scale (Table 8). In applying this scheme, we found a need for a more detailed scheme that enabled description of study characteristics beyond those captured by the Holsman scheme. The change from Holsman's category, *Type of Evidence*, to our *Type & Quality of Evidence* indicated in Table 7 exemplifies the evolution of our thinking.

Our evaluation and characterization of research methods relied on the three schemes in Table 8 (Holsman, 2001; Campbell, 2000; Leach & Pelkey, 2001) and the scheme developed by Runkel and McGrath (1972) summarized in Table 9. We eventually combined the research characteristics captured by the four schemes into a unified scheme that rated the quality of each study on the six characteristics shown in Table 10: sample

size; subject selection; presence and timing of observations; group comparisons; characteristic comparisons; description.

Table 8.
Research Quality Rating Schemes

Research Rating Schemes	
Holsman (2001)	**Campbell et al. (2000)**
LR = Literature Review	Cross-sectional
R = Research	Randomized controlled trial (RCT)
R1 = Experimental design, pre-test, post-test, control group	Uncontrolled cohort
R2 = Quasi experimental design (no random assignment or control group	Controlled trial
R3 = Descriptive (one shot)	Time series
R4 = Qualitative study	Controlled cohort
R5 = Anecdotal/single case study	Other
Leach and Pelkey (2001)	
A. Unassisted interpretation	
B. Rely on respondents' views	
C. Compare against theory	
D. Compare cases in general	
E. Compare successes and failures	
F. Inferential statistics	

Table 9.
Research Quality Rating Schemes (Continued)

Research Rating Scheme

(Runkel & McGrath, 1972)

		Single Case (apply measures to one single case)	Population Census (Apply measure to all single cases)	Sampled Population (Generalize findings from measure of some single cases to population)
One Point In Time	Description (Evaluation of one characteristic)	1. Measure one characteristic for one case	2. Measure one characteristic for each case (descriptive summary only)	3. Measure one characteristic for each case in an appropriate sample (statistical inference)
	Relations (Association between 2 or more characteristics)	4. Measure two or more characteristics and list them for one case	5. Measure two or more characteristics for each case (descriptive summary only)	6. Measure two or more characteristics for each case in an appropriate sample (statistical inference)
Two or More Points in Time	Description	7. Measure one characteristic at two points in time within a single case	8. Measure one characteristic at two points in time for each case (descriptive summary)	9. Measure one characteristic at two points in time in an appropriate sample (statistical inference)
	Relations	10. Measure two or more characteristics at two points in time within a single case	11 Measure two or more characteristics at two points in time for each case (descriptive summary only)	12. Measure two or more characteristics at two points in time for an appropriate sample (statistical inference)

Table 10.
Water Outreach Project Research Quality Rating Scheme

Research Method & Characteristics
LR = Literature Review
R = Original Research
A. Sample size
1. Large
2. Small
3. Single case
B. Subject selection
1. Random sample
2. Census
3. Nonrandom sample
C. Presence & timing of observations
1. Pre-intervention, post-intervention, & long-term follow-up
1.5 Pre-intervention & post-intervention
2. Throughout intervention
2.5 Post-intervention
3. Pre-intervention
3.5 Single observation without intervention
D. Group Comparisons
1. Intervention group(s) to control group(s)
2. Among group(s)
3. Intervention groups(s) to theory
4. None
E. Characteristic Comparisons
1. Evaluations of associations between two or more characteristics
2. Evaluations of two or more characteristics
3. Evaluation of one characteristic
F. Description
1. Inferential statistics, descriptive statistics, & narrative text
2. Descriptive statistics & narrative text
3. Narrative text

Quality of studies

We based the findings, conclusions, and recommendations in this monograph on 96 of the 117 studies and reports we originally considered relevant. We dropped the other 21 studies from consideration when, after careful review, we observed that they did not provide evidence-based recommendations for audience-specific education or outreach.

We organized the study results by fourteen specific target audiences plus the general target audience, "adults" (see Table 6, Note 1). These fifteen target audiences are a revised subset of those listed in Table 6. They better reflect the availability of quality studies. Table 11 lists and describes the fifteen audiences, and identifies the *number of studies* relevant to each audience. Table 12 lists the *relevant studies* for each audience.

Quality of individual studies

We applied the rating scheme outlined in Table 10 to evaluate the research quality in the studies selected for our analysis. For each study, we looked specifically at portions of the research which led to education practice recommendations. The scheme rates the level of excellence for each of six *research characteristics* with numerical values between one (1) and four (4) as indicated in Table 10. In this scheme, we gave the strongest approach for each characteristic a score of 1. We gave the weakest approach a score of 3, 3.5, or 4 depending on the characteristic. To rate the overall quality of education practice research *for each study*, we summed the scores for the six research characteristics. A study with the highest level of research excellence would have an overall quality score of 6. A study with the lowest level of excellence would have an overall quality score of 19.5. Lower scores indicate higher research quality.

We classified studies with overall scores that range from 6 to 10.5 as Strong studies. Studies with scores from 11 to 15 are Moderate. Studies with scores from 15.5 to 19.5 are Weak.[12] Table 12 includes the scores for the 96 studies considered for our analysis. It also lists the average score of the studies relevant to each target audience. For example, in the group of studies addressing business and industry water users, we rated education practice research by Lowrie and Greenberg (1997) as 11.5. The average score for all studies reported in the business and industry water users category is 13.2.

Table 13 shows the distribution of overall excellence scores for all 117 studies originally considered for the analysis. Three quarters of the 117 studies were either Strong (37%) or Moderate (38%). Only 14% were Weak. Less than one in ten (9%) of the studies were not amenable to rating either because they were not based on research, the authors did not identify their research methods, or the research rating scheme did not apply to the nature of

[12] We used two criteria to establish the boundaries between the Strong, Moderate, and Weak groups of Overall-Excellence Scores. One was to maintain a relatively even distribution of scores among the three groups. The other was to create the boundary at a point of low frequency. Thus, at the strong end of Moderate, no study rated an Overall Excellence Score of 11. At the Weak end of Moderate, only one study rated a score of 15.

the work reported in the study. One study was an unrated literature review and one was a critique of another study included in our review.

We retained ten of the sixteen weak studies for our meta-analysis because of their overall contribution to understanding the relationship between the target audience and education strategies. We dropped the other six weak studies for reasons described earlier.

Overall quality of studies by target audience

Two factors informed our judgment of the overall quality of evidence for audience-specific BEPs for each target audience. One was the *average research quality* score for each audience. The other was the *number of references* identified for the target audience. Using one factor to judge the quality of audience specific BEP research in the absence of the other could be misleading.

For instance, we consider the BEP evidence for Households (Research Quality Score = 9.2 and No. of References = 8) to be stronger than the BEP evidence for Loggers (Research Quality Score = 9.0 and No. of References = 2). The rating of relative strength would be reversed if we only considered their relative Research Quality Scores.

Table 14 shows the overall quality of research for each audience in declining order of quality. Considering only the 96 studies or reports that were retained for analysis, research-based evidence for audience-specific BEPs was moderate or strong for all 15 audiences. The overall evidence was strong for 5 audiences: households, loggers, students in higher education and K-12, and aquaculture. There were no audiences for which the overall quality of research was weak. Our confidence in the evidence for audience specific BEPs is highest for Households and Farmers because of the combination of a higher number of references with higher overall research quality for these two audiences.

Table 11.
Specific target audiences, descriptions, and number of studies

Audience	Studies No	Studies %	Description
Adults	1	1.0%	All people ages 20 and up. This is a catch-all group.
Aquaculture business	1	1.0%	Individuals who use various technologies for raising fish and shellfish for sale
Business/ Industry water users	5	5.1%	Managers and staff members who have control over services and processes that use water either directly or indirectly in a way which may change water supply or quality
Decision-makers, local	2	2.0%	People who provide recognized leadership in the community whether in elected, appointed, salaried, or volunteer positions
Ethnic groups* (2 also summarized under farmers; 1 also summarized under recreational water users)	4	4.0%	A population from a specific ethnic or cultural group
Farmers	37	37.0%	People who work on the land to grow and produce food, animal feed, or other consumer products; and business professionals who support agricultural production
Government agency/ University Extension professionals	3	3.0%	Planners and outreach educators who work for government or a land grant university and lead water-related outreach initiatives with groups
Homeowners	5	5.1%	People who have ownership and responsibility for care and maintenance of property on which their home is located
Households	8	8.1%	Personal space of individuals and families
Landowners	10	10.1%	People who own property and use it for residential, recreational, forestry, or agricultural purposes. People who work the land, such as farmers or loggers, are described as separate target audiences.
Loggers	2	2.0%	People who are employed in the commercial logging industry
Recreational water users	7	7.1%	Adults and youth who engage in fishing, boating, and other recreational activities on or near bodies of water
Students, higher education	2	2.0%	Students engaged in post-secondary, formal education
Students, K-12	4	4.0%	Youth engaged in formal, elementary and secondary education programs
Teachers	8	8.1%	Professionals who provide a structured education experience for youth at the elementary and secondary education levels
*TOTAL (with 3 counted twice)	99	100%	

Table 12.
Studies selected for best practices analysis, organized by audience

Audience (number of references)	**Supporting Reference (*N* = 96)**	**Research Quality Score**[13]
Adults (1)	Iams & Marion (1991)	12.5
Average of research quality		***12.5** (moderate)*
Aquaculture (1)	Caffey & Kazmierczak (1994)	10.5
Average of research quality		***10.5** (strong)*
Business & Industry Water Users (5)	Boiarsky, Long, & Zimmerman (1999)	12.5
	de Bruijn & Hofman (2000)	12.5
	Lowrie & Greenberg (1997)	11.5
	McKenrick, Ii, Lawrence, Kaufmann, & Marshall (2003)	12.5
	Zipper & Rockett (1997)	17
Average of research quality		***13.2** (moderate)*
Local Decision Makers (2)	Berry, Markee, Steward, & Giewat (1996)	14.5
	Leach & Pelkey (2001)	14.5 (LR)[14]
Average of research quality		***14.5** (moderate)*
Ethnic Groups (4)	Burger & Waishwell (2001)[15]	10.5
	Napier & Sommers (1996)[16]	9
	Ryan, Mathew, Anda, & Yuen (2001)	16.5
	Sommers & Napier (1993)[17]	9.5
Average of research quality		***11.4** (moderate)*
Farmers (37)	Al-Jamal, Samis, & Ball (2001)	11.5
	Ashby, Beltrán, Guerrero, & Ramos (1996)	13.5
	Bosch, Cook, and Fuglie (1995)	7.5
	Cameron-Howell (1992)	8.5
	Contant & Young (1990)	11.5
	Cooper, Giebink, & Olson (1995)	13.5
	Feather & Amacher (1994)	13

[13] The studies were rated using a categorical scheme described in the narrative. The Research Quality Score is the sum of the category ratings for each study. Possible scores range from strongest = 6.0 to weakest = 19.5.
[14] LR = literature review
[15] Also rated under Recreational Water Users
[16] Also rated under Farmers
[17] Also rated under Farmers

Audience (number of references)	Supporting Reference (*N* = 96)	Research Quality Score[13]
	Grudens-Schuck (2000)	16.5
	Holsman & Krueger (2002)	8.5
	Knox, Jackson, & Nevers (1995)	11.5
	Kraft, Lant, & Gillman (1996)	12
	Kromm & White (1991)	11.5
	Lanyon, Kiernan, & Stolzfus (1996)	12.5
	Lefko, Rice, and Pedigo (1999)	8.5
	Mullan, Gardiner, Rosenman, Zhu, & Swanson (1996)	6.5
	Murray and Butler (1994)	16
	Napier & Bridges (2002)	7.5
	Napier & Johnson (1998); "Awareness . . ."	7.5
	Napier & Johnson (1998); "Impacts . . ."	9.5
	Napier, Robinson, & Tucker (2000)	9.5
	Napier & Sommers (1996)	9
	Nelson & Trede (2000)	12.5
	Nowak, O'Keefe, Bennett, Anderson, & Trumbo (1997)	6.5
	Padgitt (1989)	13
	Padgitt (1990)	12.5
	Petrzelka, Korsching, & Malia (1996)	13.5
	Petrzelka, Padgitt, Connelly, & Miller (1995)	7.5
	Petrzelka, Padgitt, & Miller (1994)	9.5
	Pompelli, Morfaw, English, Bowling, Bullen, & Tegegne (1997)	11.5
	Rhodes, Leland, & Niven (2002)	10.5
	Ribaudo & Horan (1999)	19.5 NA[18] (economic modeling)
	Salamon, Farnsworth, Bullock, & Yusuf (1997)	12.5
	Shepard (1999)	8.5
	Sommers & Napier (1993)	9.5
	Stanley (1992)	15

[18] NA = research criteria were not applicable; theoretical work applied in this study did not use the research model described by our criteria

Audience (number of references)	Supporting Reference (*N* = 96)	Research Quality Score[13]
	Trede & Miller (2000)	15.5
	Tucker & Napier (2001)	9.5
Average of research quality		***11.2** (moderate)*
Government Agency & University Extension Professionals (3)	Duram & Brown (1999)	14.5
	Gerakis (1998)	8.5
	Miller & Smith (1991)	13.5
Average of research quality		***12.2** (moderate)*
Homeowners (5)	Dietz, Clausen, Warner, & Filchak (2002)	8.5
	Mechenich & Shaw (1994)	12.5
	Schwartz, Waterman, Lemley, Wagenet, Landre, & Allee (1998)	11.5
	Shay (2003)	18.5
	Varlamoff, Florkowski, Jorday, Latimer, & Braman (2001)	13.5
Average of research quality		***12.9** (moderate)*
Households (8)	Dwyer, Lemming, Cobern, Porter, & Jackson (1993)	8.3 (LR)
	Gamon, Roe, & Campbell (1994)	13.5
	Harding & Anadu (2000)	9.5
	Howard & McGregor (2000)	7.5
	Michelsen, McGuckin, & Stumpf (1999)	12.5
	Poe, van Es, VandenBerg, & Bishop (1998)	7.5
	Wagenet, Pfeffer, Sutphin, & Stycos (1999)	7.5
	Watson, Murphy, Kilfoyle, & Moore (1999)	7
Average of research quality		***9.2** (strong)*
Landowners (10)	Cobourn & Donaldson (1997)	14.5
	Constance, Rikoon, & Ma (1996)	9.5
	Curtis & DeLacy (1995)	13.5
	Force & Bills (1989)	8.5
	Howell & Habron (2004)	9
	Johnson & Jacobs (1994)	14.5
	Newton (2001)	20 (NR)[19] (experience summary)
	Ransley (2003)	14.5

[19] NR = not research

Audience (number of references)	Supporting Reference (*N* = 96)	Research Quality Score[13]
	Voege & Wagner (1997)	17.5
	Wolf (1995)	16.5
Average of research quality		***13.8** (moderate)*
Loggers (2)	Davis & Clatterbuck (2003)	8.5
	Shaffer & Meade (1997)	9.5
Average of research quality		***9.0** (strong)*
Recreational Water Users (7)	Burger & Waishwell (2001)	10.5
	Fedler (2001) "An Examination of . . ."	10 (LR)
	Fedler (2001) "Fishing, Boating and Aquatic . . " in Defining Best Practices . . .	17.5
	Holsman (2001)	13
	House & Fordham (1997)	15.5
	Pflugh, Shaw, Yacovelli, & Hagen (1995)	15.5
	Siemer & Knuth (2001)	9.5
Average of research quality		***13.1** (moderate)*
Students, Higher Education (2)	Dresner (1989/90)	9.5
	Ryder & Swoope (1997)	10
Average of research quality		***9.8** (strong)*
Students, K-12 (4)	Fortner & Lahm (1990)	8.5
	Fortner & Mayer (1991)	8.5
	Milton & Cleveland (1995)	10.5
	Zint, Kraemer, Northway, & Lim (2002)	7.5
Average of research quality		***9.8** (strong)*
Teachers (8)	Beiswenger, Sturges, & Jones (1991)	14.5
	Brody (1995)	9.5
	Dijksterhuis (1996)	12.5
	Fackler (2003)	12
	Fortner & Corney (2002)	8.5
	May (2000)	15.5
	Talsma (2001)	14.5

Audience (number of references)	**Supporting Reference (*N* = 96)**	**Research Quality Score[13]**
	Wood (2001)	11.5
Average of research quality		***12.3** (moderate)*

Table 13.
Target audience Literature Review Study Strength Evaluation

Type of Evidence STUDY STRENGTH	Score for Overall Research Excellence	Number of Reference Studies
Research		
STRONG	6	0
	6.5	2
	7	1
	7.5	9
	8	0
	8.5	12
	9	2
	9.5	11
	10	2
	10.5	4
Subtotal		*43*
MODERATE	11	0
	11.5	11
	12	2
	12.5	11
	13	3
	13.5	9
	14	0
	14.5	8
	15	1
Subtotal		*45*
WEAK	15.5	5
	16	2
	16.5	4
	17	1
	17.5	2
	18	0
	18.5	1
	19	0
	19.5	1
Subtotal		*16*
Research Subtotal		***104***
Not Applicable (N/A), Not Indicated (N/I), & Not Research (N/R)		11
Literature Review (L/R)		1
Research Critique		1
Total		**117**

Table 14.
Audiences in declining order of research quality

STRENGTH Audience	No of Supporting References[20]	Research Quality Score
STRONG		
Households	8	9.0
Loggers	2	9.2
Students, Higher Education	2	9.8
Students, K-12	4	9.8
Aquaculture	1	10.5
MODERATE		
Farmers	37	11.2
Ethnic Groups*	4	11.4
Government Agency & University Extension Professionals	3	12.2
Teachers	8	12.3
Adults	1	12.5
Homeowners	5	12.9
Recreational Water Users	7	13.1
Business and Industry Water Users	5	13.2
Landowners	10	13.8
Local Decision Makers	2	14.5

*Two of these studies are also listed with farmer studies and one is listed with recreational water user studies.

[20]Three studies considered for Farmers were used also for Ethnic Groups. As a consequence of this duplication, the number of supporting references counted here totals 99 rather than 96.

Strategy for organizing information

To better understand the information gathered through the meta-analysis process, the authors independently reviewed findings from each study to identify study-specific best education practices (BEPs). We collected the findings, identified the outreach or education recommendation related to each finding or group of findings, then converted each recommendation into a positive statement describing an education practice recommendation or BEP. Although we have documented specific findings we used to develop each BEP (see Appendix D), we often referred to study details when writing the BEP in order to provide a full flavor of the authors' work.

For example, De Bruijn and Hofman (2000) looked at factors that contribute to successful pollution prevention by small and medium-sized enterprises. Here are several findings from their study:

- Pollution prevention assessment methods have shifted from *internal projects* to quick-scan methods conducted by *external* partners.
- The amount of time invested in pollution assessment by the company is positively correlated to the quality of options produced.
- Most companies indicated a positive relationship between knowledge and pollution prevention
- A majority of companies followed up on the results of the *external* assessment, but most did not use the assessment method again themselves.

We combined our understanding of these findings with any similar findings from the four other studies we identified for this audience to develop the following BEP for the business and industry water user target audience (Boiarsky, Long, et al, 1999; Lowrie & Greenberg, 1997; McKenrick, Ii, et al, 2003; Zipper & Rockett, 1997).

- Emphasize company commitment to pollution prevention activities and investment of adequate time and money. Self-assessment has produced measures of superior quality to those produced by quick-scan methods completed by a consultant. When companies invest more time in the pollution prevention project, the options produced are better tailored to the company and likely to have a more profound impact.

We analyzed study-specific BEPs for a particular audience in two ways: (1) we grouped BEPs according to seven outreach themes that emerged from our review; (2) we compared each study-specific BEP to classic education techniques (described as *Essential* BEPs in this project) shown to be effective through decades of basic research about how people learn and change (National Extension Water Outreach Education, 2004a).

Outreach themes used to sort research findings are: audience information; message content; message delivery vehicle; outreach strategy; public participation; evaluation.

Essential BEP categories used to sort research findings are: for every education or learning situation; for the individual; for the group; for web-based learning; for the community; beyond the community.

The process we applied to organize findings from 96 studies, requires us to generalize findings that are most accurately applicable only to the situation that was studied. While we believe that educators will find these generalized results very useful in their pursuit of quality education practices, we echo a caution articulated by Rickinson (2001) to remember that findings must be considered in relation to the nature, aims, and context of the particular initiatives that were studied. Speaking about results reported in his review of environmental education research about primary and secondary audiences (ages 4 – 18), Rickinson explains: "That is, they are not necessarily generalisable ingredients for success for any programme of environmental education, but characteristics that yield differences for particular programmes."

Study audiences description

Table 15 describes the outreach themes and categories for grouping recommendations. Two of the seven themes, "message content" and "message delivery," are subsets of the outreach strategy theme, but were so commonly studied that it was useful to distinguish findings for each.

Seven of the audiences we selected were described by five or more studies. This provided enough variety to see repetition of conclusions and an interesting diversity of research questions.

Farmers were the most widely studied audience (see Table 11). Thirty-seven (37) studies examined farmer education preferences and behavior. Farmer studies covered three major geographical areas across the U.S. and Canada. The largest percentage of studies focused on farmers in the central states and provinces of the North American continent (16 states and provinces). Other regions represented in the studies included western states (Washington, Oregon, California, Nevada, and New Mexico) and southeastern states (Maryland, Virginia, North Carolina, and Florida). Crops or commodities were not identified in most studies.

Landowners were the next most studied group identified for this analysis (10% of the studies). The biggest gaps in our search for studies of target audiences of interest to water educators are: ethnic groups (4%), local decision-makers (2%), loggers (2%), and Kindergarten through post-graduate students (6%).

There are many sources of information about training students and teachers. We deliberately excluded students and teachers from the audiences included in our key-word searches (see Table 8, concept 5). We included the studies of students and teachers reported here based on their match with key words used for the other concepts. Studies reported in this analysis focus on standard research questions for these audiences, but only as they relate to water education.

Research comparison to outreach themes

For each audience, we listed all education practice recommendations generated by the studies, grouped the list by theme, and collapsed the list for each theme by eliminating duplicate points. Table 16 uses Landowner BEPs to provide an example of how we summarized study recommendations for a particular audience according to themes. Study-Appendix C provides study-specific BEPs for all 15 audiences.

Chart 1 graphs the relative presence of each theme in studies for a particular audience. For example, research of aquaculture businesses, loggers, and students in higher education addressed only the "outreach strategy" theme. In contrast, research about business and industry water users addressed four themes: "audience information", "message content", "message delivery vehicle", and "outreach strategy".

Six of the target audiences provided recommendations for at least four themes and were each described by five or more studies. These were: business and industry water users, farmers, households, landowners, recreational water users, and teachers (as listed in Table 17). Water educators have a broad choice of information for these six. Recommendations for each supply useful suggestions for how to provide effective outreach, communication, and training.

Audiences with fewer studies generally provided recommendations for a smaller number of themes, when taken as a group. Audiences in this group are: adults,, aquaculture business, local decision-makers, ethnic groups, government agency/University Extension professionals, loggers, and students in both higher education and K-12 (see Table 17). As mentioned earlier, the smaller number of studies for these audiences also affects the credibility of the recommendations. For these audiences, there is not enough research-based information or information about multiple themes to provide comprehensive recommendations for how to provide effective outreach. Recommendations we gathered for each of these audiences are supported by moderate or strong research, however, and may be regarded as good advice.

Limited, but credible information is available for the homeowner audience. Homeowners were investigated in five studies, but results addressed only three of the study themes. Chart 2 presents the overall frequency of study themes in a comparative format. Four themes appeared in findings for at least six of the audiences. These themes were: "audience information", "message content", "message delivery vehicle", and "outreach strategy". Three additional themes appeared in a few studies. These were "public participation", "supporting and motivating professionals", and "evaluation".

Table 18 provides the statistics used to generate the study theme analysis in Charts 1 and 2. This representation more finely illustrates the relative strength or weakness of research for each audience as compared to a particular theme. Only the *outreach strategy theme* is consistently represented in research for most audiences (all but adults and homeowners). Nearly 7 out of every 10 (68%) of the studies addressed this theme. On average 60% of the studies for each audience addressed the outreach theme. In contrast, "audience

information", "message content", and "message delivery" themes were addressed by 30%, 17%, and 8% of all studies, respectively. "Public participation", "supporting professionals", and "evaluation" themes were addressed by only 5%, 6%, and 5% of all studies.

Table 15.
Research themes and findings analysis

Study Themes	Definition	Findings summary categories
Audience information	Development and use of information about a target audience	1) Determination of audience interests and needs 2) Use of audience information
Message content	What information to provide	1) Specific content to convey 2) Content frame or perspective
Message delivery vehicle	How to effectively convey information to the target audience	1) Communication system for message delivery
Outreach strategy	How to provide education that leads to measurable impacts	1) Design components a. Quality – provide a clear purpose; pilot test b. Stability – frequent opportunities sustained over time c. Access – inclusive, accessible, all interested audiences can participate d. Connection – involve stakeholders and partners e. Program – adapted to particular audience or topic needs f. Marketing – how audiences know about the opportunity 2) Implementation a. Management – to assure smooth operation b. Relevant instructional strategies c. Recognition of contributors
Public participation	How participation in environmental decision-making contributes to measurable change	1) When to use 2) What type to use in given context
Supporting and motivating professionals	How to help professionals to be more effective in water education work	1) How to support professionals 2) Impacts
Evaluation	How to develop and use evaluation to improve the quality of water outreach	1) What to measure 2) How to use results

Table 16.
Research recommendations for education practice with landowners

Outreach Categories	Landowner Research BEP Recommendations

Audience information	• In landowner or renter situations:
	  ○ Determine which role is primarily responsible for water quality or conservation decisions
	  ○ Identify factors that may influence the person who could take action
	  ○ Understand "opportunity costs" and social norms relative to the content or practice focus of the outreach
	• Identify characteristics of landowners that could influence interest in conservation practices
	• Match the information technology delivery mechanism to the computer work style of the landowner. How does the landowner already use the computer the landowner?

Message content	• Keep the message simple • Include information that shows how the message affects landowners personally and what specific actions landowners can take to improve the situation • Acknowledge landowner interest and concern for the quality of their land • Be aware of the boundary between education and advocacy • Emphasize local elements of control • Link conservation, stewardship, and watershed topics to a particular place on the owner's land • Provide clear information about goals and plans for land parcels • Provide regular feedback about how well goals and plans have been achieved
Message delivery vehicle	• Provide agriculture landowners with written materials in addition to whatever other communication methods are selected • Trusted individuals can deliver messages effectively
Outreach strategy	• Base your program design on specifically identified needs • Base the outreach or education process on mutual

Outreach Categories	Landowner Research BEP Recommendations

	understanding, trust, and respect that leads landowners to choose to comply because they see it in their best interest
	• Emphasize an "integrated" program that provides a continuum of information, communication, and education resources
	• Engage audience in planning
	• Tap into indigenous knowledge of local land stewards, especially since recommended, best-bet practices may have uncertain results in local application
	• Use a variety of outreach methods, with each targeted at specific, desired behaviors
	• Plan for the time it takes to adopt new ideas
	• Be aware of the boundary between education and advocacy
	• Be aware of the larger political issues and contexts in which water quality outreach and education take place (such as legislative requirements).
	  ○ Identify and communicate potential areas for measurable change
	  ○ Emphasize local elements of control

Public participation	• Create opportunities to build landowner participation in the activities of landowner groups • Provide groups with training to help develop leadership and organization skills
Supporting and motivating professionals	No research available
Evaluation	• Make time for continuous evaluation in order to best determine next steps • Provide clear information about goals and plans • Provide regular feedback about how well goals and plans have been achieved

CHART 1 -- Target Audience Research Summary

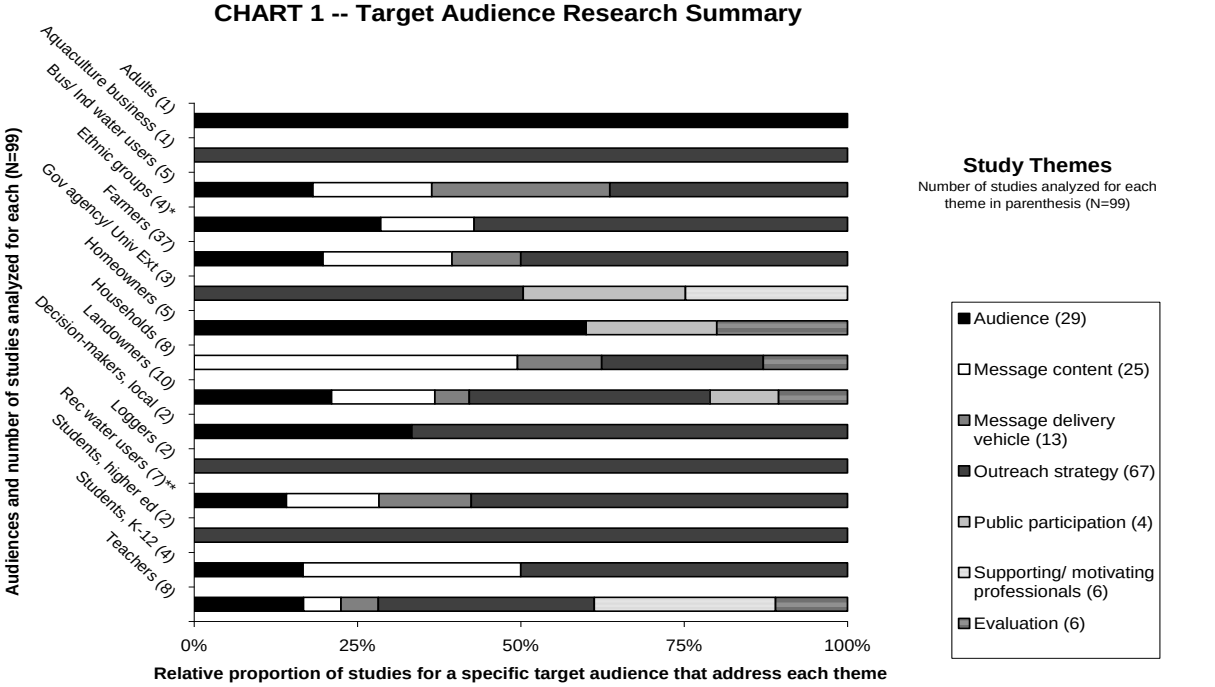

CHART 2 -- Study Theme Analysis

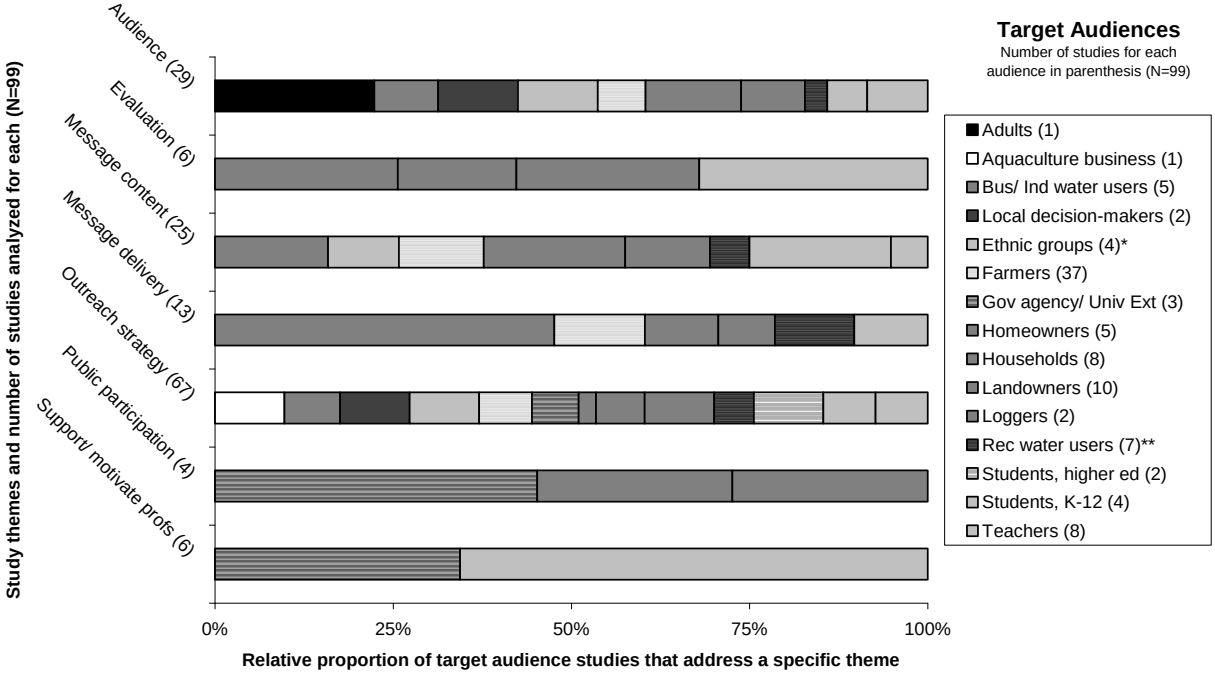

Table 17.

Findings concentrations in target audience studies

Audiences with 5 or more studies, addressing 4 or more themes:	Audiences with fewer studies and addressing fewer themes:
Business and industry water users	Adults
Farmers	Aquaculture business
Households	Decision-makers, local
Landowners	Ethnic groups
Recreational water users	Government agency/ Univ. Extension professionals
Teachers	Loggers
	Students, higher education
	Students, K-12

NOTE: Homeowners were investigated in 5 studies, but results addressed only 3 of the study themes.

Table 18.

Number and percent of research studies about a specific target audience that address each theme

Target Audience N = 99 (95 studies + 4 reviewed in two categories)	**Audience**		**Message content**		**Message delivery vehicle**		**Outreach strategy**		**Public participation**		**Supporting/ motivating professionals**		**Evaluation**	
Adults (1)	1	100 %	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Aquaculture business (1)	0	0%	0	0%	0	0%	1	100 %	0	0%	0	0%	0	0%
Business/ Industry water users (5)	2	40%	2	40 %	3	60%	4	80%	0	0%	0	0%	0	0%
Decision-makers, local (2)	1	50%	0	0%	0	0%	2	100 %	0	0%	0	0%	0	0%
Ethnic groups (4) 3 of these are also summarized under other audiences	2	50%	1	25 %	0	0%	4	100 %	0	0%	0	0%	0	0%
Farmers (37)	11	30%	11	30 %	6	16%	28	76%	0	0%	0	0%	0	0%
Government agency/ University Extension professionals (3)	0	0%	0	0%	0	0%	2	67%	1	33%	1	33%	0	0%
Homeowners (5)	3	60%	0	0%	0	0%	0	0%	1	20%	0	0%	1	20%
Households (8)	0	0%	4	50 %	1	13%	2	25%	0	0%	0	0%	1	13%
Landowners (10)	4	40%	3	30 %	1	10%	7	70%	2	20%	0	0%	2	20%
Loggers (2)	0	0%	0	0%	0	0%	2	100	0	0%	0	0%	0	0%

Target Audience N = 99 (95 studies + 4 reviewed in two categories)	**Audience**		**Message content**		**Message delivery vehicle**		**Outreach strategy**		**Public participation**		**Supporting/ motivating professionals**		**Evaluation**	
Recreational water users (7)	1	14%	1	14 %	1	14%	4	57%	0	0%	0	0%	0	0%
Students, higher education (2)	0	0%	0	0%	0	0%	2	100 %	0	0%	0	0%	0	0%
Students, K-12 (4)	1	25%	2	50 %	0	0%	3	75%	0	0%	0	0%	0	0%
Teachers (8)	3	38%	1	13 %	1	13%	6	75%	0	0%	5	63%	2	25%
AVERAGE of % FOR SPECIFIC AUDIENCES		**26%**		**15 %**		**7%**		**60%**		**4%**		**6%**		**5%**
% of ALL STUDIES		**30%**		**17 %**		**8%**		**68%**		**5%**		**6%**		**5%**
TOTAL STUDIES	**29**		**25**		**13**		**67**		**4**		**6**		**6**	

Research comparison to *Essential* Best Education Practices

We sorted and examined study-specific recommendations according to *Essential* BEPs. For purposes of the water outreach project, we classify *Essential* BEP techniques in four categories according to recommendations for: individuals, groups, communities of interest, and audiences beyond the community. Sorting the research recommendations in this way provided audience-specific suggestions for how to accomplish these classic learning and behavior change techniques. Appendix D summarizes audience-specific examples for each *Essential* BEP point.

As an example, we compared the finding that:

> *Programs for recreational water users "need to provide participants with opportunities to engage in the valuing process (i.e. choosing, affirming, and acting) as it relates to programs, program activities, and their own growth and development*

with this Essential BEP.

> *For the individual: the learning experiences relates to the individual's level of physical, intellectual, emotional, and social development*.

We counted presence and absence of references using the audience-specific examples in Appendix D to develop Tables 19-22. Each table covers one of the four categories of *Essential* BEPs. Tables 19-22 show the numbers of study references by audience for each *Essential* BEP point. We used this comparison to identify strengths and gaps for both aspects of the matrices: the *Essential* BEPs (left column) and the audiences (top row).

To determine the strength of presence of *Essential* BEPs in study findings, we tabulated the total number of *audience*s which reported findings for each point, as well as tabulating the total number of *examples* reported for each point. A case in point, research for 3 audiences provided 31 research-specific recommendations for the following *Essential* BEP listed in Table 19:

> *For the individual: the learning experience is learner centered, and consequently* ***relates to personal interest and provides for personal choice and control***;

Perhaps more importantly, we measured the frequency of audience BEP recommendations for each Essential BEP point. This type of tabulation allows us to identify gaps in research about particular audiences.

Grayed sections in Tables 19-22 indicate gaps in audience-specific research; that is, a gray column indicates an audience where there are few or no recommendations for an Essential BEP classification (Individuals, Groups, Communities, and Audiences beyond the Community). Gaps exist for audiences where audience studies addressed 2 points or less. In Table 20, for example, the homeowner column shows that research generated only one recommendation relevant to "Essential BEPs for the individual" (marked as a gray column) while research for 11 of the other 14 audiences generated 131 examples.

Table 19.

*Target audiences study references to Essential Best Education Practices for the **individual***

Audience ( ) = Number of recommendations from the findings summary that are related to this statement / **Best Education Practice for the individual** (17 categories and subcategories)	Adult	Aquaculture	Business & Industry Water User	Decision Makers, Local	Ethnic Groups	Farmers	Gov't Agency/ Univ Ext Prof	Homeowners	Households	Landowners	Loggers	Recreational Water Users	Students, Higher Ed	Students, K-12	Teachers	**TOTAL: Audiences (Examples)**
The learning experience:																
▪ Has a clear purpose with tightly focused outcomes and objectives											(1)	(1)		(1)		**3(3)**
▪ Is learner centered, and consequently:												(1)				**1(1)**
○ Assesses the learner in order to set appropriately high and challenging standards.							(1)				(1)			(1)		**3(3)**
○ Relates to the individual's level of physical, intellectual, emotional, and social development.						(1)						(2)				**2(3)**
○ Can be adapted to individual differences in learning strategies and approaches.						(5)								(1)		**2(6)**
○ Relates to personal interests and provides for personal choice and control.					(1)	(29)						(1)				**3(31)**
○ Encourages the learner to set meaningful learning goals and to take personal responsibility for their own learning.						(6)			(4)	(2)		(2)		(1)		**5(15)**
▪ Promotes active engagement and real world problem solving.					(2)	(3)		(1)	(1)	(1)		(2)	(1)	(2)		**8(13)**
▪ Enables the learner to link new knowledge to their existing knowledge in meaningful ways.						(1)			(1)			(3)	(1)	(1)	(1)	**6(8)**
▪ Builds thinking and reasoning skills – analysis, synthesis, evaluation, and problem solving – that learners can use to construct and apply their knowledge.						(1)						(1)	(1)			**3(3)**
▪ Presents a new behavior or skill by:																
○ Demonstrating its similarity to a current behavior or skill.			(1)						(2)							**2(3)**
○ Relating the new behavior to current social practices.						(6)			(2)							**2(8)**
○ Demonstrating ease of adoption in terms of time, effort and money.			(1)			(3)			(3)							**3(7)**
▪ Provides a *nurturing context* for learning, with attention to: cultural or group background and influences, the physical environment, and the use of tools or practices appropriate to learner skills and abilities.						(3)	(1)		(1)	(2)		(4)			(4)	**6(15)**
▪ Provides opportunities for extended effort and practice.					(1)	(3)			(1)		(1)	(3)		(1)	(1)	**7(11)**
▪ Builds on positive emotions, curiosity, enjoyment, and interest.														(1)		**1(1)**
▪ Allows a learner to interact and collaborate with others on instructional tasks.													(1)			**1(1)**
TOTAL: # of categories/subcategories address (examples)	**0**	**0**	**2 (2)**	**0**	**3 (4)**	**11 (61)**	**2 (2)**	**1 (1)**	**8 (15)**	**3 (5)**	**3 (3)**	**10 (20)**	**4 (4)**	**8 (9)**	**3 (6)**	**58 (132)**

Grayed columns indicate audiences where there is little reported research about BEPs for the individual

Table 20. *Target audiences study references to Essential Best Education Practices for the **class or group***

Best Education Practice for the class or group (10 categories) / **Audience** ( ) = Number of recommendations from the findings summary that are related to this statement	Adult	Aquaculture	Business & Industry Water User	Decision Makers, Local	Ethnic Groups	Farmers	Gov't Agency/ Univ Ext Prof	Homeowners	Households	Landowners	Loggers	Recreational Water Users	Students, Higher Ed	Students, K-12	Teachers	**TOTAL: Audiences (Examples)**
The learning experience:																
▪ Is based on and shaped by some form of needs assessment and use of a planning model (such as the logic model)								(1)				(1)			(1)	**3(3)**
▪ Is designed to focus on a targeted audience and is built on an understanding of audience skills and interests	(1)	(1)	(6)	(1)	(1)	(15)	(1)		(1)	(7)		(5)				**10(39)**
▪ Content and delivery is determined in cooperation with the target audience and stakeholders						(15)	(2)			(2)					(4)	**4(23)**
▪ Is relevant to and accessible by people with diverse backgrounds and influences.	(1)	(1)			(3)	(1)						(2)				**5(8)**
▪ Presents accurate and balanced information, incorporating many different perspectives						(7)				(1)						**2(8)**
▪ Incorporates methods for assessing the value of the experience, especially as it relates to desired outcomes			(1)					(1)	(2)	(1)		(1)			(3)	**6(9)**
▪ Is facilitated by quality instructors who have been trained in effective teaching methods and are supported by the program sponsor							(1)		(1)			(2)			(11)	**4(15)**
▪ Uses creative approaches						(6)								(1)		**2(7)**
▪ Values lifelong learning						(6)						(2)				**2(8)**
▪ Builds environmental literacy o Questioning and analysis skills o Knowledge of environmental processes and systems o Skills for understanding and addressing environmental issues o Personal and civic responsibility														(1)	(2)	**2(3)**
▪ Builds from key principles underlying environmental education: o Systems and interdependence are characteristics of the biological and natural order o Natural sciences, social sciences, and humanities disciplines contribute to understanding of the environment and environmental issues o Learner connections to immediate surroundings provide a base for understanding larger systems, broader issues, causes and consequences														(1)	(1)	**2(2)**
TOTAL: # of categories/subcategories address (examples)	**2 (2)**	**2 (2)**	**2 (7)**	**1 (1)**	**2 (4)**	**6 (50)**	**3 (4)**	**2 (2)**	**3 (4)**	**4 (11)**	**0**	**6 (13)**	**0**	**3 (3)**	**6 (22)**	**42 (115)**

Grayed columns indicate audiences where there is little reported research about BEPs for the class or group.

Table 21.

*Target audiences study references to Essential Best Education Practices for the **community***

Best Education Practices for the community (12 categories) / **Audience** ( ) = Number of recommendations from the findings summary that are related to this statement	Adult	Aquaculture	Business & Industry User	Decision Makers, Local	Ethnic Groups	Farmers	Gov't Agency/ Univ Ext Prof	Homeowners	Households	Landowners	Loggers	Recreational Water Users	Students, Higher Ed	Students, K-12	Teachers	**TOTAL: Audiences (Examples)**
The learning experience:																
▪ Evolves from work with a coalition or group			(2)	(1)			(1)	(4)		(1)						**5(9)**
▪ Supports a person who takes responsibility for managing or leading the process, and relies on quality group planning and facilitation techniques			(2)	(1)												**2(3)**
▪ Relates to long-term community vision and goals																**0**
▪ Takes into consideration the community as a whole, including: socio-political, economic, historical, and cultural influences						(3)				(1)		(2)			(1)	**4(7)**
▪ Builds on locally existing skills and resources				(2)		(3)				(2)						**3(7)**
▪ Is flexible in response to both process and conditions			(1)	(1)		(3)				(2)						**4(7)**
▪ Generates and makes use of data about the local condition			(3)			(7)		(4)	(2)			(1)				**5(17)**
▪ Provides training to increase skills needed to accomplish goals identified by the group			(2)	(2)	(1)			(4)		(1)					(1)	**6(11)**
▪ Takes place close to the location where people practice a behavior of concern					(1)	(1)				(2)						**3(4)**
▪ Builds effectiveness through linkages to other communities, partners, and resources			(2)	(1)						(3)		(1)				**4(7)**
▪ Reaches people in multiple ways						(2)	(3)		(2)		(1)					**4(8)**
▪ Provides participants with feedback about the results of their actions							(2)		(1)	(2)						**4(5)**
TOTAL: # of categories/subcategories address (examples)	**0**	**0**	**6 (12)**	**6 (8)**	**2 (2)**	**6 (12)**	**3 (6)**	**3 (12)**	**3 (5)**	**8 (14)**	**1 (1)**	**3 (4)**	**0**	**0**	**2 (2)**	**43 (85)**

Grayed columns indicate audiences where there is little reported research about BEPs for the community.

Results

Research strengths and gaps

This section summarizes the principal findings across **all** studies for *outreach themes*[21] and for each *Essential BEP*.[22] To build on our presentation of data in Charts 1 and 2 and Table 18, we grouped and summarized research recommendations by theme in Tables 23-29 and by *Essential* BEPs in Tables 30-33. To create the tables, we followed a procedure similar to the one followed to group recommendations from individual studies by audience and themes (described in "Strategy for organizing information, p. 28).

We describe results for each of the seven themes and four *Essential* BEP categories in the following sections. Looking at the body of research as a whole, there is an abundance of quality education practice advice for educators for each of the themes. But there is more to be learned about each theme when a particular audience is considered; and more study needed of "public participation," "supporting and motivating professionals," and "evaluation" for all audiences. Classic best education practices, generally, are represented well throughout water outreach and education literature. We did not find any research-based practice recommendations for Internet-based learning in our research. Hence, there are no study recommendations that reference BEPs for outreach via the Internet. This is a large gap in the research that needs to be filled. More study is needed as well for the four *Essential* BEP categories in Tables 30-33 for most audiences.

Refer to Tables 11 and 15 respectively for definitions of each audience and study theme. Audience-specific research lists in Appendix C summarize recommendations for all audiences by each theme. See Appendix D for definitions of Essential BEPs and a point by point summary of audience-specific research findings.

Outreach themes

The use of themes to analyze target audience research allows us to investigate the applicability of the themes to water education needs and to draw general conclusions about research needs of strategic relevance to water educators. Tables 23-29 summarize findings about:

- Audience information (Table 23)
- Message content (Table 24)
- Message delivery (Table 25)
- Outreach strategy – design and implementation (Table 26)
- Public participation (Table 27)
- Supporting and motivating professionals (Table 28)
- Evaluation (Table 29)

[21] For explanation see Table 15, p. 32, and pp. 43-51
[22] For explanation see Tables 19-22, pp. 38-41; pp. 53-59 and Appendix C

Audience Information

The principal findings for this theme are listed in Table 23. Most target audiences (10 out of 15) had study findings that addressed the *audience information* theme. There are no recommendations for general adult audiences, aquaculture business, government agency/University Extension professionals, households, loggers, and students in higher education (see Table 18).

In general, the findings recommended that natural resource and outreach professionals determine the interests and needs of their specific audiences and how they will use that information in planning their outreach and education programs. The recommendations provide educators with a starting point for understanding ten audiences. They also provide multiple models for what questions to ask and how to gather this information.

Table 23.
Principal findings across all studies: ***Audience Information*** *theme*

Audience Information – Findings grouped by category

Audience Information

1) Determination of audience interests and needs
- Create "involvement structures" (such as a Board) that are place-specific
- Assess:
  - Audience concern
  - Culturally-specific or group-specific interests and preferences
  - Preferences for receiving information
  - Preferred training methods
  - Knowledge and skills
  - Direct experience with the information or technique
- To gauge opinion, use direct surveys instead of relying on stakeholders

2) Use of audience information
- Gauge opinions at an early stage of planning
- Link new information to what people know already
- Assure that the outreach program is relevant to specific audience abilities and needs
- Pay attention to unique factors of cultural groups
  - Individual and socio-economic characteristics, especially as they relate to the proposed activity
  - Local issues and context that may affect priorities

Message content

The principal findings for this theme are listed in Table 24. Eight of the target audiences had study findings that addressed the *message content* theme. There are no audience-specific recommendations for general adult audiences, aquaculture business, local decision-makers, government agency/University Extension professionals, homeowners, loggers, or students in higher education. For the eight audiences for which this was addressed, 30% of the studies (25 of 83) addressed the topic.

Principal findings provided general recommendations for the content of education and outreach messages. The findings also suggest characteristics for more effective messages. Five of the seven characteristics are commonly recommended, but may not be observed always. The following two recommended message characteristics are less commonly observed by outreach educators:

- Message **content** should be tailored to address specific audience *circumstances*
- Message **content** should be holistic, i.e., it should address attitudes, knowledge, intentions, *and* behaviors – as opposed to some subset of these

Table 24.
Principal findings across all studies: ***Message Content*** *theme*

Message Content – Findings grouped by category
Message content
1) Specific content to convey
• Announcement of an initiatives
• Cost savings or improved economic benefit
• Ease of doing the right thing
• Locally specific information about environmental risks and benefits from behavior change
• The exact nature of the problem; what information is important to know and why
• Explicit instructions about what to do
• Feedback about benefits that resulted from behavior change
• An atmosphere of social pressure and that people can do more
2) Content frame or perspective
• Tailored to address specific audience circumstances
• Easy to understand
• From a trusted source
• Scientifically valid
• Balanced
• Up-to-date
• Holistic and addressing: attitudes, knowledge, intentions, behaviors

Message delivery

The principal findings for this theme are listed in Table 25. Six of the target audiences had study findings that addressed the *message delivery*. There were no audience-specific recommendations for general adult audiences, aquaculture business, local decision-makers, ethnic groups, government agency/University Extension professionals, homeowners, loggers, students in higher education, or K-12 students. While this seems to be an important research question for most audiences, only 17% of studies (13 of 75) for the six audiences where results were reported addressed this question.

Principal findings recommend five different vehicles for effectively transmitting intended messages to target audiences. They provide a useful checklist to consider when developing an outreach program.

Table 25.
Principal finding across all studies: ***Message Delivery Vehicle*** *theme*

Message Delivery – Findings grouped by category
Message vehicle
1) Deliver through what communication system • Already existing relationships and networks • Audience preferred and/or credible sources of information • Print version in addition to other preferred sources of information • One-on-one communication • Trained personnel

Outreach strategy

The principal findings for this theme are listed in Table 26. Almost all of the target audiences (13 of 15) had study findings that addressed *outreach strategy*. There are no audience specific recommendations for adult audiences in general or for homeowners. The 96 studies provided an extensive collection of audience-specific recommendations about how to provide outreach that leads to measurable and desired effects. Results include BEPs from 67 of the studies.

We grouped the large number of findings for this theme into two major subthemes: outreach design components and outreach implementation. We selected the subthemes and their further divisions based on previous work to outline standard elements of success for this theme (see the Water Outreach website, National Extension Water Outreach Education. 2004b).

The outreach design subtheme includes recommendations for enhancing the quality and stability of outreach strategies, working with the target audiences, involving them in the program design, adapting outreach programs to meet the needs of particular topics and target audiences, and encouraging the involvement of individuals from the target audience. This final component is also addressed by the message content and delivery vehicle themes. The outreach implementation subtheme includes extensive suggestions for how to choose and apply relevant instructional strategies.

We also expected to find research about managing outreach initiatives and recognizing program contributors. We considered these important elements of building a long-term outreach initiative (Fedler, 2001; Seng & Rushton, 2003). However, we did not find any studies that addressed these areas of outreach implementation.

Table 26.
Principal findings across all studies: ***Outreach Strategy*** *theme*

Outreach Strategy – Findings grouped by category

1) Outreach design components

a. Quality – provide a clear purpose; pilot test

- Be aware of the boundary between education and advocacy
- Provide training with a clear goal and an explicit set of objectives geared toward the needs of a target audience.
- Develop program design and content that:
  - Supports, engages in, and makes use of the scientific, social, educational, and other forms of research that have a bearing on programs
  - Recognizes the critical role and need to adequately support ongoing professional development for all personnel
- Attend to *Best Practice* recommendations for: program development and implementation, professional development for teachers/youth leaders, and program evaluation available from several sources

b. Stability – frequent opportunities sustained over time

- Emphasize company commitment to pollution prevention activities and investment of adequate time and

money.
- Allow enough time for wide spread adoption of the demonstrated BMPs.
- Emphasize an "integrated" program that provides a continuum of information, communication, and education resources
- To produce long-term changes in behavior:
  - Provide continued application and reinforcement of content
  - View the behavior-change process as one that takes place over an expanse of time, in a combination of formal and non-formal settings, within the context of a supportive social environment
- Develop program design and content that constitutes a continuous and lifelong process for individuals, families, and diverse social groups

c. Access – inclusive, accessible, all interested audiences can participate

- Develop program design and content to follow the principles of inclusion with regard to program participation by minorities and people with disabilities
- Use two-way communication methods, particularly one-on-one contact, where possible.
- Use multiple channels of communication.
- Be patient in your efforts to reach small businesses; small businesses have limited staff, busy schedules, and financial constraints, and may not take time to return phone calls or read mailed solicitations.
- Link policy makers with local information sources
- Work with farm consultants:
  - Recognize and support education providers already in place who provide information consistent with the program goal
  - Train the technical professionals who support the target audience as well as specifically training the target audience about the new practice
  - Provide the farmer with the opportunity for continuous dialog with consultant.
- Use participatory, watershed-based planning as an effective technique for building public awareness and interagency coordination.

d. Connection – involve stakeholders and partners

- Involve target audience in:
  - Choosing and testing preferred technical approaches to solving a problem
  - Developing content and process for outreach activities
  - Participatory approaches to help identify target audience education needs and motivate participation
- Develop program design and content to:
  - Provide participants with opportunities to engage in the valuing process (i.e., choosing, affirming, and acting) as it relates to programs, program activities, and their own growth and development
  - Build upon local, state, and national partnerships to support the development, implementation, and evaluation of programs as well as to support stewardship of the resource
- Base the outreach or education process on mutual understanding, trust, and respect
- Identify and provide additional support for group-designated water "experts"
- Include community members, essential service operators, environmental health workers, administrators, teachers, and regional service providers in community water conservation training programs.
- Design partnership development training to build understanding and skills. Focus on factors influencing success:
  - Maintain balance between partnership resources and scope of activity
  - Pursue flexible and informal process
  - Attend to alternative dispute resolution (ADR) processes
  - Attend to institution analysis and development (IAD) processes
- Support stakeholder engagement more fully by anticipating a political dimension in addition to a focus on subject matter. Be aware of the larger political issues and contexts in which water quality outreach and education take place.

e. Program – adapted to particular audience or topic needs

- Base program design on specifically identified needs
- Design programs to:
  - Target outcomes for specific audiences
  - Focus on a geographic area
  - Use a variety of outreach methods, with each targeted at specific, desired behaviors
- Develop program design and content to consider aquatic resources in their totality, including natural, built, technological, and social aspects (e.g. economics, politics, cultural-historical, moral, aesthetic)
- Assure that programs are relevant to the cultural milieu of the subgroup, such as ethnic or culturally-related

farm-structure differences.
- Emphasize one-on-one contact but couple with small group and demonstration events
- Recognize the role of economic factors in behavior change
- Recognize the limits of regulation in producing behavior change
- Look to these farm conditions for opportunities to provide education that is more likely to be effective:
  - Actions that improve water quality also increase profitability
  - The producers' own water quality is at stake
  - The on-farm cost of water quality impairments are shown to be sufficiently large
  - Education is accompanied by training for management skills of immediate need to the producer
- Link farm education to production decisions to reflect the fact that operators prefer to make production decisions based on their own records and advice from on-farm employees.
- Focus programs designed to facilitate adoption of precision farming techniques on farmers, who:
  - Are relatively economically secure
  - Place importance on use of conservation information when making farm-level decisions
  - Perceive that their children will be operating their farms in the future
- For sustainable agriculture education, target families with one or more of these characteristics:
  - Kin-mentor relationship that supports practice of sustainable agriculture
  - An environmental or health problem which triggers interest or motivation
  - Systematic on-farm experimentation
  - Value for prudence with resources.
- In designing outreach programs that strive to *link environmental concern with recreational behaviors* vary program goals to reflect differences in commitment among experienced and active anglers, ex anglers, inactive anglers, and non anglers
- Educate teachers about innovations in curricula to ensure that they are implemented
- Encourage and support teacher use of a community-based curriculum based on water monitoring.

f. Marketing – how audiences know about the opportunity

- If providing explanatory materials by mail to residents from communities engaged in watershed planning, find ways to encourage individuals to engage.

2) Outreach implementation

a. Management – to assure smooth operation

No research findings

b. Relevant instructional strategies

- Feel confident about choosing to communicate through major public media and education campaigns because, if properly conducted, they can have a demonstratable effect on attitudes, knowledge, behavior intentions, and behavior change.
- Develop program design and content so that program:
  - Is learner-centered
  - Begins with goals and objectives that relate to appreciation and awareness, expands to include both knowledge and skills, and culminates in personal responsibility and responsible behavior
  - Relies on a variety of systematic and continuous approaches to the assessment of participants and evaluation of programs so as to improve and eventually validate those programs
- "Test" the audience at the beginning of the workshop to improve instructor ability to enhance subsequent learning
- Design programs to:
  - Provide direct experience relevant to the objective
  - Provide authentic experience, similar to what the participant will experience in their personal life
  - Provide an opportunity to practice the target behavior
  - Enable students to demonstrate mastery through a public presentation
  - Provide learning opportunities before and after the field activities to optimize knowledge gain
- Design outreach to address farmer preferred learning style
  - Emphasize experiential learning and farmer knowledge
  - Provide farmers with opportunities to *solve a problem* in addition to providing other standard hands-on outreach techniques such as opportunities for talking with specialists, field days, demonstrations, etc.
  - When training new farmers, focus on problem-solving and production agriculture skill development
- Provide strategies and practice for differentiating objective information sources from biased information sources
- Provide the following when focusing on environmentally responsible behavior:
  - An opportunity to demonstrate a commitment.
  - A demonstration or model of desired action.
  - An opportunity to set goals or respond to goals, including use of prompts.
  - Feedback on progress toward preferred environmental change.

  - Comprehensive training in the set of variables correlated with measurable changes in environmentally-related behavior, including:
    - environmental sensitivity
    - knowledge about ecology
    - in-depth understanding of aquatic environmental issues
    - a sense of personal investment in specific environmental issues
    - knowledge of environmental action strategies
    - skills in using environmental action strategies
    - an internal locus of control
    - intentions to act
- To increase ownership and empowerment, design programs with a strong emphasis on:
  - Combining: a) field activities; b) curriculum activities; c) family and community involvement
  - Multiple methods to introduce specific concepts. Repeat concepts throughout the education experience
- Use farm assessments:
  - Work one-on-one with the farmer completing the assessment.
  - Encourage farmers to complete their own on-farm risk assessments rather than performing the assessment for them
- Use simulation games to help increase participant flexibility in making choices
- Design training to provide students with work in teams on a practical experience with interdisciplinary participants
- Structure activities at a field site in order to increase knowledge gain, but apply structured activity with care in order to avoid reducing motivation
- Encourage teachers to include the following elements in their environmental education programs:
  - Flexible curriculum
  - Collaborative learning environments
  - Students' bearing the consequences of the behavior
  - Teacher competency in listening and questioning
  - Diverse instructional strategies
  - Resourcefulness in accessing resources
  - Creativity, especially in knowledge of how to do without,
  - Facilitation skills
  - Ability to make connections
  - Understanding of local-to-global connections
  - Ability to integrate curricula
  - Using personal/student strengths/passions
  - Experiential teaching orientation
  - Cooperative and inclusive learning
  - Nurturing a sense of place

c. Recognition of contributors

No research findings

Public participation

The principal findings for this theme are listed in Table 27. Only three target audiences (government agency/University Extension professionals, homeowners, and landowners) had study findings that addressed how participation in environmental decision-making contributes to measurable change.

This appears to be an emerging area of importance to outreach educators.[23] It merits more research attention. The four studies that addressed this theme identified specific water outreach and education objectives that can be facilitated by public participation.

Table 27.

Principal findings across all studies: ***Public Participation*** *theme*

Public Participation – Findings grouped by category
Public participation 1) When to use • To develop planning goals • As a vehicle to make data available • To develop data • To build participation in groups that effectively address areas of concern

[23] The need for attention to the role of public participation in environmental decision-making is demonstrated by USDA strategic goals summarized in the introduction to this Monograph. New studies show a connection between public participation processes, environmental decision-making, and making change in the community. These are summarized, in part, by Andrews, Stevens & Wise (2002), but other recent work about public participation techniques has yet to be integrated into outreach and education approaches. (For example, see Renn, Webler & Wiedemann, 1995).

Supporting/motivating professionals

The principle findings for this theme are listed in Table 28. Only two of the target audiences (government agency/University Extension professionals and teachers) had study findings that addressed *supporting and motivating professionals*. Five of the six studies were of teachers. Only one study applied to government agency/University Extension professionals.

Professional effectiveness is clearly an important component for reaching water management goals through education. The principle findings identify some purposes and effects of supporting and motivating professionals. The results suggest some potential for application to work with other audiences, such as local decision-makers. However, more research is needed to make this link. This merits more research attention.

Table 28.
Principal findings across all studies: ***Supporting and Motivating Professionals*** *theme*

Supporting and Motivating Professionals – Findings grouped by category
Support and motivate professionals 1) Purpose and impacts • To increase likelihood of program implementation • To assure that professionals o Understand concepts o Feel supported by the organization o Can choose to participate • Provide professionals with o Help in integrating topic into their work o Hands-on training o An opportunity to practice application • Related skills

Evaluation

The principle findings for this theme are listed in Table 29. The number of studies addressing this theme was also limited. Only four of the target audiences had study findings that addressed how to develop and use evaluation to improve the quality of water outreach. These were: homeowners, households, landowners, and teachers. There are few recommendations among the principle findings about what to measure and how to make the measurements. The most helpful findings describe how to use evaluation results.

Table 29.
Principal findings across all studies: ***Evaluation*** theme

Evaluation – Findings grouped by category

Evaluation
1) What to measure
• Measure changes
  ○ Physical environmental factors
  ○ Demand
• Continuous assessment
 	
2) How to use results
• Provide feedback to target audience on a regular basis
• Keep records of specific outreach activities, especially to assess the relationship between specific activities and their outcomes
• Use evaluation outcomes to determine next steps
• Reasons and consequences for outcomes

Outreach *themes* research summary

Theme-specific BEP recommendations listed in tables 23-29 are based on moderate to strong research. However, less than 10% of the reviewed studies generated the recommendations in the tables for four of the seven themes: "message delivery vehicle," "public participation," "supporting and motivating professionals," and "evaluation." Clearly there are gaps in the volume and diversity of research for some themes. In spite of the gaps, educators can be confident that use of recommendations identified through this study will contribute to the quality of their initiative.

Future research could investigate impacts related to outreach themes:

- For the following audiences: Aquaculture business, ethnic groups, government agency and University Extension employees, homeowners, students in higher education, K-12 students
- For these specific themes: Evaluation, message delivery vehicle, public participation, supporting and motivating professionals

Outreach education techniques and *Essential* BEPs

Comparing audience-specific education practice recommendations with *Essential* BEPs creates the opportunity to examine research strengths and gaps in research approaches to evaluating these classic techniques. We classified *Essential* BEPs into five categories, but used only four of them to analyze study findings:

- BEPs "for the individual,"
- BEPs for the "class or group,"
- BEPs for "the community," and
- BEPs for audiences "beyond the community."

The fifth describes *Essential* BEPs for Internet-based learning. We did not find any research-based practice recommendations for Internet-based learning.

We summarized research strengths and gaps for the four categories of Essential BEPs in Tables 30-33. For each classification, the tables list audiences where essential practices were referenced by the research; and audiences where there were few, if any, references. The tables also list *Essential* BEP points that were frequently referenced and those that were seldom referenced.

Highlights of the comparison between study recommendations and *Essential* BEPs follow. We did not include an analysis of the "adult" audience in these comments because research about this general category is not helpful to the goals we proposed for the project. Looking at the body of research as a whole, classic education practices are well represented throughout water outreach and education literature. There are some gaps in audience-specific research, particularly in studies about learning and behavior change techniques (see Table 30, *Outreach to an* ***individual***), highlight research needs that are significant to improving overall outreach quality.

BEPs for the individual

The principle findings about BEP techniques for the individual are listed in Table 30. Research for four audiences – farmers, households, recreational water users, and K-12 students – strongly addressed the 17 points in this category. That is, recommendations addressed a minimum of 4 of the 17 points and provided a minimum of 8 examples. Another five audiences provided recommendations that at least touched on the main points. Research for the remaining five audiences did not address these points at all; hence, we cannot provide any advice about BEPs for the *individual* for these audiences: aquaculture, business and industry water users, local decision makers, government agency and University Extension professionals, and homeowners.

Looking at the body of research as a whole, there were only a few of the 17 points that were not addressed by the research at least at a minimal level. This result speaks to the general strength of the research. However, the gaps that remain concern important

points and merit additional attention. Research did not address how water educators could apply the following recommendations, which are all considered essential to a quality learning environment.

- How to create the message or training so that it relates to the individual's level of development or preferred learning strategy;
- How to effectively present a new behavior or skill, especially by showing its similarity to current behavior;
- How to use fun and curiosity to increase understanding or motivation; or
- How to improve the quality of learning by providing opportunities for learner collaboration with others

Table 30.
Analysis of study recommendations that reference best practices for outreach to an ***individual****

Category	Frequent reference	Weak or missing reference
Audiences	Farmers Households Recreational water users Students, K-12	"Adult" Aquaculture Business & industry water user Decision makers, local Government agency/ University Ext Professional Homeowners

Audience-specific recommendations relating to these *Essential* BEPs	For the individual: the learning experience:
	• Is learner centered and consequently
	  ○ Relates to personal interests and provides for personal choice and control.
	  ○ Encourages the learner to set meaningful learning goals and to take personal responsibility for their own learning.
	▪ Promotes active engagement and real world problem solving.
	▪ Enables the learner to link new knowledge to their existing knowledge in meaningful ways.
	▪ Provides a *nurturing context* for learning, with attention to: cultural or group background and influences, the physical environment, and the use of tools or practices appropriate to learner skills and abilities.
	▪ Provides opportunities for extended effort and practice.
		For the individual: the learning experience:
		• Is learner centered and consequently
		  ○ Relates to the individual's level of physical, intellectual, emotional, and social development.
		  ○ Can be adapted to individual differences in learning strategies and approaches.
		• Presents a new behavior or skill by:
		  ○ Demonstrating its similarity to a current behavior or skill.
		• Builds on positive emotions, curiosity, enjoyment, and interest.
		• Allows a learner to interact and collaborate with others on instructional tasks.

*BEPs or audiences not listed were *moderately* addressed by the research

BEPs for the class or group

The principle findings about BEP techniques for the class or group are listed in Table 31. Research for four audiences – farmers, landowners, recreational water users, and teachers – strongly addressed the 11 points in this category. That is, recommendations addressed a minimum of 3 points and provided a minimum of 6 examples for how to provide quality water education experiences for a class or group. Three audiences provided recommendations that at least touched on the main points. We cannot provide any advice about BEPs for the *class or group* for these audiences: aquaculture, business and industry water users, local decision makers, ethnic groups, homeowners, loggers, and students in higher education.

Looking at the body of research as a whole, 4 of the 11 points were not addressed by the research even at a minimal level. These had to do with using creative approaches, valuing lifelong learning, building environmental literacy, and building from key principles underlying environmental education. Criteria for addressing environmental literacy and environmental education such as those provide by Coyle (2005) and Simmons (2004) are relatively new, in research terms. These are important gaps in the research, but we are likely to see at least some research results relating to these criteria in the near future.[24]

[24] Environmental educators and agency administrators have become more familiar with environmental literacy goals since the publication of the first edition of *Guidelines for the Preparation and Professional Development of Environmental Educators* in 2001 (Simmons, 2004). State environmental education organizations and agencies provide state and national trainings regarding content. The National Environmental Education and Training Foundation (NEETF) also encourages attention to the concept of environmental literacy and recommends specific approaches to accomplishing this goal nationwide (Coyle, 2005).

Table 31.
*Analysis of study recommendations that reference best practices for outreach with a **class or group****

Category	Frequent reference	Weak or missing reference
Audiences	Farmers Landowners Recreational water users Teachers	"Adult" Aquaculture Business & industry water user Decision makers, local Ethnic groups Homeowners Loggers Students, Higher Ed
Audience-specific recommendations relating to these *Essential* BEPs	For the class or group: the learning experience: ▪ Is designed to focus on a targeted audience and is built on an understanding of audience skills and interests ▪ Content and delivery is determined in cooperation with the target audience and stakeholders ▪ Is relevant to and accessible by people with diverse backgrounds and influences. ▪ Presents accurate and balanced information, incorporating many different perspectives ▪ Incorporates methods for assessing the value of the experience, especially as it relates to desired outcomes ▪ Is facilitated by quality instructors who have been trained in effective teaching methods and are supported by the program sponsor	For the class or group: the learning experience: ▪ Uses creative approaches ▪ Values lifelong learning ▪ Builds environmental literacy o Questioning and analysis skills o Knowledge of environmental processes and systems o Skills for understanding and addressing environmental issues o Personal and civic responsibility ▪ Builds from key principles underlying environmental education: o Systems and interdependence are characteristics of the biological and natural order o Natural sciences, social sciences, and humanities disciplines contribute to understanding of the environment and environmental issues o Learner connections to immediate surroundings provide a base for understanding larger systems, broader issues, causes and consequences

*BEPs or audiences not listed were *moderately* addressed by the research

BEPs for the community

The principle findings about BEP techniques for the community are listed in Table 32. Research for six audiences – business and industry water users, local decision makers, farmers, government agency and University Extension professionals, homeowners, and landowners – strongly addressed the 12 points in this category. That is, recommendations addressed a minimum of 3 points and provided a minimum of 6 examples for how to provide quality water education experiences for the community. Two audiences provided recommendations that at least touched on the main points. We cannot provide any advice about BEPs for the *community* for these audiences: aquaculture, ethnic groups, loggers, students in higher education, K-12 students, and teachers

Looking at the body of research as a whole, 3 of the 12 points were not addressed by the research even at a minimal level. These had to do with efforts to: support the person who takes responsibility for managing a group process; relate outreach to long-term community vision and goals; and locate outreach activities close to where people practice a behavior of concern.

Table 32.
*Analysis of study recommendations that reference best practices for outreach with the **community****

Category	Frequent reference	Weak or missing reference
Audiences	Business and industry water user Decision maker, local Farmer Government agency/ Univ Ext professional Homeowners Landowners	"Adult" Aquaculture Ethnic groups Loggers Students, Higher Ed Students, K-12 Teachers
Audience-specific recommendations relating to these *Essential* BEPs	For the community: the learning experience: ▪ Evolves from work with a coalition or group ▪ Generates and makes use of data about the local condition ▪ Provides training to increase skills needed to accomplish goals identified by the group ▪ Reaches people in multiple ways	For the community: the learning experience: ▪ Supports a person who takes responsibility for managing or leading the process, and relies on quality group planning and facilitation techniques ▪ Relates to long-term community vision and goals ▪ Takes place close to the location where people practice a behavior of concern

*BEPs or audiences not listed were *moderately* addressed by the research

BEPs for audiences beyond the community

The principle findings about BEP techniques for individuals functioning beyond the community level are listed in Table 33. Research for only one audience – local decision makers – moderately addressed the 5 points in this category. That is, recommendations addressed a minimum of 2 points and provided a minimum of 2 examples for how to provide quality water education experiences for this audience. This learning category was not strongly addressed by the researchers in our meta-analysis, but it does not generally apply to most of the target audiences we covered. When looking for advice about BEPs for the audience beyond the community, educators have few sources of information; they need more.

Building skills and capacity among agency professionals and organization leaders is ultimately as important as work with individuals and groups. These state, regional, or national agency professionals and organization leaders manage water policy and planning, and often provide oversight for the work of educators. Business and industry users, farmers, landowners, and recreational water users are each likely to belong to or report to groups or agencies that function beyond the community level: such as the Farm Bureau or the Natural Resources Conservation Service.

Table 33.
*Analysis of study recommendations that reference best practices for outreach with audiences **beyond the community****

Category	Frequent reference	Weak or missing reference
Audiences	Decision makers, local	All other audiences
Audience-specific recommendations relating to these *Essential* BEPs	None	For beyond the community: the learning experience: ▪ Builds value for education as part of policy development and implementation ▪ Builds skills for flexibility and responsiveness to environmental issues and for facilitating community engagement ▪ Concerning a particular topic – the learning experience uses the same learning goals for all levels of responsibility, but varies the teaching methods, which are adapted for the target audience ▪ Matches the target audience to the scale of the problem o For example, related to a particular problem, watershed council staff receive training about a locally significant topic, while agency staff receive training about how information about several related topics informs policy development ▪ Offers avenues for participation which are competent, fair, and enhance involvement for all levels of responsibility

*BEPs or Audiences not listed were *moderately* addressed by the research

Outreach education techniques research summary

Researchers of the target audiences we covered in this meta-analysis have directed their attention to classic education techniques more comprehensively than might be expected given that they rarely claim to investigate basic education techniques or even have access to the rubric we applied to evaluate this body of literature. Accomplishing the ambitious goal for water outreach and education to develop environmentally literate citizens (Coyle, 2005; CSREES, 2004) depends on attention to these classic BEP categories. Findings from this meta-analysis will enhance educator ability to do so.

Future research could investigate impacts related to application of classic education techniques or *Essential* BEPs:

- For the following audiences: aquaculture business, business and industry water users, ethnic groups, homeowners, loggers, students in higher education.
- For these specific techniques:
    - Create the message or training so that it relates to the individual's level of development or preferred learning strategy;
    - Present a new behavior or skill, especially by showing its similarity to current behavior;
    - Use fun and curiosity to increase understanding or motivation;
    - Improve the quality of learning by providing opportunities for learner collaboration with others;
    - Use creative approaches;
    - Show a connection to lifelong learning;
    - Build environmental literacy;
    - Support the person who takes responsibility for managing a group process;
    - Relate outreach to long-term community vision and goals;
    - Locate outreach activities close to where people practice a behavior of concern.
    - Build value for education as part of policy development and implementation
    - Build skills for flexibility and responsiveness to environmental issues and for facilitating community engagement
    - Concerning a particular topic – consolidate the learning goals for all levels of responsibility, but not the teaching methods, which are adapted for the target audience
    - Match the target audience to the scale of the problem
        - For example, related to a particular problem, train watershed council staff about a locally significant topic, train agency staff about how information about several related topics informs policy development
    - Offers avenues for participation which are competent, fair, and enhance involvement for all levels of responsibility

2004 Symposium findings: BEPs for Water Outreach Professionals

While the authors were conducting the meta-analysis reported in this monograph, the Water Outreach Project also facilitated a national symposium, *Best Education Practices (BEPs) for Water Outreach Professionals* (Reilly & Andrews, 2006). The June 2004 Symposium explored the application of BEPs and ways to help educators guide water organizations and agencies to integrate BEPs more effectively into water management strategies. The Water Outreach Project looked to national Extension water quality coordinators and key stakeholders to consider questions such as:

- Can we achieve improved water management without stronger education?
- Does the information to be imparted require simple awareness or deeper education?
- Will BEPs aim at community leaders or "influentials"?

The symposium was a working meeting where participants organized their ideas through attending a combination of panel and paper presentations, small and large group discussion sessions, poster viewing, and website evaluation. To help integrate presenters' ideas about best education practices, symposium coordinators Andrews, Reilly, and Stevens organized the presentations to highlight these three groups of target audiences:

1. Conservation professionals, farmers, decision-makers, leaders, and community organizations
2. Households, neighborhoods, landowners, and recreational water users
3. Youth, youth educators, and volunteers

We invited presenters and participants to help identify:

- What we collectively know about audiences of particular interest to water educators
- Where there are gaps in our knowledge about target audiences.

Symposium Recommendations

While the 2004 Symposium had a broader overall focus than our meta-analysis, we can draw on the resulting recommendations for best education practices and work with specific audiences to compliment the results of the meta-analysis. We include selected symposium results here for this purpose. We consider their application to our meta-analysis findings in the overall recommendations presented later in this monograph.

The BEP concept itself

- Gather accounts of exemplary practices
- Identify professional development needs and strategies that will improve outreach effectiveness
- Build a common understanding of BEPs
- Find ways to articulate theory that supports specific BEPs in the minds of the practitioner.
- Promote rigorous social science research and evaluation methods to build the body of literature about and for BEPs.

- Test BEPs that are identified through research, in practice.

BEPs for target audience

The presentations provided recommendations for nine groups of audiences, as follows:

- Conservation professionals
- Ethnic groups
- Households and neighborhoods
- Recreational water users
- Decision-makers, leaders, community organizations
- Farmers
- Landowners
- Volunteers
- Youth

We sorted recommendations by these themes:

- audience information
- message delivery vehicle
- supporting and motivating professionals
- message content
- outreach strategies and methods for teaching
- evaluation

We found these **strengths** in the presentations:

- Gems of advice for each of nine featured audiences and for six themes, indicating a strong understanding about effective techniques among outreach professionals.
- Comprehensive BEPs for outreach with "households and neighborhoods."
- Comprehensive BEPs about "outreach strategies and methods for teaching," for all nine audiences.
- Combined recommendations for each audience provide a more holistic picture of water outreach, to enable us to see what works with specific audiences.

We identified these **gaps** through review of presentations and posters:

- BEPs for landowners, recreational water users, and volunteers.
- BEPs for the outreach themes: "message content" and "supporting and motivating professionals."
- Studies about: scientists, hydrologists, and engineers: as partners for collaborative learning about water; grounds keepers and facilities managers; planners and design professionals; policy makers and influentials; socio-economically underserved; minorities; recreational water users; ranchers and irrigators.

Make water education and actions part of the mainstream of community life

The presentations and discussions provided these recommendations for this important goal of water educator work:

- Value a team effort and coordinate the team through a variety of activities.
- Establish baseline information about water education needs to improve ability to show progress and to help establish outreach priorities.
- Build citizen and group skills to ask the right questions
- Provide avenues for communication among groups
- Build program acceptability, especially through encouraging decision-makers and partners to tell the story of the program and to publicize impacts

Meta-analysis study strengths and weaknesses

No study can do or cover everything. For instance, as much as we endeavored to be comprehensive in our review of current literature, we are confident that we missed research that might have added to the quality of our results. The following are other study strengths and weakness of which we are aware.

- We were as transparent as possible with our procedures so that critical readers can know how and where we drew the boundaries of our research and know its limits.
- Meta-analysis recommendations are based only on literature published in journals included in the databases cited in Table 7. We did not make an exhaustive effort to find research literature published elsewhere, nor did we search for "grey" literature. We did, however, make repeated checks with specialists to attempt to discover literature of interest to this study.
- The quantity of supporting research is quite limited for several target audiences considered in this study. As a result, some audience-specific findings are not as robust as they might have been had we found more primary research and literature reviews relevant to the study.
- We faithfully documented the schemes we used for rating the quality of research. We used schemes drawn from multiple sources to maximize their objectivity. However, no rating is completely objective. No matter how objective the scheme, its implementation is always, to some degree, subjective.
- We rated the quality of each study and report as a whole. We did not attempt to rate differences in the quality of individual findings within each study. Individual findings may differ in their strength and quality, but we report them here as if they were equal in validity and veracity. To do otherwise was beyond the scope and resources of the project.
- We provided the references for the target audience recommendations as a group. That is, we did not provide the specific reference or references for each finding or audience-specific best education practice recommendation. Again, to do otherwise was beyond the scope and resources of the project.
- We engaged in an interpretive process to convert study findings and recommendations to BEPs. While we made every attempt to faithfully mirror the research finding in the BEP statement we created, it is likely that we missed some relevant points or that, in some cases, we made an interpretation not fully validated by the research.
- Recommendations in this meta-analysis are based solely on the research described in the 96 studies we considered in the analysis. We did not attempt to compare recommendations about a specific topic, such as message content or message delivery strategies, with other research conducted on that specific topic when it was derived from studying applications that lay outside the water outreach parameters defined for our analysis.

Summary of meta-analysis findings

Given the tens of thousands of publications identified and considered for inclusion in our meta-analysis, we found surprisingly few that provided research-based recommendations to guide the efforts of water educators. Our analysis and findings relied on 96 research studies targeting 14 specific audiences and one audience generally described as "adults." We produced a number of resources from the results of the meta-analysis that may be of value to educators and researchers. All of them are posted on the water outreach website <http://wateroutreach.uwex.edu>. These resources are extensive and detailed. Some are useful as is; others will be more useful when available via a searchable database. These are some of the resources provided in this monograph and available at the water outreach Web site for water outreach educators and researchers:

- ❖ Educator resources:
  - Audience-specific BEP recommendations for 15 audiences (Appendix B)
  - Audience-specific examples of Essential BEPs (classic education techniques shown to be effective through decades of basic research about how people learn and change) (Appendix C)
  - A synopsis of principal findings across all studies – organized by seven themes and by four Essential BEP categories. (Monograph text and Tables 23-33)
- ❖ Researcher resources:
  - Target audience bibliography (Monograph references)
  - Study matrix summarizing data about each of the 117 studies reviewed for the meta-analysis across 14 categories (Appendix D)
  - Recommendations for the research of target audiences, themes and education practices where additional research is needed (Monograph text)

We found the quality of research reported in the 96 studies to be, generally, moderate to strong. The reliability of the findings reported in this monograph and in the other references for educators and researchers listed above is defined and limited by the quality of the reported research. We considered the meta-analysis from three perspectives: what it had to recommend for working with specific audiences, what patterns or themes emerged from the data across audiences, and how the research findings related to classic, essential BEPs. Our observations and findings are organized below by these three perspectives.

- ❖ Target audiences:
  - There is a broad choice of information available to water educators for these six audiences: business and industry water users, farmers, households, landowners, recreational water users, and teachers
  - Farmers were the most widely studied audience with thirty-seven studies (37%) examining farmer education preferences and behavior. Landowners were the next most studied group identified for this analysis with ten studies (10.1%).

- The 2004 Symposium identified a number of BEPs for outreach with "households and neighborhoods."

❖ Outreach Themes:

- We summarized research-based BEP recommendations by themes that emerged from the research. The themes are:
  - Audience information
  - Message delivery vehicle
  - Public participation
  - Evaluation
  - Message content
  - Outreach strategy
  - Supporting and motivating professionals
- Theme-specific BEP recommendations (Appendix B) are based on moderate to strong research.
- In spite of gaps in the volume and diversity of research for some themes, educators can be confident that use of recommendations identified through this study will contribute to the quality of their initiative.
- We grouped "Outreach strategy" recommendations by nine categories. Reference to the categories, themselves, may provide water educators with useful guidance. These are:

  Outreach design:
  - Quality
  - Access
  - Program
  - Stability
  - Connection
  - Marketing

  Outreach implementation:
  - Management
  - Relevant instructional strategies
  - Recognition of contributors
- Themes related to the 2004 Symposium recommendations:
  - Provided recommendations for each of nine audiences or groups of audiences.
  - Identified comprehensive BEPs about "outreach strategies and methods for teaching," for all nine audiences. These are similar to the meta-analysis results, but provide additional detail for specific audiences and use of specific outreach techniques.
  - Added significantly to the meta-analysis results about volunteer and ethnic groups.

- Added significantly to the meta-analysis results for use of websites for data sharing and analysis.
- Indicated a strong understanding about effective techniques among outreach professionals demonstrated by poster and presentation content.

❖ Classic education practices (*Essential* BEPs)

- Research-based BEP recommendations are compared to a list of classic education techniques, or *Essential* BEPs, identified through another project activity. *Essential* BEPs are organized by six categories:
  - For every education or learning situation
  - For the individual
  - For the group
  - For web-based learning
  - For the community
  - For beyond the community
- Looking at the body of research as a whole, classic best education practices are well represented throughout water outreach and education literature.
- Research recommendations about BEPs for the individual are more fully covered than other categories of *Essential* BEPs
- Essential BEP recommendations are more fully covered for these audiences:
  - Farmers
  - Households
  - Landowners
  - Local decision-makers
  - Recreational water users

Recommendations

Many of the reported findings reveal shortcomings in our meta-analysis and in the direct research of practices for water outreach and education. More work is needed to find completed studies not included in this meta-analysis. There is also need for more direct research to identify best education practices for audience-specific water outreach and education. The following lists our recommendations for improved research in general and, specifically, for more direct research of outreach and education approached each of the three perspectives used above to organize our findings.

❖ Find literature missing from our meta-analysis, particularly literature which lies outside of standard publications, i.e., “grey” literature

❖ Identify additional literature that reports on audience-specific studies of outreach and education, especially for the fourteen target audiences emphasized in our meta-analysis.

- ❖ Compare findings from research about BEPs for target audiences involved in the management and use of water with findings about the same audiences involved in the management and use of other resources.

- ❖ Encourage researchers and project evaluators to pay careful attention to research techniques when judging the effectiveness of outreach with target audiences.
  - For example, water conservation studies conducted by or for utilities often failed to segregate impacts of individual outreach efforts. Impacts were clumped, and therefore it was not clear which particular outreach effort or group of efforts resulted in the reported impact (e.g., Michelsen, McGuckin, & Stumpf, 1999). We did not include findings derived in this way in the study recommendations.

- ❖ Target Audiences
  - All audiences identified through this study would benefit from additional research-based information. However, there is a particular need for more research about the following audiences:

    Audiences covered in the meta-analysis:
    - Ethnic groups (4%)
    - Loggers (2%)
    - Local decision-makers (2%)
    - Kindergarten through post-graduate students (6%)

    Audiences identified through the 2004 Symposium:
    - Conservation professionals
    - Neighborhoods
    - Conservation organizations
    - Volunteers

    Additional audiences identified by the Water Outreach Project Advisory Committee and participants in the 2004 Symposium:
    - Agricultural commodity groups
    - Retailers of water recreation equipment
    - Scientists, hydrologists, and engineers: as partners for collaborative learning about water
    - Policy makers and influentials
    - Minorities
    - Ranchers and irrigators.
    - Land development businesses
    - Service clubs
    - Grounds keepers and facilities managers; planners and design professionals
    - Socio-economically underserved
    - Recreational water users

- Provide more information about multiple themes in order to provide comprehensive recommendations for how to provide effective outreach for the following audiences:
    - Aquaculture business
    - Ethnic groups
    - Loggers
    - Local decision-makers
    - Government agency/ University professionals
    - Students, higher education
    - Students, K-12.

❖ Outreach Themes

- Provide more studies about the following outreach themes:
    - Educators would benefit from more audience-specific findings about four of the seven themes:
        - Message delivery
        - Supporting and motivating professionals
        - Public participation
        - Evaluation."

      Less than 10% of the reviewed studies generated the recommendations in the tables for these themes.
    - More research attention needs to be direct to explaining how public participation contributes to meeting desired outreach goals. This theme appears to be an area of emerging importance to outreach educators.
    - The principle findings for professional effectiveness identify some purposes and effects of supporting and motivating professionals, but more research attention is needed. This is clearly an important component for reaching water management goals through education.

❖ Classic education practices (*Essential* BEPs)

Our research revealed that there are some essential BEPs that have been the subject of few, if any, studies. We listed these in the "weak or missing evidence" columns of Tables 30-33. Future studies must:

- Address gaps in the research of audience-specific information regarding how people learn and water outreach more generally.
- Conduct research to close gaps in studies of practices associated with *Essential* BEPs identified in Tables 30-33 For:

The Individual:

- Create messages or training that relates to the individual's level of development or preferred learning strategy
- Emphasize their similarity to current behavior when presenting a new skill or behavior

- Use fun and curiosity to increase understanding and motivation
- Providing opportunities for learner collaboration with others to improve the quality of learning

The Class or Group:

- Use creative approaches
- Show connections to lifelong learning
- Build environmental literacy
- Build from key principles underlying environmental education

The Community:

- Support people who take responsibility for managing a group processes
- Relate outreach to long-term community vision and goals;
- Locate outreach activities close to where people practice behaviors of concern.

Beyond the Community:

- This learning category was not strongly addressed by the researchers in our meta-analysis, but it does not generally apply to most of the target audiences we covered. When looking for advice about BEPs for the audience beyond the community, educators have few sources of information; they need more.
- Build value for education as part of policy development and implementation
- Build skills for flexibility and responsiveness to environmental issues and for facilitating community engagement
- Concerning a particular topic – the learning experience uses the same learning goals for all levels of responsibility, but varies the teaching methods, which are adapted for the target audience
- Match the target audience to the scope of the problem
  - For example, train watershed council staff about a locally significant topic, train agency staff about how information about several related topics informs policy

development

- Offer avenues for participation that are competent, fair, and enhance involvement for all levels of responsibility
- Investigate strategies that enable educators to train and facilitate policy makers, organization leaders, and agency administrators.
-

Internet-based learning:

- Build on information provided by findings from the 2004 Symposium
- In general: We did not find any research-based practice recommendations for Internet-based learning in our research. Hence, there are no study recommendations that reference BEPs for outreach via the Internet. This is a large gap in the research that needs to be filled.

Conclusions

We conducted an extensive review of research published from 1988-2004 for a meta-analysis of water outreach and education methods that were shown to be *best* practices for educating specific target audiences. We expected to find few studies that had identified and tested the relative effectiveness of specific education practices with these audiences. We confirmed this expectation for most audiences. Only farmers were moderately-well investigated as a target audience.

There are considerable gaps in the research, but it is important to disseminate findings from this and similar studies, and to provide water educators with skills and practice for applying these findings, even as we continue to increase the sophistication of our understanding about how to work with different audiences.

This study points to the complexity of identifying and practicing effective outreach techniques that respect citizen decision-making processes and still lead to a more universal commitment to careful management of the water resource and its related human and natural ecosystems. It also points to the strengths and weaknesses of work in progress. Building educator skills for implementing effective practices will make a difference. Research that amplifies these results will increase understanding for how to make a difference.

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Appendices

A. Water Outreach project and products

B. Findings, summarized by target audience

C. Findings, summarized by Essential BEPs

D. Target audience meta-analysis matrix (separate file)

A. Water Outreach project and products

National Extension Water Outreach Education – Facilitating Access to Resources and Best Education Practices

Project Products

Study of Provider Needs (2002)

The advisory committee determined that a formative evaluation strategy would be most effective for the success of this project. In 2002 we conducted the *BEP Study of Provider Needs* to identify what resources water outreach professionals currently use, how the resources might better meet user needs, how the project can make them more accessible, and how it can promote the use of best practices in water outreach education. Informants included Extension Water Quality Coordinators as well as other U.S. water outreach and education professionals.

Literature Search for Audience-Specific BEPs (2002-2004)

The BEP literature search was developed in 2002 to identify research findings that apply to water education of specific audiences. We have implemented a system to search thousands of papers to find unique tips or strategies that have been tested and shown to be effective with target audiences. The review and summary of findings for this work will be presented at the BEP Symposium in June 2004.

Pilot Web Site Development, Content and Design (2002-2004)

The pilot site is hosted by the University of Wisconsin Cooperative Extension Service and will be launched to a select audience at the BEP Symposium in June 2004.

- Web site recommendations—The BEP Study of Provider Needs helped us identify the problems water management professionals have finding and accessing education materials and resources. Their responses, an in-depth look at knowledge management principles, experts in the field of knowledge management, and BEP Advisory Team members helped us build a framework of organization for the site.

- Keywords—We pulled keywords from major water quality stakeholders, including the USDA/CSREES National Water Quality Program themes, Clean Water Action Plan, our Study of Providers' Needs, and the EPA's Office of Water web site, to provide a matrix for database entry that will be recognizable and consistent for users.

- Content collected for site resources including:
    - NWQP theme areas
    - e-networking opportunities

- Short course
- Professional development and training opportunities
- Success stories
- Best education resources links
- Guide for Researchers

- **Model Education Techniques—The *Essential* Best Education Practices (2003).** Developed model education techniques, based on review and summary of education theories that contribute to best education practices.

- **Pilot Web Site Database and Content Development (2003-2004).** Worked with UW Extension web site database administrator and designer to establish the site delivery systems and "look". Established a list of 877 data fields of information that will provide quick and easy access to project products, case studies and other education resources. The site template is complete and we began adding content to the pilot site in January 2004.

Synthesis of Significant Education Research (2003-2004)

Developed content and web delivery system to help users quickly explore the components of learning, theoretical foundations of education, and components of practice (planning, implementation and evaluation), which can be applied effectively to water outreach efforts.

The BEP Decision Tree (2003-2004)
Designed a decision tree to help natural resource professionals select outreach strategies most likely to lead to desired impacts.

Water Outreach Education Symposium (June, 2004)
The Symposium will engage national Extension water quality coordinators, outreach professionals, and key stakeholders in fine-tuning BEP Project products and marketing strategy to best assist natural resource professionals in meeting their water management education and outreach objectives.

Project Support

These activities were critical to the understanding of the task ahead and the development of project products.

EPA/UW Extension project: Community-based Environmental Education Principles (2000)
Completed project on the theoretical and research-based foundations for the CBEE model and its application in voluntary management of the environment. This is an important BEP resource.

USDA/CSREES National Water Quality Coordinator's Conferences (2000-2004)
Each year, participation at these conferences provides opportunities to understand the breadth and depth of national water outreach/education efforts, network with water management professionals, identify opportunities for education facilitation, and enlist the help of participants in reviewing project products and directions.

National Watershed Forum (2001)
Helped forge education recommendations at this national dialogue on establishing cooperative efforts for sustaining water resources.

Web Site Development—Working Site (2002-2004)
The Project required work on two web sites. The "working" site, www.uwex.edu/erc/waterbeps, helped communicate project goals and objectives, keeping project stakeholders appraised of our progress, and making products available for review. In addition, we are developing the BEP Pilot Web Site that will provide the primary delivery system for BEP project products and resources.

Great Lakes Fisheries and Ecosystem Education Networking Conference (2003)
Participation in this event helped shape content and web site deliverables, and strengthened our understanding of the barriers that exist for natural resources educators.

Plan the Water Outreach Education June, 2004 Symposium (2003)
The Symposium will engage national Extension water quality coordinators, outreach professionals, and key stakeholders in fine-tuning BEP Project products and marketing strategy to best assist natural resource professionals in meeting their water management education and outreach objectives.

Preliminary On-line Library Data Field Review (2004)
At the 2004 National Water Quality Coordinator's Conference in Florida we asked participants to review select web site data fields.

Work with Advisers and Partners

Project partners provided advice and resources, helped shape project goals, and evaluated the Water Outreach Education pilot web site and products. They also provided networking communications and advice about the interests of the professionals they work with.

National advisory committee selection, preparation and participation (2000-2004)
The advisory committee has guided development of the purpose, themes, and direction of the project through face-to-face meetings, periodic conference calls and one-on-one meetings. The committee includes representatives from the U.S. Environmental Protection Agency (EPA), two national nongovernmental organizations (NGOs), a state department of natural resources, and Cooperative Extension in California, Nebraska, Ohio, and Wisconsin.

Recreational Boating and Fishing Foundation's (RBFF) Education Task Force (2000-2001)
Assisted RBFF in the development of best education practices for boating, fishing and aquatic stewardship. This work helped frame the issues and provided insight for developing our project goals and objectives.

B. Findings, summarized by target audience

Appendix B includes tables comparing Best Education Practices (BEPs) for 14 target audiences, distilled from the 96 studies reviewed for the *Water Outreach Project* Target Audience Literature Study. We undertook the project to make it easier for water management and outreach professionals to take initial steps in designing a program or resource by identifying best education practices for educating specialized audiences.

The BEPs are organized by one or more of seven focus areas that emerged from the research. These are listed in Tables I – VI.

Specialized Audiences Investigated for the Water Outreach Literature Review	
Aquaculture business	Households
Business/ Industry water users	Landowners
Decision-makers, local	Loggers
Ethnic groups	Recreational water users
Farmers	Students, higher education
Government agency/ University Extension professionals	Students, K-12
Homeowners	Teachers

Target Audience Study Themes	
Table I	Audience
Table II	Message content
Table III	Message delivery vehicle
Table IV	Outreach strategy
Table V	Public participation
Table VI	Supporting and motivating professionals
Table VII	Evaluation

TABLE I – The Audience

Target Audience	The Audience
Adults	• Assess audience concerns and preferred method for receiving information prior to developing outreach or education initiatives
Aquaculture business	No research available

Business/ Industry water users	• Recognize that audiences are often already aware of important issues. Outreach materials should:
	  ○ Emphasize a pollution-prevention practice
	  ○ Tell audience a little about how to prevent pollution
	  ○ Tell audience where they can obtain information about prevention.
	• Emphasize "place", by creating a local Board for example, has potential for broad impacts on locally identified environmental problems.

Decision-makers, local	• When designing education programs for decision makers: ○ Gather data about policy maker skills and preferences prior to designing training
Ethnic groups	• Identify locally-specific or culturally-specific needs or problems related to water conservation and quality. These may not be what an expert would typically expect due to unique cultural or situational needs. For example, in a person-to-person outreach initiative about toxic substances in fish, African-Americans were most interested in risks to their health from eating contaminated fish. Caucasians were most interested in the levels of contamination in the fish.

Farmers	• Collect and assess data about the following, prior to developing the outreach program
	  ○ Regional audience preferences for where to get information and which source is *reliable*
	  ○ Adoption training methods known to be successful with the target audience.
	  ○ Approach and materials for training new farmers based on input from farmers
	  ○ Producer assessment of project BMP recommendations prior to implementing outreach program
	• Consider target audience issues such as time, skill, and direct experience with saving money over time
	• Acknowledge a farmer characteristic to be "averse to additional risk ". That is, a new practice or technology must not add to current risks, or it must reduce risks to productivity incurred through other practices in order to be viewed favorably.
	• Assure that intervention programs are relevant to perceived needs of farmers, relevant to cultural milieu of subgroups, and relevant to specific environmental needs:
	  ○ Cultural and farm-structure differences must be considered when intervention strategies are developed to bring about behavioral changes among specific groups
	  ○ Potential Mennonite adaptors have to be convinced that adoption of conservation tillage will be profitable and not threaten the values of the collective group
	• Pay attention to unique factors of cultural groups, but programs that focus on efficiency and productivity in decision-making are likely to succeed, whatever the social characteristics of the farm group
	• Create information, communication and education design to address research-based information about farmer characteristics, such as:
	  ○ Priorities: profitability of agriculture; quality of drinking water; agriculture health and safety; controlling soil erosion
	  ○ Lack of concern about threats to groundwater quality on their own property, but concerned about the problem elsewhere [relates to research findings about farmer minimization of the threat of risk when the source is familiar, voluntary, controllable]
	  ○ Sources of information that most influenced farmer views about problems associated with groundwater and agricultural chemical use were: farm magazines and newspapers; general newspapers and news on radio and television; educational/research agency reports; personal observation

Government agency/ University Extension professionals	No research available
Homeowners	• Identify the need for education or outreach based on audience characteristics (e.g. understanding of the problem, socio-economic characteristics) and/or details about the specific local environmental concern
Households	No research available

Target Audience	The Audience

Landowners	• In landowner or renter situations:
	  ○ Determine which role is primarily responsible for water quality or conservation decisions
	  ○ Identify factors that may influence the person who could take action
	  ○ Understand "opportunity costs" and social norms relative to your content or practice focus
	• Identify characteristics of landowners that could influence interest in conservation practices
	• Match the information technology delivery mechanism to the computer work style of the landowner. How does the landowner already use the computer the landowner?

Loggers	No research available
Recreational water users	• Use direct surveys and interviews to gauge public opinion as opposed to relying on "representative" stakeholders (direct representation may highlight factors not previously considered or lead to unexpected interests or concerns) • Gauge public preference at an early stage of planning and design, or at least at the point where possible options are being considered • In designing outreach to encourage *participation* in outdoor recreation programs, attend to: • Individual and socio-economic characteristics of participants (age, gender, income, education) as they relate to their participation in outdoor activities • Participant engagement in environmental behavior, rather than their attitudes about the environment • In designing outreach programs that strive to *link environmental concern with recreational behaviors*, attend to social factors that influence the choice of activity and the interpretation given the recreational experience
Students, higher education	No research available
Students, K-12	• Use a test or an advance activity to learn information about students, in order to enhance the likelihood of an increase in student knowledge about a specific water topic through presentation of the topic in a way which is interesting and relevant to students and builds motivation to learn

Teachers	• Recognize that issues and context for different geographic regions impact educator and natural resource manager priorities for the relative importance of selected concepts, skills, and values
	• Tie water and water resource education to local values and needs of:
	  ○ The geographic region
	  ○ Educator identified priorities
	  ○ Natural resource manager identified priorities
	• Determine whether teachers can implement topics by checking to see if:
	• To determine whether a teacher could implement a topic, check to see if:
	  ○ They have knowledge about the topics
	  ○ They have a place to fit the topic in their curriculum
	• Understand the roots of the environmental management problem and select your target audience based on a specific need. For example, if economic activity is most closely associated with the environmental problem, outreach initiatives should relate to the needs and interests of the target audience engaged in the economic activity

TABLE II – Message Content

Target Audience	Message Content
Adults	No research available
Aquaculture business	No research available
Business/ Industry water users	• Focus the content for outreach materials on cost savings, such as when and where pollution prevention is as cheap as or cheaper than traditional techniques. Include facts and figures. • Emphasize how easy it is to do the right thing and the impacts of not engaging in pollution prevention. • Stress benefits such as efficiency or better relations with government, for businesses not primarily concerned with public image.
Decision-makers, local	No research available
Ethnic groups	• Carefully tailor the water conservation message to address the specific circumstances of the target audience
Farmers	• Make sure that participants know about the initiative and know how to participate. • Address farmer perception of risk. o Acknowledge a farmer characteristic to be "averse to additional risk ". That is, a new practice or technology must not add to current risks, or it must reduce risks to productivity incurred through other practices in order to be viewed favorably o Acknowledge emotional and political context of a risk message. Statements about potential agricultural chemical risks can fuel public fears. Farmers may not respond to risk messages because they view their own use of chemicals as "voluntary, familiar and controllable" whereas nonfarm consumers would view it as partially familiar, involuntary and uncontrollable • Provide information that is high quality, explains risks; and is: o Easy to understand o From a trusted source o Scientifically valid o Balanced, (gives both sides on an issue) o Up-to-date o Directly applicable o Consistent with beliefs • Address economic benefits: o Focus outreach programs on the potential of the farm practice to increase yield or otherwise improve economic benefit o Show that profits will increase as a result of adoption of the practice • Include environmental stewardship information shown to be significant in predicting farmer adoption of new practices: o Locally specific information about watershed risks. Farmers assess agricultural chemical risks in the context of localized situations o Substantive local data to support claims that specific BMPs are environmentally effective and economically advantageous as compared to in-place practices o Information about soil and water conservation benefits to be derived from adoption of precision farming techniques • In communication and outreach about groundwater, address: o The quality of the drinking water supplies o Concerns about risks of handling and applying chemicals o Recognition of farm economics o Evidence that contamination will affect profits o Present programs or information about health and environmental risks as part of other outreach efforts rather than on their own • When persuading farmers to reduce chemical use: o Show that farm chemicals are contaminating groundwater on the *individual's farm* o *Link to quality of drinking water on the individual's farm* o Provide alternative methods with a demonstrated outcome that has no adverse affect on profits and no more than a modest decline in yield • Focus training for new farmers on problem-solving and production agriculture skill development
Government agency/ University Extension professionals	No research available

Target Audience	Message Content
Homeowners	No research available
Households	• Adapt language and appearance of notification materials to reflect the diversity of those being notified and the literacy level of the group. • Explain the exact nature of the water quality problem. • Make a recommendation for action and provide explicit instructions for how to take action without too much investment of time or money. • Indicate personal risk when risks exist. • Address each goal – change in attitudes, knowledge, behavior intentions, or behavior – because there is no evidence that changes in one area, such as attitudes, will have an impact on changes in another, such as behavior change. • Phosphorus public information campaigns need: o Clear simple messages o Sufficient media exposure to outline the seriousness of the collective problem o Some sort of feedback to the target audience about impact of behavior changes o To create an atmosphere of social pressure and the feeling that people can do more
Landowners	• Acknowledge landowner interest and concern for the quality of their land • Be aware of the boundary between education and advocacy • Emphasize local elements of control • Link conservation, stewardship, and watershed topics to a particular place on the owner's land • Provide clear information about goals and plans • Provide regular feedback about how well goals and plans have been achieved
Loggers	No research available
Recreational water users	• Segment information content, to address differences in target audience interests
Students, higher education	No research available
Students, K-12	• Carefully determine what is important for students to know and why before presenting classroom activities focusing on a specific water topic • Build student environmental stewardship motivation and competencies by focusing on the characteristics of environmentally responsible behavior: o Knowledge of issues o Skill in actions o Knowledge of ecology and actions o Group locus of control o Intention to act o Environmental sensitivity o Personal responsibility o Individual locus of control
Teachers	• Water and water resource education has a distinct body of knowledge described by topics categorized as concepts, skills, and values or emotions. Water science and management knowledge has been organized by Brody (1995) and others.

TABLE III – Message Delivery Vehicle

Target Audience	Message Delivery Vehicle
Adults	No research available
Aquaculture business	No research available
Business/ Industry water users	• Provide outreach through external relationships chosen by the business, such as suppliers, trade shows, other companies, and publications to which businesses subscribe. • Encourage businesses to take advantage of external relationships such as those offered by trade associations and courses. • Reduce emphasis on information from the government except for information about tax deductions and other incentives. • Generate ongoing environmental change by initiating and coordinating pollution prevention activities through regional networks or consortia.
Decision-makers, local	No research available
Ethnic groups	No research available
Farmers	• Use farmer-preferred sources of information and strategies for outreach about making decisions. • Rely on farmer personal experience as more influential than education or research reports • Use the internet for training new farmers in preference to other distance education techniques • When providing information related to sustainable farming, use conventional sources of information to convey new ideas rather than start a new newsletter or organization or other new source of information. • Provide information through field days, pamphlets, farm journals, media and books. These can contribute to: o More positive attitudes towards various aspects of management o Greater levels of knowledge about the concepts and the practical application of those concepts o Intention to carry out concepts o Adoption of a wider range of BMPs
Government agency/ University Extension professionals	No research available
Homeowners	No research available
Households	• Train the person who serves as the agency interface with the public to assure that citizens are fully informed about options • Promote resources through sources the audience considers credible
Landowners	• Provide agriculture landowners with written materials in addition to whatever other communication methods are selected
Loggers	No research available
Recreational water users	• Provide one-on-one communication with a person engaged in the targeted activity to enhance the knowledge they gain and their interest in acquiring more information
Students, higher education	No research available
Students, K-12	No research available
Teachers	• Develop, promote, and/or disseminate pre-developed materials, hands-on activities and grade level appropriate software about priority water topics

TABLE IV – Outreach Strategy

Target Audience	Outreach Strategy
Adults	No research available
Aquaculture business	• Develop a strategy that responds to the fact that the effectiveness of a new educational program may be hindered by the insular nature of communities in which producers live.
Business/ Industry water users	• Emphasize company commitment to pollution prevention activities and investment of adequate time and money. Self-assessment has produced measures of superior quality to those produced by quick-scan methods completed by a consultant. When companies invest more time in the pollution prevention project, the options produced are better tailored to the company and likely to have a more profound impact. • For auto repair shops, provide a direct visit from an educator who provides an audit activity and information materials. • Be patient in your efforts to reach small businesses; small businesses are a difficult audience to reach – limited staff, busy schedules, financial constraints; many will not take the time to return phone calls that are considered non-essential and many do not read mailed solicitations.
Decision-makers, local	• Provide policy makers with a link to local information sources • Provide strategies and practice for differentiating objective information sources from biased information sources • Identify and provide additional support for group-designated water "experts" • Design partnership development training to build understanding and skills for partnership success factors and themes identified through the Leach and Pelky (2001) meta-analysis of empirical literature. (See Table 2, p. 382 for detailed list of these associated with each factor). Focus on factors influencing partnership success: o Maintain balance between partnership resources and scope of activity o Pursue flexible and informal process o Attend to alternative dispute resolution (ADR) processes o Attend to institution analysis and development (IAD) processes
Ethnic groups	• Assure that intervention programs are relevant to the cultural milieu of the subgroup. • Talk with people one-by-one about the information • Include community members, essential service operators, environmental health workers, administrators, teachers, and regional service providers in community water conservation training programs. • Convey water conservation techniques through hands-on training and talking through questions in a workshop style. • Consider ethnic or culturally-related farm-structure differences when developing intervention strategies to bring about behavioral change. • Focus outreach to farmers on farm efficiency and productivity, whatever the social characteristics of the farm group. But pay attention to unique factors of cultural groups, as well.
Farmers	• Look to these conditions for opportunities to provide education that is more likely to be effective: o Actions that improve water quality also increase profitability o The producers' own water quality is at stake o The on-farm cost of water quality impairments are shown to be sufficiently large o Education is accompanied by training for management skills of immediate need to the producer • Provide information to farmers in three stages: o Information to stimulate farmer interest o Personal contact with farmer to provide new farming practices that are viewed as solutions to their problems o Work collaboratively and cooperatively with the farmer in the adoption of new practices • Focus on a geographic area: o Define the geographical area where environmental intervention is crucial o Focus outreach initiatives on a geographic area with a targeted audience • Involve target audience in: o Choosing and testing preferred technical approaches to solving a problem o Developing content and process for outreach activities o Participatory approaches to help identify target audience education needs and motivate participation • Support stakeholder engagement more fully by anticipating a political dimension in addition to a focus on subject matter. [This emphasizes Cervero and Wilson's (1994) democratic approach to program planning whereby adult educators talk openly about social and political aspirations of interested parties in addition to content matter objectives.] • Work with consultants:

Target Audience	Outreach Strategy
	○ Recognize and support education providers already in place who provide information consistent with the program goal ○ Train the technical professionals who support the target audience as well as specifically training the target audience about the new practice ○ Provide the farmer with the opportunity for continuous dialog with consultant. This outreach process has been shown to result in multiple on-farm management refinements with practices continuing even when dialog with consultants is no longer available as part of a project • Emphasize one-on-one contact. ○ Correlates with farmer willingness to change practices, but adoption of a new technology requires more than a personal conversation and data about the specific situation ○ Couple with small group and demonstration events ○ Work with farmers individually to determine participation level • Facilitate farmer-led program design and implementation that leads to: ○ Farmer developed reasons for taking charge of environmental protection ○ Peer development of solutions ○ Peer assessment of potential hazards of current practices ○ Farmers rather than technical experts complete environmental assessment and Action Plan ○ Farm plan and data evaluation via peer review • Design outreach to address farmer preferred learning style ○ Emphasize experiential learning and farmer knowledge ○ Provide farmers with opportunities to *solve a problem* in addition to providing other standard hands-on outreach techniques such as opportunities for talking with specialists, field days, demonstrations, etc. ○ When training new farmers, focus on problem-solving and production agriculture skill development • Use financial incentives, where possible, to facilitate behavior change: ○ Provide information, encouragement and cash incentives to participate in or practice a new technology, but keep in mind that incentives have a weak influence on adoption ○ Couple general outreach, information, and communication techniques with financial incentives • Recognize the role of economic factors in behavior change: ○ Carefully design a demonstration project to meet farmer economic and other regionally specific needs ○ Since producer income is an important predictor of BMP use, sequence audience involvement by income level. Consider a focus on low income audiences • Recognize the limits of regulation in producing behavior change: ○ Regulation leads to adoption of specific regulated behaviors only. (e.g. the target audience performed required nitrogen test but did not apply resulting information when making decisions about nitrogen application) • Link education to production decisions to reflect the fact that operators prefer to make production decisions based on their own farm records and advice from on-farm employees. ○ Work with operators to review farm records in order to consider potential impacts of proposed changes ○ Increase knowledge of on-farm advisors ○ Collaborate with many groups/organizations to convey important information • Use farm assessments: ○ To identify pollution risks when the use of an assessment tool is likely to lead to cost-effective, voluntary actions to reduce those risks ○ To increase the likelihood of management changes for topics addressed in the assessment work one-on-one with the farmer completing the assessment. • Encourage farmers to complete their own on-farm risk assessments rather than performing the assessment for them • Focus programs designed to facilitate adoption of precision farming techniques on farmers, who: ○ Are relatively economically secure ○ Place importance on use of conservation information when making farm-level decisions ○ Perceive that their children will be operating their farms in the future • For sustainable agriculture education, target families with one or more of these characteristics: ○ Kin-mentor relationship that supports practice of sustainable agriculture ○ An environmental or health problem which triggers interest or motivation ○ Systematic on-farm experimentation ○ Value for prudence with resources. • Allow enough time for wide spread adoption of the demonstrated BMPs. A nine to ten year time frame may be necessary to move from initial implementation of BMP demonstration projects to adoption.

Target Audience	Outreach Strategy
Government agency/ University Extension professionals	• Test the audience at the beginning of the workshop to improve instructor ability to enhance subsequent learning • Use two-way communication methods, particularly door-to-door contact, where possible. These methods are more successful in soliciting participation for watershed planning initiatives than one-way communication (information) methods. • Use participatory, watershed-based planning as an effective technique for building public awareness and interagency coordination.
Homeowners	No research available
Households	• Use multiple channels of communication. • Provide the following when focusing on environmentally responsible behavior: o An opportunity to demonstrate a commitment. o A demonstration or model of desired action. o An opportunity to set goals or respond to goals, including use of prompts. o Feedback on progress toward preferred environmental change. • If providing explanatory materials by mail to residents from communities engaged in watershed planning, keep in mind that only residents *who take the time* to review materials are likely to demonstrate knowledge mastery and an inclination to apply results. If using this method of disseminating information, find ways to encourage individuals to engage. • Feel confident about choosing to communicate through major public media and education campaigns because, if properly conducted, they can have a demonstratable effect on attitudes, knowledge, behavior intentions, and behavior change.
Landowners	• Base your program design on specifically identified needs • Base the outreach or education process on mutual understanding, trust, and respect that leads landowners to choose to comply because they see it in their best interest • Emphasize an "integrated" program that provides a continuum of information, communication, and education resources • Engage audience in planning • Use a variety of outreach methods, with each targeted at specific, desired behaviors • Plan for the time it takes to adopt new ideas • Provide agricultural landowners with written materials in addition to whatever other communication methods are selected • Be aware of the boundary between education and advocacy • Be aware of the larger political issues and contexts in which water quality outreach and education take place (such as legislative requirements). o Identify and communicate potential areas for measurable change o Emphasize local elements of control
Loggers	• Provide training with a clear goal, geared toward the needs of a target audience. • Require locally extensive training, which has been shown to increase peer group awareness and implementation of skills in a study with a small sample group.
Recreational water users	• To increase ownership and empowerment, design programs with a strong emphasis on: o Combining: a) field activities; b) curriculum activities; c) family and community involvement o Multi-faceted experiences, which are more likely to lead to an increase in skills, knowledge and motivation than education which includes only one of the above elements. • To produce long-term changes in behavior: o Provide comprehensive training in the set of variables correlated with measurable changes in environmentally-related behavior, including: ▪ environmental sensitivity ▪ knowledge about ecology ▪ in-depth understanding of aquatic environmental issues ▪ a sense of personal investment in specific environmental issues ▪ knowledge of environmental action strategies ▪ skills in using environmental action strategies ▪ an internal locus of control ▪ intentions to act o Provide continued application and reinforcement of content o View the behavior-change process as one that takes place over an expanse of time, in a combination of formal and non-formal settings, within the context of a supportive social environment • Design programs to: o Establish an explicit set of objectives o Target outcomes for specific audiences o Provide direct experience relevant to the objective o Provide authentic experience, similar to what the participant will experience in their personal life o Provide an opportunity to practice the target behavior

Target Audience	Outreach Strategy
	○ Provide learning opportunities before and after the field activities to optimize knowledge gain • Develop program design and content to adhere to guiding principles for boating, fishing, and aquatic stewardship education. Program: ○ Is learner-centered ○ Constitutes a continuous and lifelong process for individuals, families, and diverse social groups ○ Considers aquatic resources in their totality, including natural, built, technological, and social aspects (e.g. economics, politics, cultural-historical, moral, aesthetic) ○ Provides participants with opportunities to engage in the valuing process (i.e., choosing, affirming, and acting) as it relates to programs, program activities, and their own growth and development ○ Follows the principles of inclusion with regard to program participation by minorities and people with disabilities ○ Begins with goals and objectives that relate to appreciation and awareness, expands to include both knowledge and skills, and culminates in personal responsibility and responsible behavior ○ Builds upon local, state, and national partnerships to support the development, implementation, and evaluation of programs as well as to support stewardship of the resource ○ Relies on a variety of systematic and continuous approaches to the assessment of participants and evaluation of programs so as to improve and eventually validate those programs ○ Supports, engages in, and makes use of the scientific, social, educational, and other forms of research that have a bearing on programs ○ Recognizes the critical role and the need to adequately support ongoing professional development for all personnel associated with these efforts and programs, including those suggested or implied in the above principles • Attend to *Best Practice* recommendations for: program development and implementation, professional development for teachers/youth leaders, and program evaluation available through the Recreational Fishing and Boating Foundation, as well as many other sources including the Water Outreach website • In designing outreach programs that strive to *link environmental concern with recreational behaviors* vary program goals to reflect differences in commitment among experienced and active anglers, ex anglers, inactive anglers, and non anglers
Students, higher education	• Use simulation games to help increase participant flexibility in making choices • Design training to provide students with work in teams on a practical experience with interdisciplinary participants
Students, K-12	• Use multiple methods to introduce specific concepts. Repeat concepts throughout the education experience • Structure activities at a field site in order to increase knowledge gain, but apply structured activity with care in order to avoid reducing motivation • Provide activities: ○ With a real problem to solve ○ That enable students to respond to a real-world or authentic challenge ○ That enable students to demonstrate mastery through a public presentation • Incorporate field-based experiences and service-learning as significant components of environmental stewardship programs that focus on building environmentally responsible behavior among students
Teachers	• Educate teachers about innovations in curricula to ensure that they are implemented • Encourage and support use of a community-based curriculum based on water monitoring. (This type of curriculum has been shown to be highly acceptable among teachers and to provide professional satisfaction.) • Encourage teachers to include the following elements in their environmental education programs: ○ Flexible curriculum ○ Collaborative learning environments ○ Students' bearing the consequences of the behavior ○ Teacher competency in listening and questioning ○ Diverse instructional strategies ○ Resourcefulness in accessing resources ○ Creativity, especially in knowledge of how to do without, ○ Facilitation skills ○ Ability to make connections ○ Understanding of local-to-global connections ○ Ability to integrate curricula ○ Using personal/student strengths/passions

Target Audience	Outreach Strategy
	○ Experiential teaching orientation ○ Cooperative and inclusive learning ○ Nurturing a sense of place ○ Consistent can-do vision ○ Infectious passion for EE and teaching in general ○ Humor in the classroom ○ Practice of environmentally responsible behavior ○ Risk taking ○ Recharging oneself

TABLE V – Public participation

Target Audience	Public Participation
Adults	Not available
Aquaculture business	Not available
Business/ Industry water users	Not available
Decision-makers, local	Not available
Ethnic groups	Not available
Farmers	Not available
Government agency/ University Extension professionals	• Public participation is used most effectively to accomplish watershed plan goals and less effectively with other planning steps. • Watershed-based, participatory planning can be helpful in making watershed data publicly available and in establishing plan legitimacy.
Homeowners	• Engage the "community of interest" in checking information about a local environmental condition (such as excess nutrients in water) o Gather data about local environmental condition o Relate data to expectations about needs o Change practice recommendations to reflect results o Develop data to show environmental improvements that result from following recommended practices
Households	Not available
Landowners	• Create opportunities to build landowner participation in the activities of landowner groups • Provide groups with training to help develop leadership and organization skills
Loggers	Not available
Recreational water users	Not available
Students, higher education	Not available
Students, K-12	Not available
Teachers	Not available

TABLE VI – Supporting and Motivating Professionals

Target Audience	Supporting professionals
Adults	Not available
Aquaculture business	Not available
Business/ Industry water users	Not available
Decision-makers, local	Not available
Ethnic groups	Not available
Farmers	Not available
Government agency/ University Extension professionals	• Design communication and professional development opportunities for outreach educators that will motivate them to implement a priority program because: o They understand the program o It is clear that they are supported by their organization and resources are made available. o They have a choice to participate o The program fits their job description o The program has social significance o The program is part of work in a team
Homeowners	Not available
Households	Not available
Landowners	Not available
Loggers	Not available
Recreational water users	Not available
Students, higher education	Not available
Students, K-12	Not available
Teachers	• Provide teachers with substantial support, to better enable them to build water supply and management topics into their curricula, by: o Building teacher self confidence in understanding water concepts that are less familiar to them o Helping teachers figure out how to integrate water topics into their regular curriculum o Providing teachers with new science skills and pedagogical knowledge to build self confidence o Providing teachers with the following, to assure that they can successfully implement a curriculum: ▪ Supportive curriculum resources ▪ Training to support thorough understanding of scope and content objectives • Provide teacher training that is: hands-on, intense, comprehensive, and includes work in the field. A successful training could: o Include an introduction to the watershed topic(s), water quality testing, use of equipment, hands-on instruction, introduction to inquiry-based learning, introduction to and use of field-based science investigations, and related science and career topics o Assure availability of any resources required for the training o Include practice training activities designed to match the situation where teachers will apply the activities o Provide professional development in: student initiatives, action research, interdisciplinary approaches, and help with barriers to program implementation

TABLE VII – Evaluation

Target Audience	Evaluation
Adults	Not available
Aquaculture business	Not available
Business/ Industry water users	Not available
Decision-makers, local	Not available
Ethnic groups	Not available
Farmers	Not available
Government agency/ University Extension professionals	Not available
Homeowners	• Effectiveness of education program delivery can be tested through comparison of changes in nitrate, nutrients and bacteria in runoff.
Households	• Use a "water demand" mathematical model to provide feedback to citizens and to demonstrate the effect of community water conservation outreach programs. • Maintain records describing which specific outreach programs were initiated to address which specific community environmental concerns and/or audiences in order to have sufficient data to interpret evaluation results.
Landowners	• Make time for continuous evaluation in order to best determine next steps • Provide clear information about goals and plans • Provide regular feedback about how well goals and plans have been achieved
Loggers	Not available
Recreational water users	Not available
Students, higher education	Not available
Students, K-12	Not available
Teachers	• Document information and outreach work to help improve ability to assess the relationship between outreach and outcomes and to exchange materials and knowledge with others • Evaluate progress toward clearly defined objectives • Apply an evaluation strategy which helps educator to identify reasons and consequences for training outcomes

C. Findings, summarized by Essential BEPs

For the Individual

The learning experience:	Study-Specific BEPs, FOR THE INDIVIDUAL
▪ Has a clear purpose with tightly focused outcomes and objectives	LOGGERS – Provide training with a clear goal, geared toward the needs of a target audience. RECREATIONAL WATER USERS – Design programs to: o Establish an explicit set of objectives STUDENTS, K-12 – Carefully determine what is important for students to know and why before presenting classroom activities focusing on a specific water topic
▪ Is learner centered, and consequently:	RECREATIONAL WATER USERS – Develop program design and content to adhere to guiding principles for boating, fishing, and aquatic stewardship education: such as o The program: Is learner-centered
o Assesses the learner in order to set appropriately high and challenging standards.	GOVERNMENT AGENCY /UNIVERSITY EXTENSION PROFESSIONALS – Test the audience at the beginning of the workshop to improve instructor ability to enhance subsequent learning LOGGERS – Require locally extensive training. In a study with a small sample group, this requirement was shown to increase peer group awareness and implementation of skills. STUDENTS, K-12 – Provide activities: o That enable students to demonstrate mastery through a public presentation
o Relates to the individual's level of physical, intellectual, emotional, and social development.	FARMERS – Rely on farmer personal experience as more influential than education or research reports RECREATIONAL WATER USERS – In designing outreach to encourage participation in outdoor recreation programs, attend to: o Individual and socio-economic characteristics of participants (age, gender, income, education) as they relate to their participation in outdoor activities RECREATIONAL WATER USERS – Develop program design and content to adhere to guiding principles for boating, fishing, and aquatic stewardship education, such as: o The program provides participants with opportunities to engage in the valuing process (i.e., choosing, affirming, and acting) as it relates to programs, program activities, and their own growth and development

The learning experience:	Study-Specific BEPs, FOR THE INDIVIDUAL
○ Can be adapted to individual differences in learning strategies and approaches.	FARMERS – Use farm assessments: ○ To identify pollution risks when the use of an assessment tool is likely to lead to cost-effective, voluntary actions to reduce those risks FARMERS – Link education to production decisions to reflect the fact that operators prefer to make production decisions based on their own farm records and advice from on-farm employees. ○ Work with operators to review farm records in order to consider potential impacts of proposed changes ○ Increase knowledge of on-farm advisors ○ Collaborate with many groups/organizations to convey important information FARMERS – Work with farmers individually to determine participation level STUDENTS, K-12 – Structure activities at a field site in order to increase knowledge gain, but apply structured activity with care in order to avoid reducing motivation
○ Relates to personal interests and provides for personal choice and control.	ETHNIC GROUPS – Carefully tailor the water conservation message to address the specific circumstances of the target audience. FARMERS – Collect and assess data about the following, prior to developing the outreach program: ○ Regional audience preferences for where to get information and which source is *reliable* ○ Adoption training methods known to be successful with the target audience. ○ Approach and materials for training new farmers based on input from farmers FARMERS – Create information, communication and education design to address research-based information about farmer characteristics, such as: o Priorities: profitability of agriculture; quality of drinking water; agriculture health and safety; controlling soil erosion o Lack of concern about threats to groundwater quality on their own property, but concerned about the problem elsewhere [relates to research findings about farmer minimization of the threat of risk when the source is familiar, voluntary, controllable] FARMERS – In communication and outreach about groundwater, address: ○ The quality of the drinking water supplies ○ Concerns about risks of handling and applying chemicals ○ Recognition of farm economics ○ Evidence that contamination will affect profits ○ Present programs or information about health and environmental risks as part of other outreach efforts rather than on their own FARMERS – Recognize the role of economic factors in behavior change: ○ Carefully design a demonstration project to meet farmer economic and other regionally specific needs FARMERS – Link education to production decisions to reflect the fact that operators prefer to make production decisions based on their own farm records and advice from on-farm employees. ○ Work with operators to review farm records in order to consider potential impacts of proposed changes ○ Increase knowledge of on-farm advisors ○ Collaborate with many groups/organizations to convey important information FARMERS – Recognize the limits of regulation in producing behavior change: ○ Regulation leads to adoption of specific regulated behaviors only. (e.g. the target audience performed required nitrogen test but did not apply resulting information when making decisions about nitrogen application) FARMERS – Look to these conditions for opportunities to provide education that is more likely to be effective:

The learning experience:	Study-Specific BEPs, FOR THE INDIVIDUAL
	○ Actions that improve water quality also increase profitability ○ The producers' own water quality is at stake ○ The on-farm cost of water quality impairments are shown to be sufficiently large ○ Education is accompanied by training for management skills of immediate need to the producer FARMERS – Address farmer perception of risk. ○ Acknowledge a farmer characteristic to be "averse to additional risk ". That is, a new practice or technology must not add to current risks, or it must reduce risks to productivity incurred through other practices in order to be viewed favorably ○ Acknowledge emotional and political context of a risk message. Statements about potential agricultural chemical risks can fuel public fears. Farmers may not respond to risk messages because they view their own use of chemicals as "voluntary, familiar and controllable" whereas nonfarm consumers would view it as partially familiar, involuntary and uncontrollable FARMERS – When persuading farmers to reduce chemical use: ○ Show that farm chemicals are contaminating groundwater on the individual's farm ○ Link to quality of drinking water on the individual's farm ○ Provide alternative methods with a demonstrated outcome that has no adverse affect on profits and no more than a modest decline in yield FARMERS – Use farm assessments: ○ To identify pollution risks when the use of an assessment tool is likely to lead to cost-effective, voluntary actions to reduce those risks FARMERS – For sustainable agriculture education, target families with one or more of these characteristics: ○ Kin-mentor relationship that supports practice of sustainable agriculture ○ An environmental or health problem which triggers interest or motivation ○ Systematic on-farm experimentation ○ Value for prudence with resources. RECREATIONAL WATER USERS – In designing outreach programs that strive to link environmental concern with recreational behaviors, attend to social factors that influence the choice of activity and the interpretation given the recreational experience
○ Encourages the learner to set meaningful learning goals and to take personal responsibility for their own learning.	FARMERS – Facilitate farmer-led program design and implementation that leads to: ○ Farmer developed reasons for taking charge of environmental protection ○ Peer development of solutions ○ Peer assessment of potential hazards of current practices ○ Farmers rather than technical experts complete environmental assessment and Action Plan ○ Farm plan and data evaluation via peer review FARMERS – Use farm assessments: ○ To identify pollution risks when the use of an assessment tool is likely to lead to cost-effective, voluntary actions to reduce those risks HOUSEHOLDS – Provide the following when focusing on environmentally responsible behavior: ○ An opportunity to demonstrate a commitment. ○ An opportunity to set goals or respond to goals, including use of prompts. ○ Feedback on progress toward preferred environmental change.

The learning experience:	Study-Specific BEPs, FOR THE INDIVIDUAL
	HOUSEHOLDS – Indicate personal risk when risks exist. LANDOWNERS – Keep the message simple LANDOWNERS – Include information that shows how the message affects landowners personally and what specific actions landowners can take to improve the situation RECREATIONAL WATER USERS – To increase ownership and empowerment, design programs with a strong emphasis on: o Combining: a) field activities; b) curriculum activities; c) family and community involvement o Multi-faceted experiences, which are more likely to lead to an increase in skills, knowledge and motivation than education which includes only one of the above elements. STUDENTS, K-12 – Provide activities: o That enable students to respond to a real-world or authentic challenge
▪ Promotes active engagement and real world problem solving.	ETHNIC GROUPS – Focus outreach to farmers on farm efficiency and productivity, whatever the social characteristics of the farm group. But pay attention to unique factors of cultural groups, as well. ETHNIC GROUPS – Convey water conservation techniques through hands-on training and talking through questions in a workshop style. FARMERS – Provide information to farmers in three stages: o Information to stimulate farmer interest o Personal contact with farmer to provide new farming practices that are viewed as solutions to their problems o Work collaboratively and cooperatively with the farmer in the adoption of new practices FARMERS – Design outreach to address farmer preferred learning style o Provide farmers with opportunities to *solve a problem* in addition to providing other standard hands-on outreach techniques such as opportunities for talking with specialists, field days, demonstrations, etc. o When training new farmers, focus on problem-solving and production agriculture skill development HOMEOWNERS – Effectiveness of education program delivery can be tested through comparison of changes in nitrate, nutrients and bacteria in runoff. HOUSEHOLDS – Indicate personal risk when risks exist. LANDOWNERS – Include information that shows how the message affects landowners personally and what specific actions landowners can take to improve the situation RECREATIONAL WATER USERS – In designing outreach to encourage participation in outdoor recreation programs, attend to: o Participant engagement in environmental behavior, rather than their attitudes about the environment RECREATIONAL WATER USERS – Design programs to: o Provide direct experience relevant to the objective STUDENTS, HIGHER EDUCATION – Use simulation games to help increase participant flexibility in making choices

The learning experience:	Study-Specific BEPs, FOR THE INDIVIDUAL
	STUDENTS, K-12 – Provide activities: o With a real problem to solve STUDENTS, K-12 – Incorporate field-based experiences and service-learning as significant components of environmental stewardship programs that focus on building environmentally responsible behavior among students
▪ Enables the learner to link new knowledge to their existing knowledge in meaningful ways.	FARMERS – Use the internet for training new farmers in preference to other distance education techniques HOUSEHOLDS – • Promote resources through sources the audience considers credible. RECREATIONAL WATER USERS – Segment information content, to address differences in target audience interests RECREATIONAL WATER USERS – Design programs to: o Provide authentic experience, similar to what the participant will experience in their personal life RECREATIONAL WATER USERS – To produce long-term changes in behavior: o Provide comprehensive training in the set of variables correlated with measurable changes in environmentally-related behavior, including: ▪ environmental sensitivity ▪ knowledge about ecology ▪ in-depth understanding of aquatic environmental issues ▪ a sense of personal investment in specific environmental issues ▪ knowledge of environmental action strategies ▪ skills in using environmental action strategies ▪ an internal locus of control ▪ intentions to act STUDENTS, HIGHER EDUCATION – Use simulation games to help increase participant flexibility in making choices STUDENTS, K-12 – Use a test or an advance activity to learn information about students, in order to enhance the likelihood of an increase in student knowledge about a specific water topic through presentation of the topic in a way which is interesting and relevant to students and builds motivation to learn TEACHERS – Provide teachers with substantial support, to better enable them to build water supply and management topics into their curricula, by: o Building teacher self confidence in understanding water concepts that are less familiar to them
▪ Builds thinking and reasoning skills – analysis, synthesis, evaluation, and problem solving – that learners can use to construct and apply their knowledge.	FARMERS – Use farm assessments: o To identify pollution risks when the use of an assessment tool is likely to lead to cost-effective, voluntary actions to reduce those risks RECREATIONAL WATER USERS – Segment information content, to address differences in target audience interests STUDENTS, HIGHER EDUCATION – Use simulation games to help increase participant flexibility in making choices

The learning experience:	Study-Specific BEPs, FOR THE INDIVIDUAL
▪ Presents a new behavior or skill by:	
o Demonstrating its similarity to a current behavior or skill.	BUS & IND WATER USERS – Emphasize how easy it is to do the right thing and the impacts of not engaging in pollution prevention. HOUSEHOLDS – Phosphorus public information campaigns need: o Clear simple messages HOUSEHOLDS – • Feel confident about choosing to communicate through major public media and education campaigns because, if each goal is specifically addressed, they can have a demonstratable effect on attitudes, knowledge, behavior intentions, and behavior change.
o Relating the new behavior to current social practices.	FARMERS – Assure that intervention programs are relevant to perceived needs of farmers, relevant to cultural milieu of subgroups, and relevant to specific environmental needs: o Cultural and farm-structure differences must be considered when intervention strategies are developed to bring about behavioral changes among specific groups o Potential Mennonite adaptors have to be convinced that adoption of conservation tillage will be profitable and not threaten the values of the collective group FARMERS – Include environmental stewardship information shown to be significant in predicting farmer adoption of new practices: o Information about soil and water conservation benefits to be derived from adoption of precision farming techniques FARMERS – Focus programs designed to facilitate adoption of precision farming techniques on farmers who: o Are relatively economically secure o Place importance on use of conservation information when making farm-level decisions o Perceive that their children will be operating their farms in the future HOUSEHOLDS – Phosphorus public information campaigns need: o To create an atmosphere of social pressure and the feeling that people can do more HOUSEHOLDS – Feel confident about choosing to communicate through major public media and education campaigns because, if each goal is specifically addressed, they can have a demonstratable effect on attitudes, knowledge, behavior intentions, and behavior change.
o Demonstrating ease of adoption in terms of time, effort and money.	BUS & IND WATER USERS – Focus the content for outreach materials on cost savings, such as when and where pollution prevention is as cheap as or cheaper than traditional techniques. Include facts and figures. FARMERS – Provide information to farmers in three stages: o Information to stimulate farmer interest o Personal contact with farmer to provide new farming practices that are viewed as solutions to their problems o Work collaboratively and cooperatively with the farmer in the adoption of new practices FARMERS – Encourage farmers to complete their own on-farm risk assessments rather than performing the assessment for them FARMERS – Consider target audience issues such as time, skill, and direct experience with saving money over time HOUSEHOLDS – Make a recommendation for action and provide explicit instructions for how to take action without too much

The learning experience:	Study-Specific BEPs, FOR THE INDIVIDUAL
	investment of time or money. HOUSEHOLDS – Indicate personal risk when risks exist. HOUSEHOLDS – Feel confident about choosing to communicate through major public media and education campaigns because, if each goal is specifically addressed, they can have a demonstratable effect on attitudes, knowledge, behavior intentions, and behavior change.
▪ Provides a *nurturing context* for learning, with attention to: cultural or group background and influences, the physical environment, and the use of tools or practices appropriate to learner skills and abilities.	FARMERS – Provide information to farmers in three stages: o Information to stimulate farmer interest o Personal contact with farmer to provide new farming practices that are viewed as solutions to their problems o Work collaboratively and cooperatively with the farmer in the adoption of new practices FARMERS – Emphasize one-on-one contact. o Correlates with farmer willingness to change practices, but adoption of a new technology requires more than a personal conversation and data about the specific situation FARMERS – For sustainable agriculture education, target families with kin-mentor relationship that supports practice of sustainable agriculture GOVERNMENT AGENCY /UNIVERSITY PROFESSIONALS – Design communication and professional development opportunities for outreach educators that will motivate them to implement a priority program because: o The program is part of work in a team HOUSEHOLDS – Provide the following when focusing on environmentally responsible behavior: o A demonstration or model of desired action. LANDOWNERS – Trusted individuals can deliver messages effectively LANDOWNERS – Emphasize an "integrated" program that provides a continuum of information, communication, and education resources RECREATIONAL WATER USERS – Provide one-on-one communication with a person engaged in the targeted activity to enhance the knowledge they gain and their interest in acquiring more information RECREATIONAL WATER USERS – In designing outreach to encourage participation in outdoor recreation programs, attend to: o Individual and socio-economic characteristics of participants (age, gender, income, education) as they relate to their participation in outdoor activities RECREATIONAL WATER USERS – In designing outreach programs that strive to link environmental concern with recreational behaviors vary program goals to reflect differences in commitment among experienced and active anglers, ex anglers, inactive anglers, and non anglers RECREATIONAL WATER USERS – Design programs to: o Provide learning opportunities before and after the field activities to optimize knowledge gain TEACHERS – Provide teachers with substantial support, to better enable them to build water supply and management topics into their curricula, by: o Building teacher self confidence in understanding water concepts that are less familiar to them o Providing teachers with new science skills and pedagogical knowledge to build self confidence TEACHERS – Provide teacher training that is: hands-on, intense, comprehensive, and includes work in the field. A successful

The learning experience:	Study-Specific BEPs, FOR THE INDIVIDUAL
	training could: o Assure availability of any resources required for the training o Include practice training activities designed to match the situation where teachers will apply the activities
▪ Provides opportunities for extended effort and practice.	ETHNIC GROUPS – Focus outreach to farmers on farm efficiency and productivity, whatever the social characteristics of the farm group. But pay attention to unique factors of cultural groups, as well FARMERS – Provide information, encouragement and cash incentives to participate in or practice a new technology, but keep in mind that incentives have a weak influence on adoption FARMERS – Recognize the limits of regulation in producing behavior change: o Regulation leads to adoption of specific regulated behaviors only. (e.g. the target audience performed required nitrogen test but did not apply resulting information when making decisions about nitrogen application) FARMERS – Emphasize one-on-one contact. o Correlates with farmer willingness to change practices, but adoption of a new technology requires more than a personal conversation and data about the specific situation HOUSEHOLDS – • If providing explanatory materials by mail to residents from communities engaged in watershed planning, find ways to encourage individuals to engage. Keep in mind that only residents who take the time to review materials are likely to demonstrate knowledge mastery and an inclination to apply results. LOGGERS – Require locally extensive training, which has been shown to increase peer group awareness and implementation of skills in a study with a small sample group. RECREATIONAL WATER USERS – Develop program design and content to adhere to guiding principles for boating, fishing, and aquatic stewardship education. The program: o Constitutes a continuous and lifelong process for individuals, families, and diverse social groups RECREATIONAL WATER USERS – Design programs to: o Provide an opportunity to practice the target behavior RECREATIONAL WATER USERS – To produce long-term changes in behavior: o Provide continued application and reinforcement of content STUDENTS, K-12 -- Use multiple methods to introduce specific concepts. Repeat concepts throughout the education experience TEACHERS – Provide teacher training that is: hands-on, intense, comprehensive, and includes work in the field. A successful training could: o Include practice training activities designed to match the situation where teachers will apply the activities
▪ Builds on positive emotions, curiosity, enjoyment, and interest.	STUDENTS, K-12 – Structure activities at a field site in order to increase knowledge gain, but apply structured activity with care in order to avoid reducing motivation

The learning experience:	Study-Specific BEPs, FOR THE INDIVIDUAL
▪ Allows a learner to interact and collaborate with others on instructional tasks.	STUDENTS, HIGHER EDUCATION -- Design training to provide students with work in teams on a practical experience with interdisciplinary participants

For the Class or Group

The learning experience:	Study-Specific BEPs FOR THE CLASS OR GROUP
▪ Is based on and shaped by some form of needs assessment and use of a planning model (such as the logic model)	HOMEOWNERS – •Identify the need for education or outreach based on audience characteristics (e.g. understanding of the problem, socio-economic characteristics) and/or details about the specific local environmental concern RECREATIONAL WATER USERS – Develop program design and content to adhere to guiding principles for boating, fishing, and aquatic stewardship education. The program: o Begins with goals and objectives that relate to appreciation and awareness, expands to include both knowledge and skills, and culminates in personal responsibility and responsible behavior TEACHERS – Understand the roots of the environmental management problem and select your target audience based on a specific need. For example, if economic activity is most closely associated with the environmental problem, outreach initiatives should relate to the needs and interests of the target audience engaged in the economic activity
▪ Is designed to focus on a targeted audience and is built on an understanding of audience skills and interests	ADULT – Assess audience concerns and preferred method for receiving information prior to developing outreach or education initiatives AQUACULTURE BUS – Effectiveness of new educational programs may be hindered by insular nature of communities in which producers live. BUS & IND WATER USERS – Recognize that audiences are often already aware of important issues. Outreach materials should: o Emphasize a pollution-prevention practice o Tell audience a little about how to prevent pollution o Tell audience where they can obtain information about prevention. BUS & IND WATER USERS – Provide outreach through external relationships chosen by the business, such as suppliers, trade shows, other companies, and publications to which businesses subscribe. BUS & IND WATER USERS – For auto repair shops, provide a direct visit from an educator who provides an audit activity and information materials. BUS & IND WATER USERS – Reduce emphasis on information from the government except for information about tax deductions and other incentives. DECISION-MAKERS – When designing education programs for decision makers: o Gather data about policy maker skills and preferences prior to designing training ETHNIC GROUPS – Identify locally-specific or culturally-specific needs or problems related to water conservation and quality. These may not be what an expert would typically expect due to unique cultural or situational needs. For example, in a person-to-person outreach initiative about toxic substances in fish, African-Americans were most interested in risks to their health from eating contaminated fish. Caucasians were most interested in the levels of contamination in the fish. FARMERS – Make sure that participants know about the initiative and know how to participate.

The learning experience:	Study-Specific BEPs FOR THE CLASS OR GROUP
	FARMERS – Use farmer-preferred sources of information and strategies for outreach about making decisions. FARMERS – Provide information through field days, pamphlets, farm journals, media and books. These can contribute to: o More positive attitudes towards various aspects of management o Greater levels of knowledge about the concepts and the practical application of those concepts o Intention to carry out concepts o Adoption of a wider range of BMPs FARMERS – When providing information related to sustainable farming, use conventional sources of information to convey new ideas rather than start a new newsletter or organization or other new source of information. FARMERS – Couple general outreach, information, and communication techniques with financial incentives FARMERS – Facilitate farmer-led program design and implementation that leads to: o Farmer developed reasons for taking charge of environmental protection o Peer development of solutions o Peer assessment of potential hazards of current practices o Farmers rather than technical experts complete environmental assessment and Action Plan o Farm plan and data evaluation via peer review FARMERS – Work with consultants: o Train the technical professionals who support the target audience as well as specifically training the target audience about the new practice FARMERS – Allow enough time for wide spread adoption of the demonstrated BMPs. A nine to ten year time frame may be necessary to move from initial implementation of BMP demonstration projects to adoption. FARMERS – When persuading farmers to reduce chemical use: o Show that farm chemicals are contaminating groundwater on the individual's farm o Link to quality of drinking water on the individual's farm o Provide alternative methods with a demonstrated outcome that has no adverse affect on profits and no more than a modest decline in yield GOVERNMENT AGENCY /UNIVERSITY PROFESSIONALS – Design communication and professional development opportunities for outreach educators that will motivate them to implement a priority program because: o They understand the program HOUSEHOLDS – Adapt language and appearance of notification materials to reflect the diversity of those being notified and the literacy level of the group. LANDOWNERS – Base your program design on specifically identified needs LANDOWNERS – In landowner or renter situations: o Determine which role is primarily responsible for water quality or conservation decisions o Identify factors that may influence the person who could take action o Understand "opportunity costs" and social norms relative to the content or practice focus of the outreach LANDOWNERS – Match the information technology delivery mechanism to the computer work style of the landowner. How does the landowner already use the computer the landowner? LANDOWNERS – Provide agriculture landowners with written materials in addition to whatever other communication methods are selected LANDOWNERS – Base the outreach or education process on mutual understanding, trust, and respect that leads landowners to choose to comply because they see it in their best interest

The learning experience:	Study-Specific BEPs FOR THE CLASS OR GROUP
	RECREATIONAL WATER USERS – Segment information content, to address differences in target audience interests RECREATIONAL WATER USERS – In designing outreach to encourage participation in outdoor recreation programs, attend to: o Individual and socio-economic characteristics of participants (age, gender, income, education) as they relate to their participation in outdoor activities RECREATIONAL WATER USERS – In designing outreach programs that strive to link environmental concern with recreational behaviors vary program goals to reflect differences in commitment among experienced and active anglers, ex anglers, inactive anglers, and non anglers RECREATIONAL WATER USERS – In designing outreach programs that strive to link environmental concern with recreational behaviors, attend to social factors that influence the choice of activity and the interpretation given the recreational experience RECREATIONAL WATER USERS – Design programs to: o Target outcomes for specific audiences
▪ Content and delivery is determined in cooperation with the target audience and stakeholders	FARMERS – Collect and assess data about the following, prior to developing the outreach program: o Regional audience preferences for where to get information and which source is *reliable* o Adoption training methods known to be successful with the target audience. o Producer assessment of project BMP recommendations prior to implementing outreach program FARMERS – Look to these conditions for opportunities to provide education that is more likely to be effective: o Actions that improve water quality also increase profitability o The producers' own water quality is at stake o The on-farm cost of water quality impairments are shown to be sufficiently large FARMERS – Involve target audience in: o Choosing and testing preferred technical approaches to solving a problem o Developing content and process for outreach activities o Participatory approaches to help identify target audience education needs and motivate participation FARMERS – Emphasize one-on-one contact. o Correlates with farmer willingness to change practices, but adoption of a new technology requires more than a personal conversation and data about the specific situation FARMERS – Address economic benefits: o Focus outreach programs on the potential of the farm practice to increase yield or otherwise improve economic benefit o Show that profits will increase as a result of adoption of the practice FARMERS – Pay attention to unique factors of cultural groups, but programs that focus on efficiency and productivity in decision-making are likely to succeed, whatever the social characteristics of the farm group FARMERS – When providing information related to sustainable farming, use conventional sources of information to convey new ideas rather than start a new newsletter or organization or other new source of information. FARMERS – Work with consultants: o Train the technical professionals who support the target audience as well as specifically training the target audience about the new practice GOVERNMENT AGENCY /UNIVERSITY PROFESSIONALS – Design communication and professional development opportunities for outreach educators that will motivate them to implement a priority program because: o It is clear that they are supported by their organization and resources are made available.

The learning experience:	Study-Specific BEPs FOR THE CLASS OR GROUP
	○ They have a choice to participate LANDOWNERS – Engage audience in planning LANDOWNERS – Acknowledge landowner interest and concern for the quality of their land TEACHERS – Recognize that issues and context for different geographic regions impact educator and natural resource manager priorities for the relative importance of selected concepts, skills, and values TEACHERS – Tie water and water resource education to local values and needs of: ○ The geographic region ○ Educator identified priorities ○ Natural resource manager identified priorities
▪ Is relevant to and accessible by people with diverse backgrounds and influences.	ADULT – Assess audience concerns and preferred method for receiving information prior to developing outreach or education initiatives AQUACULTURE BUS – Effectiveness of new educational programs may be hindered by insular nature of communities in which producers live. ETHNIC GROUPS – Carefully tailor the water conservation message to address the specific circumstances of the target audience. ETHNIC GROUPS – Assure that intervention programs are relevant to the cultural milieu of the subgroup. ETHNIC GROUPS – Consider ethnic or culturally-related farm-structure differences when developing intervention strategies to bring about behavioral change. FARMERS – Work with consultants: ○ Train the technical professionals who support the target audience as well as specifically training the target audience about the new practice RECREATIONAL WATER USERS – Segment information content, to address differences in target audience interests RECREATIONAL WATER USERS – Develop program design and content to adhere to guiding principles for boating, fishing, and aquatic stewardship education. The program: ○ Follows the principles of inclusion with regard to program participation by minorities and people with disabilities
▪ Presents accurate and balanced information, incorporating many different perspectives	FARMERS – Provide information that is high quality, explains risks; and is: ○ Easy to understand ○ From a trusted source ○ Scientifically valid ○ Balanced, (gives both sides on an issue) ○ Up-to-date ○ Directly applicable ○ Consistent with beliefs LANDOWNERS – Be aware of the boundary between education and advocacy

The learning experience:	Study-Specific BEPs FOR THE CLASS OR GROUP
▪ Incorporates methods for assessing the value of the experience, especially as it relates to desired outcomes	BUS & IND WATER USERS – For auto repair shops, provide a direct visit from an educator who provides an audit activity and information materials. HOMEOWNERS – •Effectiveness of education program delivery can be tested through comparison of changes in nitrate, nutrients and bacteria in runoff. HOUSEHOLDS – Use a "water demand" mathematical model to provide feedback to citizens and to demonstrate the effect of community water conservation outreach programs. HOUSEHOLDS – Maintain records describing which specific outreach programs were initiated to address which specific community environmental concerns and/or audiences in order to have sufficient data to interpret evaluation results. LANDOWNER – Make time for continuous evaluation in order to best determine next steps RECREATIONAL WATER USERS – Develop program design and content to adhere to guiding principles for boating, fishing, and aquatic stewardship education. The program: o Relies on a variety of systematic and continuous approaches to the assessment of participants and evaluation of programs so as to improve and eventually validate those programs TEACHERS – Document information and outreach work to help improve ability to assess the relationship between outreach and outcomes and to exchange materials and knowledge with others TEACHERS – Evaluate progress toward clearly defined objectives TEACHERS – Apply an evaluation strategy which helps educator to identify reasons and consequences for training outcomes
▪ Is facilitated by quality instructors who have been trained in effective teaching methods and are supported by the program sponsor	GOVERNMENT AGENCY /UNIVERSITY PROFESSIONALS – Design communication and professional development opportunities for outreach educators that will motivate them to implement a priority program because: o The program fits their job description HOUSEHOLDS – • Train the person who serves as the agency interface with the public to assure that citizens are fully informed about options. RECREATIONAL WATER USERS – Develop program design and content to adhere to guiding principles for boating, fishing, and aquatic stewardship education. The program: o Supports, engages in, and makes use of the scientific, social, educational, and other forms of research that have a bearing on programs o Recognizes the critical role and the need to adequately support ongoing professional development for all personnel associated with these efforts and programs, including those suggested or implied in the above principles TEACHERS – Develop, promote, and/or disseminate pre-developed materials, hands-on activities and grade level appropriate software about priority water topics TEACHERS – Encourage and support use of a community-based curriculum based on water monitoring. (This type of curriculum has been shown to be highly acceptable among teachers and to provide professional satisfaction.) TEACHERS – Educate teachers about innovations in curricula to ensure that they are implemented

The learning experience:	Study-Specific BEPs FOR THE CLASS OR GROUP
	TEACHERS – Determine whether teachers can implement topics by checking to see if: o They have knowledge about the topics o They have a place to fit the topic in their curriculum TEACHERS – Provide teachers with substantial support, to better enable them to build water supply and management topics into their curricula, by: o Providing teachers with the following, to assure that they can successfully implement a curriculum: ▪ Supportive curriculum resources ▪ Training to support thorough understanding of scope and content objectives TEACHERS – Provide teacher training that is: hands-on, intense, comprehensive, and includes work in the field. A successful training could: o Include an introduction to the watershed topic(s), water quality testing, use of equipment, hands-on instruction, introduction to inquiry-based learning, introduction to and use of field-based science investigations, and related science and career topics o Assure availability of any resources required for the training o Include practice training activities designed to match the situation where teachers will apply the activities o Provide professional development in: student initiatives, action research, interdisciplinary approaches, and help with barriers to program implementation TEACHERS – Encourage teachers to include the following elements in their environmental education programs: o Flexible curriculum o Collaborative learning environments o Students' bearing the consequences of the behavior o Teacher competency in listening and questioning o Diverse instructional strategies o Resourcefulness in accessing resources o Creativity, especially in knowledge of how to do without, o Facilitation skills o Ability to make connections o Understanding of local-to-global connections o Ability to integrate curricula o Using personal/student strengths/passions o Experiential teaching orientation o Cooperative and inclusive learning o Nurturing a sense of place o Consistent can-do vision o Infectious passion for EE and teaching in general o Humor in the classroom o Practice of environmentally responsible behavior o Risk taking o Recharging oneself
▪ Uses creative approaches	FARMERS – Facilitate farmer-led program design and implementation that leads to: o Farmer developed reasons for taking charge of environmental protection o Peer development of solutions o Peer assessment of potential hazards of current practices

The learning experience:	Study-Specific BEPs FOR THE CLASS OR GROUP
	○ Farmers rather than technical experts complete environmental assessment and Action Plan ○ Farm plan and data evaluation via peer review FARMERS -- Design outreach to address farmer preferred learning style ○ Emphasize experiential learning and farmer knowledge STUDENTS, K-12 – Incorporate field-based experiences and service-learning as significant components of environmental stewardship programs that focus on building environmentally responsible behavior among students
▪ Values lifelong learning	FARMERS – Facilitate farmer-led program design and implementation that leads to: ○ Farmer developed reasons for taking charge of environmental protection ○ Peer development of solutions ○ Peer assessment of potential hazards of current practices ○ Farmers rather than technical experts complete environmental assessment and Action Plan ○ Farm plan and data evaluation via peer review FARMERS -- Design outreach to address farmer preferred learning style ○ Emphasize experiential learning and farmer knowledge RECREATIONAL WATER USERS – Develop program design and content to adhere to guiding principles for boating, fishing, and aquatic stewardship education. The program: ○ Constitutes a continuous and lifelong process for individuals, families, and diverse social groups RECREATIONAL WATER USERS – To produce long-term changes in behavior: ○ View the behavior-change process as one that takes place over an expanse of time, in a combination of formal and non-formal settings, within the context of a supportive social environment
▪ Builds environmental literacy: ○ Questioning and analysis skills ○ Knowledge of environmental processes and systems ○ Skills for understanding and addressing environmental issues ○ Personal and civic responsibility	STUDENTS, K-12 – Build student environmental stewardship motivation and competencies by focusing on the characteristics of environmentally responsible behavior: ○ Knowledge of issues ○ Skill in actions ○ Knowledge of ecology and actions ○ Group locus of control ○ Intention to act ○ Environmental sensitivity ○ Personal responsibility ○ Individual locus of control TEACHERS – Water and water resource education has a distinct body of knowledge described by topics categorized as concepts, skills, and values or emotions. Water science and management knowledge has been organized by Brody (1995) and others. TEACHERS – Provide teacher training that is: hands-on, intense, comprehensive, and includes work in the field. A successful training could: ○ Include practice training activities designed to match the situation where teachers will apply the activities

The learning experience:	Study-Specific BEPs FOR THE CLASS OR GROUP
▪ Builds from key principles underlying environmental education: o Systems and interdependence are characteristics of the biological and natural order o Natural sciences, social sciences, and humanities disciplines contribute to understanding of the environment and environmental issues o Learner connections to immediate surroundings provide a base for understanding larger systems, broader issues, causes and consequence	STUDENTS, K-12 – Build student environmental stewardship motivation and competencies by focusing on the characteristics of environmentally responsible behavior: o Knowledge of issues o Skill in actions o Knowledge of ecology and actions o Group locus of control o Intention to act o Environmental sensitivity o Personal responsibility o Individual locus of control TEACHERS – Encourage and support use of a community-based curriculum based on water monitoring. (This type of curriculum has been shown to be highly acceptable among teachers and to provide professional satisfaction.)

For the Community

The learning experience:	Study-Specific BEPs FOR THE COMMUNITY
▪ Evolves from work with a coalition or group	BUS & IND WATER USERS – Generate ongoing environmental change by initiating and coordinating pollution prevention activities through regional networks or consortia. BUS & IND WATER USERS – Emphasize "place", by creating a local Board for example, has potential for broad impacts on locally identified environmental problems. DECISION-MAKERS – Design partnership development training to build understanding and skills for partnership success factors and themes. Focus on factors influencing partnership success: o Maintain balance between partnership resources and scope of activity o Pursue flexible and informal process o Attend to alternative dispute resolution (ADR) processes o Attend to institution analysis and development (IAD) processes GOVERNMENT AGENCY /UNIVERSITY EXTENSION PROFESSIONALS –Use participatory, watershed-based planning as an effective technique for building public awareness and interagency coordination. HOMEOWNERS – Engage the "community of interest" in checking information about a local environmental condition (such as excess nutrients in water) o Gather data about local environmental condition o Relate data to expectations about needs o Change practice recommendations to reflect results o Develop data to show environmental improvements that result from following recommended practices LANDOWNERS – Create opportunities to build landowner participation in the activities of landowner groups
▪ Supports a person who takes responsibility for managing or leading the process, and relies on quality group planning and facilitation techniques	BUS & IND WATER USERS – Emphasize company commitment to pollution prevention activities and investment of adequate time and money. Self-assessment has produced measures of superior quality to those produced by quick-scan methods completed by a consultant. When companies invest more time in the pollution prevention project, the options produced are better tailored to the company and likely to have a more profound impact. BUS & IND WATER USERS – Emphasize "place", by creating a local Board for example, has potential for broad impacts on locally identified environmental problems. DECISION-MAKERS – Design partnership development training to build understanding and skills for partnership success factors and themes. Focus on factors influencing partnership success: o Maintain balance between partnership resources and scope of activity o Pursue flexible and informal process o Attend to alternative dispute resolution (ADR) processes o Attend to institution analysis and development (IAD) processes

The learning experience:	Study-Specific BEPs FOR THE COMMUNITY
▪ Relates to long-term community vision and goals	
▪ Takes into consideration the community as a whole, including: socio-political, economic, historical, and cultural influences	FARMERS – Focus on a geographic area: o Define the geographical area where environmental intervention is crucial o Focus outreach initiatives on a geographic area with a targeted audience FARMERS – Support stakeholder engagement more fully by anticipating a political dimension in addition to a focus on subject matter. [This emphasizes Cervero and Wilson's (1994) democratic approach to program planning whereby adult educators talk openly about social and political aspirations of interested parties in addition to content matter objectives.] LANDOWNERS – Identify characteristics of landowners that could influence interest in conservation practices RECREATIONAL WATER USERS – Develop program design and content to adhere to guiding principles for boating, fishing, and aquatic stewardship education. The program: o Considers aquatic resources in their totality, including natural, built, technological, and social aspects (e.g. economics, politics, cultural-historical, moral, aesthetic) RECREATIONAL WATER USERS – Gauge public preference at an early stage of planning and design, or at least at the point where possible options are being considered TEACHERS – Understand the roots of the environmental management problem and select your target audience based on a specific need. For example, if economic activity is most closely associated with the environmental problem, outreach initiatives should relate to the needs and interests of the target audience engaged in the economic activity
▪ Builds on locally existing skills and resources	DECISION-MAKERS – Provide policy makers with a link to local information sources DECISION-MAKERS – Identify and provide additional support for group-designated water "experts" FARMERS – Work with consultants: o Recognize and support education providers already in place who provide information consistent with the program goal o Train the technical professionals who support the target audience as well as specifically training the target audience about the new practice o Provide the farmer with the opportunity for continuous dialog with consultant. This outreach process has been shown to result in multiple on-farm management refinements with practices continuing even when dialog with consultants is no longer available as part of a project LANDOWNERS – Provide groups with training to help develop leadership and organization skills LANDOWNERS – Tap into indigenous knowledge of local land stewards, especially since recommended, best-bet practices may have uncertain results in local application
▪ Is flexible in response to both process and conditions	BUS & IND WATER USERS – Be patient in your efforts to reach small businesses; small businesses are a difficult audience to reach – limited staff, busy schedules, financial constraints; many will not take the time to return phone calls that are considered non-essential and many do not read mailed solicitations. DECISION-MAKERS – Design partnership development training to build understanding and skills for partnership success factors and themes. Focus on factors influencing partnership success:

The learning experience:	Study-Specific BEPs FOR THE COMMUNITY
	○ Maintain balance between partnership resources and scope of activity ○ Pursue flexible and informal process ○ Attend to alternative dispute resolution (ADR) processes ○ Attend to institution analysis and development (IAD) processes FARMERS – Focus on a geographic area: ○ Define the geographical area where environmental intervention is crucial ○ Focus outreach initiatives on a geographic area with a targeted audience FARMERS – Acknowledge a farmer characteristic to be "averse to additional risk ". That is, a new practice or technology must not add to current risks, or it must reduce risks to productivity incurred through other practices in order to be viewed favorably. LANDOWNERS – Emphasize local elements of control LANDOWNERS – Plan for the time it takes to adopt new ideas
▪ Generates and makes use of data about the local condition	BUS & IND WATER USERS – Emphasize company commitment to pollution prevention activities and investment of adequate time and money. Self-assessment has produced measures of superior quality to those produced by quick-scan methods completed by a consultant. When companies invest more time in the pollution prevention project, the options produced are better tailored to the company and likely to have a more profound impact. BUS & IND WATER USERS – Focus the content for outreach materials on cost savings, such as when and where pollution prevention is as cheap as or cheaper than traditional techniques. Include facts and figures. BUS & IND WATER USERS – Emphasize "place", by creating a local Board for example, has potential for broad impacts on locally identified environmental problems. FARMERS – Look to these conditions for opportunities to provide education that is more likely to be effective: ○ Actions that improve water quality also increase profitability ○ The producers' own water quality is at stake ○ The on-farm cost of water quality impairments are shown to be sufficiently large FARMERS – Pay attention to unique factors of cultural groups, but programs that focus on efficiency and productivity in decision-making are likely to succeed, whatever the social characteristics of the farm group FARMERS – Use farm assessments: ○ To identify pollution risks when the use of an assessment tool is likely to lead to cost-effective, voluntary actions to reduce those risks FARMERS – Include environmental stewardship information shown to be significant in predicting farmer adoption of new practices: ○ Substantive local data to support claims that specific BMPs are environmentally effective and economically advantageous as compared to in-place practices FARMERS – When persuading farmers to reduce chemical use: ○ Show that farm chemicals are contaminating groundwater on the individual's farm ○ Link to quality of drinking water on the individual's farm ○ Provide alternative methods with a demonstrated outcome that has no adverse affect on profits and no more than a modest decline in yield HOMEOWNERS – Engage the "community of interest" in checking information about a local environmental condition (such as

The learning experience:	Study-Specific BEPs FOR THE COMMUNITY
	excess nutrients in water) o Gather data about local environmental condition o Relate data to expectations about needs o Change practice recommendations to reflect results o Develop data to show environmental improvements that result from following recommended practices HOUSEHOLDS – Explain the exact nature of the water quality problem. HOUSEHOLDS – Phosphorus public information campaigns need: o Sufficient media exposure to outline the seriousness of the collective problem RECREATIONAL WATER USERS – Use direct surveys and interviews to gauge public opinion as opposed to relying on "representative" stakeholders (direct representation may highlight factors not previously considered or lead to unexpected interests or concerns)
▪ Provides training to increase skills needed to accomplish goals identified by the group	BUS & IND WATER USERS – Emphasize company commitment to pollution prevention activities and investment of adequate time and money. Self-assessment has produced measures of superior quality to those produced by quick-scan methods completed by a consultant. When companies invest more time in the pollution prevention project, the options produced are better tailored to the company and likely to have a more profound impact. BUS & IND WATER USERS – Provide staff training, and/or provide access to environmental experts for businesses not already engaged in pollution prevention activities. Aim to increase concern about liability. DECISION-MAKERS – Provide strategies and practice for differentiating objective information sources from biased information sources DECISION-MAKERS – Design partnership development training to build understanding and skills for partnership success factors and themes. Focus on factors influencing partnership success: o Maintain balance between partnership resources and scope of activity o Pursue flexible and informal process o Attend to alternative dispute resolution (ADR) processes o Attend to institution analysis and development (IAD) processes ETHNIC GROUPS – Include community members, essential service operators, environmental health workers, administrators, teachers, and regional service providers in community water conservation training programs. HOMEOWNERS – Engage the "community of interest" in checking information about a local environmental condition (such as excess nutrients in water) o Gather data about local environmental condition o Relate data to expectations about needs o Change practice recommendations to reflect results o Develop data to show environmental improvements that result from following recommended practices LANDOWNERS – Provide groups with training to help develop leadership and organization skills TEACHERS – Educate teachers about innovations in curricula to ensure that they are implemented

The learning experience:	Study-Specific BEPs FOR THE COMMUNITY
▪ Takes place close to the location where people practice a behavior of concern	ETHNIC GROUPS – Carefully tailor the water conservation message to address the specific circumstances of the target audience. FARMERS – Acknowledge a farmer characteristic to be "averse to additional risk ". That is, a new practice or technology must not add to current risks, or it must reduce risks to productivity incurred through other practices in order to be viewed favorably. LANDOWNERS – Create opportunities to build landowner participation in the activities of landowner groups LANDOWNERS – Link conservation, stewardship, and watershed topics to a particular place on the owner's land
▪ Builds effectiveness through linkages to other communities, partners, and resources	BUS & IND WATER USERS – Encourage businesses to take advantage of external relationships such as those offered by trade associations and courses. BUS & IND WATER USERS – Stress benefits such as efficiency or better relations with government, for businesses not primarily concerned with public image. DECISION-MAKERS – Provide policy makers with a link to local information sources LANDOWNERS – Be aware of the boundary between education and advocacy LANDOWNERS – Be aware of the larger political issues and contexts in which water quality outreach and education take place (such as legislative requirements). o Identify and communicate potential areas for measurable change o Emphasize local elements of control RECREATIONAL WATER USERS – Develop program design and content to adhere to guiding principles for boating, fishing, and aquatic stewardship education. The program: o Builds upon local, state, and national partnerships to support the development, implementation, and evaluation of programs as well as to support stewardship of the resource
▪ Reaches people in multiple ways	FARMERS – Focus on a geographic area: o Define the geographical area where environmental intervention is crucial o Focus outreach initiatives on a geographic area with a targeted audience GOVERNMENT AGENCY /UNIVERSITY EXTENSION PROFESSIONALS – Recommend use of two-way communication methods, particularly door-to-door contact, where possible. These methods are more successful in soliciting participation for watershed planning initiatives than one-way communication (information) methods. GOVERNMENT AGENCY /UNIVERSITY EXTENSION PROFESSIONALS – Recommend use of participatory, watershed-based planning as an effective technique for building public awareness and interagency coordination. GOVERNMENT AGENCY /UNIVERSITY EXTENSION PROFESSIONALS – Recommend most effective use of public participation is to accomplish watershed plan goals and less effectively with other planning steps. HOUSEHOLDS – Use multiple channels of communication.

The learning experience:	Study-Specific BEPs FOR THE COMMUNITY
	HOUSEHOLDS – Feel confident about choosing to communicate through major public media and education campaigns because, if each goal is specifically addressed, they can have a demonstratable effect on attitudes, knowledge, behavior intentions, and behavior change. LANDOWNERS – Use a variety of outreach methods, with each targeted at specific, desired behaviors
▪ Provides participants with feedback about the results of their actions	GOVERNMENT AGENCY PROFESSIONALS – Use two-way communication methods, particularly door-to-door contact, where possible. These methods are more successful in soliciting participation for watershed planning initiatives than one-way communication (information) methods. GOVERNMENT AGENCY PROFESSIONALS – Watershed-based, participatory planning can be helpful in making watershed data publicly available and in establishing plan legitimacy. HOUSEHOLDS – Phosphorus public information campaigns need: o Some sort of feedback to the target audience about impact of behavior changes LANDOWNERS – Provide clear information about goals and plans for land parcels LANDOWNERS – Provide regular feedback about how well goals and plans have been achieved

Beyond the Community

The learning experience:	Study-Specific BEPs BEYOND THE COMMUNITY
▪ Builds value for education as part of policy development and implementation	FARMER – Recognize the role of economic factors in behavior change: o Since producer income is an important predictor of BMP use, sequence audience involvement by income level. Consider a focus on low income audiences HOUSEHOLDS – • Provide the following when focusing on environmentally responsible behavior: o Feedback on progress toward preferred environmental change.
▪ Builds skills for flexibility and responsiveness to environmental issues and for facilitating community engagement	DECISION-MAKERS – Design partnership development training to build understanding and skills for partnership success factors and themes. Focus on factors influencing partnership success: o Maintain balance between partnership resources and scope of activity o Pursue flexible and informal process o Attend to alternative dispute resolution (ADR) processes o Attend to institution analysis and development (IAD) processes GOVERNMENT AGENCY /UNIVERSITY PROFESSIONALS – Design communication and professional development opportunities for outreach educators that will motivate them to implement a priority program because: o The program has social significance
▪ Concerning a particular topic – consolidates the learning goals for all levels of responsibility, but not the teaching methods, which are adapted for the target audience	
▪ Matches the target audience to the scale of the problem o For example, related to a particular problem, watershed council staff receive training about a locally significant topic, while agency staff receive training about how information about several related topics informs policy development	
▪ Offers avenues for participation which	DECISION-MAKERS – Design partnership development training to build understanding and skills for partnership success factors and themes. Focus on factors influencing partnership success:

are competent, fair, and enhance involvement for all levels of responsibility	○ Maintain balance between partnership resources and scope of activity ○ Pursue flexible and informal process ○ Attend to alternative dispute resolution (ADR) processes ○ Attend to institution analysis and development (IAD) processes

D. Target audience meta-analysis matrix (separate file)