Local Control of the Environment: Is This What They Asked For?

Timothy Lawrence
Ohio Nonpoint Education for Municipal Officials
Ohio State University Extension, Columbus
lawrence.53@osu.edu

Tomas Koontz
School of Natural Resources, Human Dimensions
The Ohio State University, Columbus
koontz.31@osu.edu

Abstract

The National Pollution Discharge Elimination System (NPDES) Phase II Storm Water Program, being implemented by many small to medium sized communities across the nation, provides a unique opportunity to investigate the role that federal, state and local communities assume to protect the environment. Local, state, and some federal officials, as well as political pundits and activists from both the right and the left, are increasingly questioning the judgment and value of relying on a central authority to protect the environment. These proponents of environmental devolution argue that locals have a better understanding of the problems and constraints to institute lasting and effective environmental protection to best meet the needs and interests of local residents. This presentation will discuss preliminary results of a research project that looks at local officials' perception of their abilities to implement federally mandated environmental regulations based on knowledge; their willingness to participate in multi-jurisdictional collaboration; the role of local watershed groups in protecting the environment; the balance between economic and environmental concerns; their ability to implement environmental regulations; their perspective on local control versus federal or state control; and their view of regulatory control mechanisms. The study utilized a mixed methodological approach using both qualitative and quantitative data analysis. This includes interviews with key informants, document review, a census survey of local officials, and in-depth interviews with local officials. The results of this research will provide a better understanding of how environmental educators can meet needs of local public officials in addressing federal and state environmental regulations.

Introduction

A major component of the current environmental regulatory philosophy in the United States is the involvement of the federal government in setting standards for environmental protection to avoid competition between states in the classic "race to the bottom scenario." In the environmental context, the race to the bottom argument suggests that local political jurisdictions will fail to enact environmental regulations that provide adequate protection of our natural resources in an effort to attract economic interests away from other locations (Butler & Macey, 1996; Revesz, 2001). The resulting federal answer in some environmental arenas has been the enactment of an approach often referred to as command and control, top down strategies, to environmental protection. This approach has led to substantial reduction or limitation of air, water, and toxic waste problems in the United States, but it is often viewed by state and local officials as an intrusion on what they

deem the legitimate function of subnational governments, with the federal government attempting to micromanage their affairs (Scheberle, 1997).

The proponents of environmental devolution (vesting authority in lower levels of government) contend the centralized command and control system, which relies on deterrence as a means of compliance, is far less effective than would be an incentives-based system overseen by state or local officials (Markell, 2000). This centralized "one size fits all" approach fails to recognize not only the critical aspects of the local environment, but also other variables such as the local economy, jobs, and local custom or tradition. Even the success of the current regulatory system to reduce pollution problems, does not mean they are well suited to address environmental problems generated by small sources of pollution or nonpoint sources of pollution (Stewart, 2001). Moreover, various economic models have pointed to the benefits of devolution and dispel the notion that communities ostensibly practice "race to the bottom" in regard to environmental regulations (Oates & Schwab, 1988, 1996a, 1996b). Thus it is not surprising to find many local communities upset by recent efforts by the federal government to impose new efforts to control "urban" nonpoint source pollution controls through the National Pollution Discharge Elimination System (NPDES) Phase II Storm Water Program. Like many states, Ohio has shifted much of the initial criteria establishment for this program to the local level. Ohio intends to rely, to a large degree, on local watershed groups and communities to establish Total Maximum Daily Load (TMDL) levels and NPDES Phase II permit criteria (Deal II Project Team, 2000).

Depending on local officials for environmental protection will require local jurisdictions to consider and give weight to environmental quality in their land use decision-making process. Related local regulations such as zoning, subdivision requirements, or laws specifically intended to control runoff from urban development must include environmental considerations. However, other constraints may limit officials' ability to meet anything other than basic minimum requirements. Ohio Environmental Protection Agency (EPA), Ohio Department of Natural Resources (ODNR) and Ohio State University (OSU) Extension believe that local watershed groups can play an important role in helping communities achieve these objectives. The Ohio initiatives seem to emulate common themes found in ecosystem-based management and collaborative decision-making processes. These include: integrated or systems approaches to problem solving; improving institutional performance; improving the integration of government policies; enhancing cooperation between governmental and nongovernmental organizations; broad participation; key stakeholder involvement; and a strong scientific basis to governmental policies (Imperial, 1999). In a state like Ohio, with sub-governmental jurisdictions down to the township level having land use decision making authority, these initiatives will require a high level of collaboration between governmental jurisdictions if they are to be effective. Under such a local system problems such as fragmentation and duplication of authority, poor use of information and resources, and inconsistency of policies across and between levels of government may arise (Imperial, 1999). These problems can be overcome if there is political support for environmental concepts as demonstrated by the extent of public concern, stakeholder involvement, and the willingness of states to commit funds for implementation (Ringquist, 1995; Scheberle, 1997). To determine the prospects for locally-based environmental regulations in Ohio, this study investigates implementation of the NPDES Phase II Storm Water Program in rapidly developing watersheds. The study is expected to help local watershed groups working with local officials, and help environmental educators meet the needs of both watershed groups and local jurisdictional officials.

Methodology

Target Population

A major educational effort for local officials on NPDES Phase II Storm Water Program was conducted by various entities throughout the state. This effort began in 1999, shortly after the announcement of the NPDES program and culminating with a flurry of activity in the months leading up to the March 10, 2003 deadline. The Ohio Storm Water Task Force[1] conducted many of the educational programs, with assistance from the ODNR and the OSU Extension's Nonpoint Education for Municipal Officials (NEMO) program and the Ohio Watershed Academy. Local watershed groups, conservancy districts, regional planning organizations also conducted NPDES related training programs for local officials. The Ohio EPA was typically an active participant in these efforts and posted fact-sheets on their Web site[2]. With such an extensive educational effort, it is reasonable to assume that most local officials in Ohio were at least aware of the NPDES Phase II Storm Water Program.

There are 423 communities listed by the Ohio EPA as meeting the criteria of having a population in excess of 50,000 or having a population density in excess of 1000 per square mile (additional circumstances may also apply). All of these communities were required to submit their storm water management plan (SWMP) by March 10, 2003. Most of these communities have until 2008 to implement their plan. Ohio EPA has designated 72 communities in 11 watersheds as "rapidly developing" and must meet the compliance criteria by 2006. The concern was that these communities were developing so rapidly that they should be made to comply as soon as possible to minimize the potential impact on water quality. The Ohio EPA indicated these communities would have their plans reviewed first, providing an independent measure of the submitted plan. It was reasonable to expect that local officials from these areas should have a better understanding of the impact and implications of these new regulations in advance of other Phase II communities. A purposeful sample of all these Ohio EPA designated rapidly developing watersheds (RDW) would provide a basis to conduct an exploratory investigation related to second-order (state to local jurisdiction) devolution, implementation of the Phase II program, and identification of educational needs of local officials. Additionally, this study could identify needs and concerns of other jurisdictions related to land use, water quality, and storm water management.

It was decided that with such a relatively small pool of potential participants, a census of relevant local officials from all of the RDWs would be the sample population. All local officials, directly related to approval or implementation of the SWMP, were included in the list of participants. These officials included township trustees, county commissioners, county and municipal engineers, mayors, city council members, law directors or county prosecutors, city managers, and county administrators.

Interviews

To determine the current state of the NPDES Phase II communities and to identify issues related to the development, submission, and implementation of the Storm Water Management Plan (SWMP) submitted to the Ohio EPA, key informants having direct knowledge of the NPDES

[1] The Ohio Storm Water Task Force is a grassroots organization made up of a wide variety of stakeholders throughout the state. Membership includes township, municipal and county officials, representatives from development organizations, state government, environmental groups, consultants and other interested persons.
[2] http://www.epa.state.oh.us/dsw/storm/construction_index.html

program in the rapidly developing watersheds were selected for in-depth interviews. In all, a total of 21 key informants were interviewed, 19 of which provided useful information. Initial interviews were conducted with agency personnel from the ODNR and Ohio EPA.

Recommendations for other key informants from these initial interviews led to additional interviews being conducted with personnel from county Soil and Water Conservation Districts, regional planning organizations, private consultants working within the RDWs, and individuals working for state level local jurisdictional associations.

The interviews ranged in length from 20 minutes to one hour. They consisted of a series of open-ended questions, and the use of probes and follow up questions to explore in greater detail additional issues brought up by the interviewee. The original plan was to interview at least 15 key informants and to continue interviewing until all relevant issues related to the NPDES Phase II program had emerged ("saturation"). It was clear by the completion of the last two or three interviews that most of the key issues related to local development and implementation of the program had surfaced during the interview process. The two interviewees who did not yield useful information lacked sufficient knowledge related to the implementation of the NPDES program.

All of the interviews were digitally recorded and transcribed into a word processing document. The transcribed documents were then coded using QSR N6 software[3]. The results of the analysis yielded seven key areas of concern: collaboration with other jurisdictions in the development; implementation of the SWMP; the overall importance of the environment to the local community; the level of knowledge that local officials had about the NPDES program and its implications for their community; the ability and willingness of local versus state or federal control over the environment; the Ohio EPA and its role in assisting local jurisdictions with the Phase II program; and the means, willingness and authority of local jurisdictions to regulate the Phase II program.

Questionnaire

Statements that represented the general theme of each of the seven subcategories were selected and reworded to provide a balance of positive and negative emphases. A total of 42 statements from the initial interviews were selected for inclusion in the survey questionnaire. The researchers added additional questions related to the details of the collaboration with other jurisdictions. Three of the questions related to the existence or need for a storm water utility, and the ability of such a mechanism to cover the financial obligations of a SWMP. Five additional questions related to the economic, technical, political, and financial ability of the Phase II program were also included in this first section of the questionnaire. With the exception of one question the participants were asked to rate the statement from 1 to 10 related to whether they agreed or disagreed. A scale was provided at the top of each page with 1 being strongly disagree and 10 being strongly agree. The participants were instructed to write the number corresponding to their reaction in a box to the left of each statement. Some of the statements were somewhat technical in nature, and some local officials may not be familiar with specific details about the SWMP, therefore a no opinion option for each of these statements was provided.

The second part of the questionnaire asked specific questions about the participant relating to the position they held, how long they had been in that position, and total years of local community service. Part three asked for specifics about their plan relating to collaboration, costs, Ohio EPA

[3] N6 is the latest version of the coding software program NUD*IST. In this research project the program allowed the researchers to code and search data looking for patterns and key points.

approval, and their opinion of the plan. The fourth section asked specific questions related to the involvement of local watershed groups in storm water management. On the last page of the questionnaire the participants were given an opportunity to add any additional comments.

Experts in storm water management, the Phase II regulatory program, Extension education, and survey instrument development reviewed the questionnaire. Modifications were made to the instrument to reflect the suggestions and concerns of the reviewers. The draft questionnaire was then distributed to local officials through two local watershed groups and three local jurisdictional associations to Phase II communities outside of the RDWs. This pilot group was asked to complete the draft survey questionnaire, to comment on any potential conflicts of confidentiality, and to indicate approximately how long it took them to complete the questionnaire. A total of 43 pilot questionnaires were returned. No significant concerns with conflicts to confidentiality of the participants were identified. The average length of time to complete the questionnaire was just over 20 minutes with a range from 5 minutes to one hour. The responses were tested for internal consistency of the instrument using Cronbach's Alpha with $\alpha = .776$. The range for Cronbach's Alpha if items were deleted ran from .754 to .782.

Initially 428 local elected officials from 72 communities were identified for participation in the study through official jurisdictional and county board of elections web sites. Using a variant of the Tailored Design Method (Dillman, 2000) each participant was sent an initial letter about the study and were told to expect a questionnaire soon. Five days after the introductory letter was sent, each participant received a letter cosigned by the principal investigator, the director of OSU Extension, and the executive directors of the County Commissioners Association of Ohio, the County Engineers Association of Ohio, the Ohio Township Trustees Association, and the Ohio Municipal League, urging participation and insuring confidentiality, along with a numbered copy of the questionnaire. The questionnaires were numbered to identify returns and avoid unnecessary additional contacts. Five days after the questionnaires were sent, reminder postcards were mailed to the participants thanking them if they had already completed the questionnaire and encouraging them to do so if they had not. Ten days following the mailing of the questionnaire, e-mails were sent to all non-responding participants with identified addresses (approximately 60%) once again encouraging them to complete the questionnaires. A week later a letter and second questionnaire were sent to all of the remaining non-responding participants, again encouraging their participation in the study.

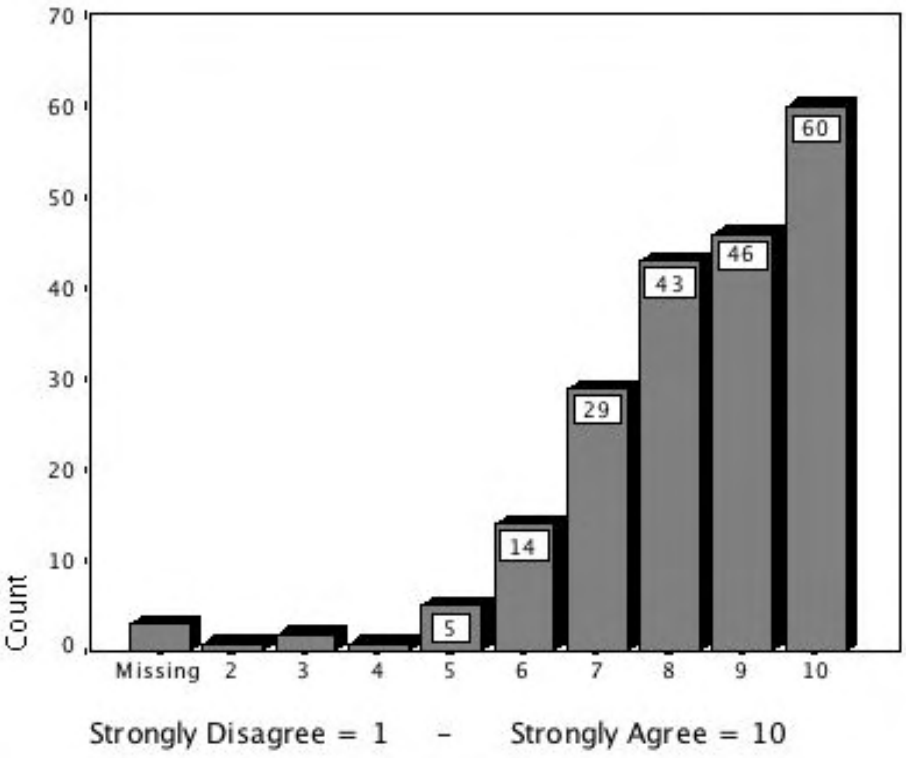
Multi-variant correlation with the responses to this questionnaire, EPA water quality data, political demographic information, median income, and the regulatory stringency of the plans originally submitted by the jurisdictions to the Ohio EPA will be conducted in the final analysis of these data. However, an initial look at the descriptive statistics provides some interesting perspectives about tendencies of local officials' perception about the environment, local control versus federal and state control, and the role that local watershed groups should take in an environmental program like a storm water management plan. These perspectives provide interesting and useful information for environmental educators related to the educational needs of local elected officials and how local watershed groups can meet those needs.

Results

The results presented here are based on a current response rate of 53.8%, of which 48% yielded useful information for this analysis. A final request for participation still needs to be sent, which may boost these numbers to a small degree, and a non-responder follow-up will need to be completed. Even with these limitations there are some interesting trends emerging from the data. It is not surprising that local officials, for the most part, are not supportive of a system where the

federal government dictates the rules, the state government enforces those rules and the locals are required to implement them. However, it is interesting that, for the most part, local officials feel that the Clean Water Act (CWA) has had a positive impact on their communities and it appears that local storm water management would not have been a high priority without federal intervention. Local officials are very supportive of greater local input in deciding how to protect the environment. Protection of natural resources being a high priority for a SWMP was also strongly supported by the survey participants. There was equally strong support for the concept that protecting the environment added to the quality of life in their communities (Figure 1).

Figure 1. Response of local officials to the statement "Protection of the environment adds to the quality of life in my community."



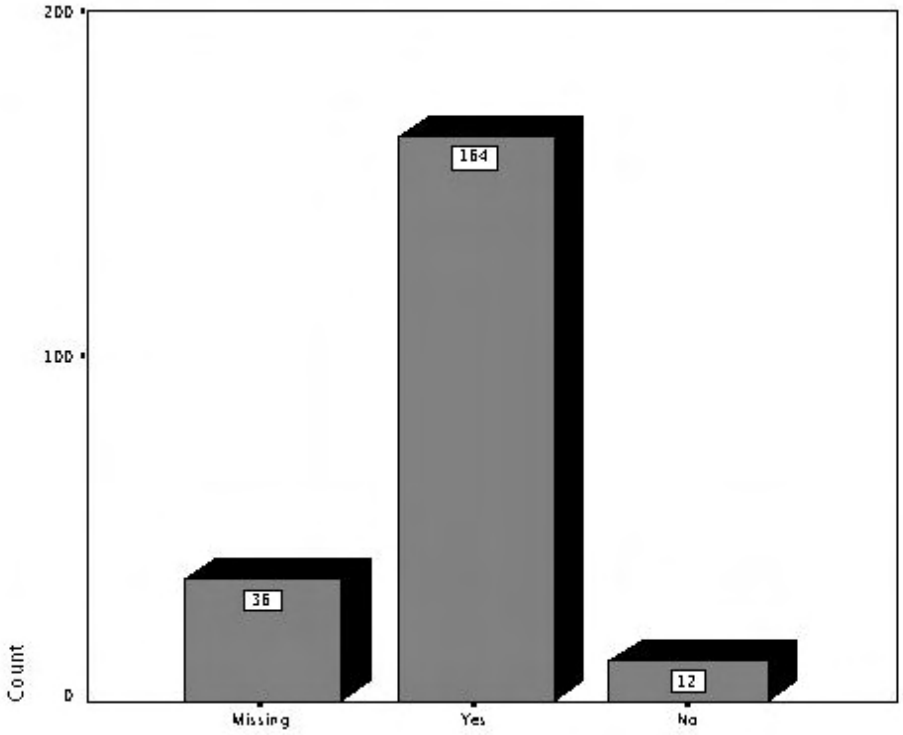
The majority of the respondents reported they had a good understanding of the SWMP their communities submitted to the Ohio EPA, and they felt they had sufficient information available to them to make informed decisions in this regard. For the most part they felt they had a good understanding of the benefits of storm water management. However, their responses to the overall costs associated with the plan as it was submitted to the Ohio EPA were rather ambivalent with nearly equal numbers across the scale in regard to their understanding of this issue. During the interview phase of the study, many of the key informants suggested they were not confident that local officials were cognizant of the real long-term costs of the program. When asked if they felt that too much emphasis was being placed on urban nonpoint source pollution without a clearly demonstrating the overall impact, many respondents had no opinion and there was no clear trend one way or the other from those who did respond to this statement. In regard to Ohio EPA explanation of the minimum requirements for the Phase II program and the need for the program,

the results were bimodal with a near equal distribution between those that agreed and disagreed with those statements.

One clear area of concern was the overall cost of the program. Many of the respondents indicated they did not have the financial resources necessary to implement the plan. Cost and adequate resources were the most common comments added by the participants. These were also the most common reasons given for communities collaborating with other local jurisdictions on their SWMP. With this group of communities, it appears that when communities did collaborate the lead was often taken by the county, with the townships and municipalities acting as cooperators. Sixty-two percent of the respondents reported that their community did not have a storm water utility, and despite their concerns about financial resources, nearly 50% of the respondents had no opinion whether they would need to establish one.

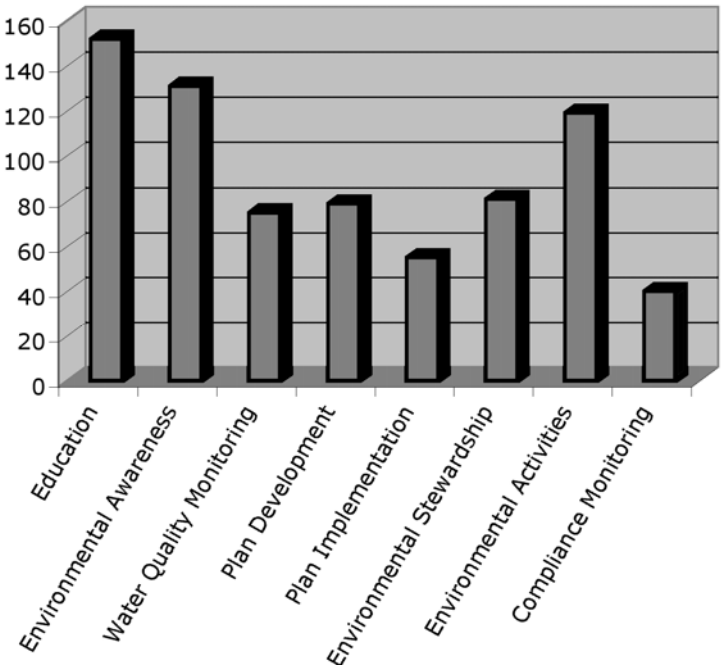
It was interesting to see the role that local officials see for local watershed groups with Ohio's EPA and ODNR emphases on their involvement in watershed planning. Seventy-one percentage of the respondents thought watershed groups should be involved in storm water management, and less than 6% felt they should not be involved (Figure 2).

Figure 2. Local officials who feel watershed groups should be included in watershed planning



The vast majority, 71.4%, felt that watershed groups should play a role in environmental education, 61.9% in environmental awareness, 36.2% in water quality monitoring, 38.1%in SWMP development, 26.7% in plan implementation, 38.1% in environmental stewardship, 56.2% in environmental activities, and just 19.5% in compliance monitoring (Figure 3).

Figure 3. Roles local officials feel are appropriate for watershed groups



Conclusions

At this point is too early to draw any definitive conclusions from this study. It appears, however, that the local officials who returned their questionnaires were confident in their understanding of storm water management issues. There does appear to be a need to focus more attention on the overall costs of the program and the implications they will have on local communities. There also appears to be a need for educational programming for implementation mechanisms like storm water utilities and long term cost/benefit programs. Involvement of watershed groups in storm water management plans that are consistent with watershed planning activities, outside of education and awareness activities, appears to be somewhat problematic with the majority of the survey respondents. With the strong emphasis that Ohio EPA and DNR have placed on watershed groups' involvement in watershed planning, and the large number of cross-jurisdictional collaborations with storm water management plans, greater integration between watershed groups and local officials will need to occur. Watershed groups need to do better job of understanding local political situations, increasing their sensitivity to jurisdiction authority and autonomy. They also need to improve their message regarding the benefits that local communities can realize by working with them and how they can help to foster collaborative efforts.

References

Butler, H. N., & Macey, J. R. (1996). *Using federalism to improve environmental policy*. Washington D.C.: American Enterprise Institute Press.

Dillman, D. A. (2000). *Mail and Internet surveys: The Tailored Design Method* (2nd ed.). New York: John Wiley and Sons.

Imperial, M. T. (1999). Institutional analysis and ecosystem-based management: The institutional analysis and development framework. *Environmental Management, 24*(4), 449-465.

Deal II Project Team. (2000). *Total maximum daily load: Improving stakeholder understanding and involvement in the TMDL process (ISUI/TMDL Final Report)*. Columbus: Ohio Environmental Protection Agency.

Markell, D. L. (2000). The role of deterrence-based enforcement in a "reinvented" state/federal relationship: The divide between theory and reality. *Harvard Environmental Law Review, 24*(1).

Oates, W. E., & Schwab, R. M. (1988). Economic competition among jurisdictions: Efficiency enhancing or distortion inducing? *Journal of Public Economics, 35*, 333-354.

Oates, W. E., & Schwab, R. M. (1996a). Economic competition among jurisdictions: Efficiency enhancing or distortion inducing? In W. E. Oates (Ed.), *The economics of environmental regulation* (pp. 297-318). Brookfield, VT: Edward Elgar.

Oates, W. E., & Schwab, R. M. (1996b). The theory of regulatory federalism: The case of environmental management. In W. E. Oates (Ed.), *The economics of environmental regulation* (pp. 319-331). Brookfield, VT: Edward Elgar.

Revesz, R. L. (2001). Federalism and environmental regulation: A public choice analysis. *Harvard Law Review, 115*.

Ringquist, E. J. (1995). Is effective regulation always oxymoronic? The states and ambient air quality. *Social Science Quarterly, 76*(1), 69-87.

Scheberle, D. (1997). *Federalism and environmental policy: Trust and the politics of implementation* (1st ed.). Washington DC: Georgetown University Press.

Stewart, R. B. (2001). A new generation of environmental regulation. *Capital University Law Review, 29*(21).

From Theory to Practice: Best Practices in Boating, Fishing, and Aquatic Stewardship Education

Jennifer Levin
Recreational Boating and Fishing Foundation
Alexandria, VA
jlevin@rbff.org

Michael F. O'Malley
Watchable Wildlife
Washington Department of Fish and Wildlife, Olympia

Abstract

This paper summarizes the process used by The Recreational Boating and Fishing Foundation (RBFF) to develop a new resource, *Best Practices for Boating, Fishing, and Aquatic Stewardship Education*, that will further RBFF's mission of implementing a national outreach strategy to increase participation in fishing, boating, and stewardship of the nation's aquatic natural resources. A "Best Practice" can be defined as a program or practice that has been clearly defined, refined through repeated delivery, and supported by a substantial body of research evidence. RBFF commissioned a research project that would identify research-based Best Practices in boating, fishing and aquatic stewardship education. The resulting document, *Defining Best Practices In Boating, Fishing, and Stewardship Education* (Fedler, 2001) formed the basis for creating recommended practices for program planning, development and implementation. From the Best Practices research, a professional team developed tools for educators to implement the researched recommendations (Seng & Rushton, 2003). Currently, RBFF is partnering with state agencies and researchers to evaluate the effectiveness of Best Practices tools. As a next step, RBFF plans to facilitate development of instructional tools to assist educators in successfully evaluating their own programs.

Introduction

The need for public involvement with and stewardship of our aquatic natural resources continues to grow, as the average American's connection with those resources continues to diminish. This disconnect portends significant threats to the sustainability of our natural world by diminishing public support for natural resources managers and conservation, as well as by decreasing knowledge and personal empowerment regarding individuals' impacts on those resources.

No longer are agencies that manage natural resources, from the federal to the state to the local government, solely responsible for the water, land, and air. Education has increasingly become a staple responsibility for these entities. For years, efforts at effective aquatic education have suffered from unclear objectives and erroneous methodology.

In this day of tight government budgets and increasing accountability, Best Practices in education have become a necessity. This effort aims to put "professional" in front of aquatic educator, and provide sound practices to make education efforts more effective, as well as provide research-based support for the value and necessity of education as part of holistic natural resources management.

Project Background

In 1998, the U.S. Department of the Interior, Sport Fishing and Boating Partnership Advisory Council completed a strategic plan for their Outreach and Communication Program. The initiative sought to increase participation in fishing and boating to complement ongoing conservation efforts by government agencies, and to pass on these American traditions and a legacy of stewardship.

The Recreational Boating and Fishing Foundation (RBFF) was created to carry out this initiative. Its mission is to increase participation in recreational angling and boating and thereby increase public awareness and appreciation of the need for protecting, conserving and restoring this nation's aquatic natural resources. At the time of Best Practices inception, RBFF had five goal areas; the first four were addressed by a group of stakeholders, known as Task Forces. In addition, RBFF has a Stewardship Team to explore the relationship between stewardship and participation.

Goal 1: Create top of mind awareness campaigns (ad program, external communications/PR, outreach).
Goal 2: Enable stakeholders to use research and best practices to educate people about boating, fishing and aquatic resource stewardship.
Goal 3: Provide research basis for making boating and fishing marketing decisions.
Goal 4: Educate stakeholders on marketing and outreach using RBFF products, tools and services.
Goal 5: Make availability of and access to information about boating and fishing locations easy and simple.

The Best Practices initiative arose from the work of Task Force 2, in addressing Goal 2. Task Force 2 (see Appendix A for list of members) identified a variety of issues as priority concerns and defined an ambitious agenda to answer its charge: *Enable stakeholders to use research and best practices to educate people about boating, fishing and aquatic resource stewardship*. To begin, the task force defined recreational boating, fishing and stewardship education as:

"A complex process by which related skills, attitudes, knowledge, and behaviors are enhanced, developed and supported through a planned series of experiences" (Fedler, 2001, p. 4).

Boating and fishing education was characterized as:

- Complex
- Life-long
- Linked to stewardship
- Changes behavior over time

They identified these primary and secondary audiences for the work of this task force:

Primary Audiences:
Aquatic educators
Education service providers, including their supervisors and administrators
Agency educators (formal and non-formal) including: Extension, parks and recreation
"Education brokers" – organizations responsible for providing education services

Secondary Audiences:
Task Force 4
Point of sale staff (state licensing process)
Partners
Enforcement
Nongovernment organizations (NGO's) with conservation education programs
Community-based organizations that provide education

Developing Best Practices

"A 'best practice' can be defined as a program or practice that has been clearly defined, refined through repeated delivery, and supported by a substantial body of research evidence" (Fedler, 2001, p. 7).

Task Force 2 identified developing guidelines for research-based boating/fishing education programs utilizing best professional practices as necessary to facilitate a sound educational process.

In its initial plans, the task force included the need to determine which processes provide the best experiences for conveying knowledge, developing skills, and changing attitudes and behaviors. It was decided that a broad approach, examining multiple disciplines, would provide the best sources of information. The following fields were suggested:

- Community-based education
- Traditional evaluation
- Experiential education
- Outcome-based education and evaluation
- Drug prevention education
- Watershed education
- Environmental ethics education
- Outdoor education/adventure learning
- Risk education
- Intervention
- Therapeutic recreation
- Sports sociology (preferences as to individual/team/watching)
- Cognitive/affective/psychomotor domains
- Demographic specific
- How to learn
- Leisure education
- Non-formal education

To accomplish this, RBFF issued a request for proposals for a contractor to compile the best professional practices that provide guidance to boating, fishing and stewardship. Dr. Anthony Fedler of Human Dimensions Consulting was selected to facilitate the development of guidelines/standards for research-based education programs utilizing best professional practices.

The first step in developing these Best Practices was to engage academic professionals proficient in the fields of interest to summarize available research on the best methods for achieving learner outcomes. The following is a list of those research papers and authors:

- *Best Practices for Curriculum, Teaching, and Evaluation Components of Aquatic Stewardship Education* - William F. Siemer
- *Elements of Effective Environmental Education Programs* - Julie A. Athman and Martha C. Monroe
- *The Right Tools for the Right Job: How Can Aquatic Resource Education Succeed in the Classroom* - Rosanne W. Fortner
- *Guidelines for Best Practices in Aquatic, Fisheries, and Environmental Education* - Michaela Zint
- *Best Practices in Boater Safety Education* - Alan R. Graefe
- *Defining Best Practices in Boating, Fishing, and Stewardship Education: Challenges and Opportunities for Reaching Diverse Audiences* - Myron F. Floyd
- *An Overview of an Issue and Action Instruction Program for Stewardship Education* - Tom Marcinkowski
- *Outdoor and Risk Educational Practices* - Marni Goldenberg
- *Water-Based Outdoor Recreation and Persons with Disabilities* - Jo-Ellen Ross
- *Recommended Educational Practices for Youth Environmental Education from a 4-H Youth Development Perspective* - Kathleen E. Vos
- *Best Practices in Marine and Coastal Science Education: Lessons Learned From a National Estuarine Research Reserve* - Janice D. McDonnell

The Best Practices in Boating, Fishing and Stewardship Education project focused on identifying accepted principles and standards generally applicable to boating, fishing and stewardship education.

Research was compiled from the following disciplines:

- Boating education
- Aquatic education
- Environmental education
- Marine education
- Youth development
- Stewardship and environmental ethics education
- Adventure recreation education
- Minority education
- Outdoor education for people with disabilities

Each expert wrote a review paper distilling the best professional practices from his or her field that would likely result in accomplishing the goals of boating, fishing, and stewardship education programs. The experts also wrote a brief overview of appropriate evaluation methods for gauging the effectiveness of the programs. Gaps in the literature, pertaining to understanding the effectiveness of different educational approaches, were identified and prioritized as future research needs.

The Best Practices are founded on research and practical experience from diverse fields, and the recommendations for curricula, programs, and leadership are practices that will affect change in aquatic resource and environmental knowledge, attitudes, and behaviors. Recommendations were required to be supported with scientific research, peer recommendations, and practical experience.

After completing their papers, the experts were joined by 14 professional boating, fishing and aquatic education administrators and practitioners in a workshop designed to reach consensus on basic principles and best practices derived from the collection of written papers, and the group's collective practical experience. During the workshop, participants identified 10 general guiding principles for education programs (see Appendix B). Additionally, the group recommended basic practices for each of four educational areas: 17 for program planning, development and implementation (see Appendix C); 21 for professional development (see Appendix D); 11 for program evaluation (Table 4); and 6 for educational program research (see Appendix E). Each of the principles and recommendations can be used in forming components of new programs or in evaluating existing programs.

The resulting eleven papers and these guidelines were edited by Dr. Fedler (2001) and compiled in a document, *Defining Best Practices in Boating, Fishing, and Stewardship Education*. This document is available for download at the RBFF Web site:
http://www.rbff.org/educational/BPE1.pdf

In the year succeeding publication of the Best Practices, RBFF staff initiated communications with educators individually and at venues such as the Aquatic Resources Education Association West (AREA West) meeting and the North American Association for Environmental Education (NAAEE) conference, to gauge interest in Best Practices as a concept and the usefulness of the document.

Overall, the feedback indicated that people think the idea of having Best Practices in education is good and that the information contained in the document is worthy. All those providing feedback indicated they would never actually read it and everyone agreed that the guidelines as written were theoretical, not actionable. In addition, most educators were interested in doing a better job of evaluating their programs and using those evaluations to do a better job of educating, but none were comfortable with their abilities to effectively evaluate. They requested training and tools to enable them to improve in that area.

Translating Theory into Action

Based on this feedback, RBFF requested a contractor to help take the information from the Best Practices and translate it into actionable formats. These formats include information sheets about Best Practices; workbooks that will take aquatic educators through the program development/evaluation process as outlined in the report; a trainer's guide to assist facilitators in teaching Best Practices; and tools to help communicate the importance of the Best Practices, including a PowerPoint presentation (Seng & Rushton, 2003). These tools are available for download at http://www.rbff.org/educational/ bestpractices.cfm.

To assist in the development of these tools, the contractor engaged a review panel of 30 that included original authors of the Best Practices, as well as practitioners of aquatic education.[1] The review panel reviewed three drafts of each tool for accuracy and utility.

A brief description of each tool follows:

[1] Editor's Note: Names and positions of review panel members are listed on the Web site and in the workbook, http://www.rbff.org/educational/bestpractices.cfm.

Program Development Workbook

The workbook is an interactive, reusable tool that aquatic educators can use to help them develop effective programs and/or evaluate existing programs. It translates the technical concepts identified in the Best Practices document into guidelines that practitioners can implement in their own situations. The workbook has sections to assist practitioners who are just building a new program, as well as sections designed to help ongoing programs identify and tackle problems using real-world examples (from aquatic education and other education disciplines) and interactive, problem-based learning models. The primary consideration in the development of this workbook is to make it easy for practitioners to fold the workbook guidelines and recommendations into their ongoing work. It is organized in ten chapters:

1. Plan Ahead For Success
2. Building Your Program
3. Well-Trained Instructors
4. Evaluation
5. Diverse Audiences
6. Persons With Disabilities
7. Boating Education Programs
8. Fishing Education Programs
9. Aquatic Stewardship Education
10. Let Research Help

The workbook also contains a “Glossary/Index”, and “A Brief History of Environmental Education.” In addition, there are over 80 worksheets to help guide users through the content and to make it personally applicable and relevant.

Information Sheets

The fact sheets are short summaries of the information contained in the Workbook. They describe the kind of information that Best Practices represent, the intention of Best Practices, and the importance of using Best Practices in program development, professional development, and evaluation. They are to be used in association with the Workbook described above, and in brochures as communications pieces about Best Practices. The following is a list of the information sheets developed:

- Making Your Education Program the Best in the Nation
- Planning Ahead
- Building Your Program on Solid Ground
- Expanding Your Capabilities: Well-Trained Instructors
- How Do You Know If It’s Working? Evaluation!
- Expanding Your Reach to Diverse Audiences
- Enhancing Boating Education Programs
- Enhancing Fishing Education Programs
- Enhancing Aquatic Stewardship Education
- Clubs and Grassroots Organization
- Building Support Within Your Agency/Organization

Trainer's Guide

In the absence of a delivery mechanism that clearly demonstrates how and why aquatic educators can/should use the materials described above, the materials will quickly find a spot on a dusty

shelf. Even the best materials in the world will remain largely unused in the absence of hands-on training or interpretation. This guide acts as a "cookbook" for conducting a one- or two-day workshop that would walk end users through the Program Development Workbooks and motivate them to adopt the information and materials into their programs.

PowerPoint Presentation

The comprehensive PowerPoint presentation includes text and design elements developed to help various target audiences communicate about the importance of Best Practices. Topics covered in the presentation include:

- Why Best Practices are important
- History and development of Best Practices
- What Best Practices are (basic elements)
- What is needed to implement Best Practices

Use of Best Practices and Next Steps

From February through May 2004, over 300 individuals have requested Best Practices materials. Over 50 individuals from 15 states have been trained in Best Practices in RBFF-sponsored workshops and multiple states are implementing Best Practices to build programs from the ground up, or to evaluate existing programs. In addition, Chicago State University, under the guidance of Dr. Jo-Ellen Ross, developed, implemented and evaluated a two-credit college course on fishing, boating, and aquatic stewardship education based on the Best Practices. Through classroom and field instruction, students were given a chance to participate and learn the basics of developing, implementing and evaluating programs using the Best Practices tools.

Beginning in the summer of 2004, RBFF will be working with partnering state agencies and Chicago State University to evaluate the effectiveness of the Best Practices tools. Reports on their successes and lessons learned will be forthcoming. Results of the evaluations will help shape future iterations of the Best Practices guidelines and the tools that enable their implementation.

Another important next step will be the development of a companion evaluation tool. While the Best Practices emphasize evaluation and the importance of including it in every phase of program development and implementation, very little guidance has been compiled on methodology to assist educators in successfully evaluating programs. RBFF plans to facilitate development of this instructional tool.

Since the project's inception, the aquatic education community's response has been overwhelmingly positive. The tools and the information contained therein have struck a chord with the community, piecing together existing knowledge and resources into a comprehensive guide to program success. The following are a few testimonials:

> "I'm blown away by the Best Practices Document. I can't wait to use it. It's about everything I'm trying to champion. It's a fabulous tool…"
> Margaret Tudor, Washington Department of Fish and Wildlife

> "It's nice to see the things I've tried to piece together for years in one document…"
> Barb Gigar, Iowa Department of Natural Resources

> "It is really quite a spectacular effort. It gathers so much of what we should use every day and puts it right at your fingertips."
> Judy Stokes, New Hampshire Fish and Game Department

> "I see Best Practices as integral to our success. We've made copies for everyone in our department involved in education, not just aquatic education. It provides us good direction and is a great path for us to follow. We believe this will help us to leave a true legacy."
> Patricia Miller, Tennessee Wildlife Resources Agency

> "We plan to teach Best Practices to all of our divisions. The information applies to the hunting side just as much as boating, fishing, and stewardship. We'll then give everyone an opportunity to help us determine where we should go with each of our programs."
> M.N. "Corky" Pugh, Alabama Department of Conservation and Natural Resources

For more information on Best Practices in Boating, Fishing, and Aquatic Stewardship Education, and to download materials, visit the Web at http://www.rbff.org/educational/ bestpractices.cfm. Free preview copies are available through the RBFF.

References

Fedler, A. J. (Ed.) (2001). *Defining best practices in boating, fishing, and stewardship education.* Alexandria, VA: Recreational Boating and Fishing Foundation. Retrieved November 12, 2004 from the Recreational Boating and Fishing Foundation Web site: http://rbff.org/educational/BPE1.pdf

Seng, P. T., & Rushton, S. (Eds.). (2003). *Best practices workbook for boating, fishing, and aquatic resources stewardship education.* Alexandria, VA: Recreational Boating and Fishing Foundation. Retrieved June, 2004 from the Recreational Boating and Fishing Foundation Web site: http://www.rbff.org/newfiles/FINAL%20Workbook %20Layouts%2011-6-03.pdf

APPENDIX A (Levin & O'Malley)

The Best Practices Task Force 2 Members Recreational Boating and Fishing Foundation

Members of Task Force 2 come from a variety of disciplines and experiences in aquatic and boating education. They are:

- Mike O'Malley (Chair), Watchable Wildlife Manager, Washington Dept of Fish and Wildlife
- Elaine Andrews, Environmental Education Specialist, Environmental Resources Center, UW Cooperative Extension
- Eleanor Bochenek, Marine Scientist, Rutgers University
- Virgil Chambers, Executive Director, National Safe Boating Council
- Mark Cole, CEO, Inner City Fishing Institute
- Shari Dann, Assistant Professor & Extension Specialist, Dept. of Fisheries and Wildlife, Michigan State University
- Anne Glick, Educational Programs Coordinator, American Sportfishing Association
- Carl Richardson, Aquatic Resource Education Program, Pennsylvania Fish & Boat Commission
- Rich Wehnes, Stream Services Program Supervisor, Missouri Department of Conservation

APPENDIX B (Levin & O'Malley)

Guiding Principles for Boating, Fishing, and Aquatic Stewardship Education

Boating, fishing, and stewardship education:

- 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, and 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, expand to include both knowledge and skills, and culminate 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.

APPENDIX C (Levin & O'Malley)

Best Practices for Program Planning, Development, and Implementation

Effective Programs:

- Are relevant to the mission of the agency or organization sponsoring the program, the educational objectives of the audience, and everyday life of the learner.
- Use some form of needs assessment to establish a basis for and to help shape individual programs. Assessments should include needs of the agency, community, and participants.
- Involve stakeholders at all levels of their development.
- Empower learners with skills to address environmental issues and with a sense of personal and civic responsibility.
- Present accurate and balanced information incorporating multiple perspectives using an interdisciplinary approach.
- Are accessible to persons with disabilities and incorporate adaptive technology, support staff, and services to meet the needs of all participants in an inclusive manner.
- Receive adequate resources, staffing, and are supported through appropriate resources and staff so that they become sustainable over time.
- Are instructionally sound, utilizing learner-centered and experiential instructional approaches to provide opportunities for collaborative learning and the development of critical thinking skills.
- Are developmentally appropriate, using multiple methods to enhance learning opportunities for diverse learning styles.
- Provide educational opportunities that are frequent and sustained over time.
- Use an interdisciplinary approach to develop skills, formulate concepts, and examine issues.
- Aligns curriculum with national and state educational standards, when appropriate.
- Use curricular materials and other print and electronic resources that present accurate information, and when addressing controversial topics, expose participants to different perspectives in a fair and balanced manner.

Appendix C (continued)

- Inventory and utilize a variety of educational resources and environments, including community resources (e.g., speakers, offices), and lab and field sites (e.g., hatcheries, marinas, ponds and lakes), in a sustainable manner.

- Are planned and carried out in a manner that clearly addresses safety and other regulations, and reduces real risks to everyone involved by utilizing professional safety and risk management techniques.

- Rely on experienced, well informed, prepared, and ethical staff to develop, implement, and evaluate programs.

- Make use of a variety of teaching and learning methods that are appropriate for a program's goals, objectives and subject matter, and are sensitive to participant age, developmental level, and background.

APPENDIX D (Levin & O'Malley)

Best Practices for Professional Development

Effective professional development:

- Clearly presents the agency's or organization's mission and goals.
- Inspires active, ongoing, lifelong learning by professional educators.
- Addresses diverse learning styles by presenting material in a variety of formats and experiences, and incorporates active learning.
- Values diversity and relates to audiences consisting of diverse social, cultural, and economic groups.
- Includes opportunities for youth leadership development as well as for adults.
- Includes aquatic resource stewardship as an outcome and/or longer-term impact.
- Follows a validated process for workshop training to establish consistency, when appropriate.
- Offers tiers of training to provide for continuing education using a "roll out" process for increasing learner knowledge and competency over time.
- Includes presentation of effective teaching methods and ways to foster learning.
- Presents models of good instructional and assessment practices.
- Provides opportunities for learning to continue over an extended period through the innovative use of the Internet, listservers, newsletters and networking.
- Provides mechanisms for updating existing information and disseminating it to educators and administrators.
- Uses attractive and appropriate training materials, and provide hands-on exposure to materials to be used in the classroom.
- Provides appropriate models of program evaluation.
- Considers audience motivations for participating in professional development (e.g., mandatory or voluntary).
- Includes formative, summative and long-term evaluation of the trainer, the program and the trainee.

Appendix D (continued)

- Includes pre-service (basic training) and in-service (in-depth) training modules and avoids brief one-shot training sessions.
- Recruits instructors with experience and knowledge in the subject area.
- Incorporates educational theory into training curriculum.
- Screens instructors, with criminal background checks, and interviews them for potential, motivation, commitment, ethical behavior, knowledge, and the ability to work diverse groups.
- Provide opportunities for mentoring by experienced instructors and staff.

APPENDIX E (Levin & O'Malley)

Best Practices for Program Evaluation

Effective program evaluation:

- Is envisioned and undertaken as a systematic and ongoing process that begins when a program is being planned or developed, and that included both formative and summative evaluations.
- Receives both administrative support and budgeted allocations as part of program costs.
- Is utilized as a learning tool to support program reflection, decision-making, and improvement.
- Includes pre-assessments of learners and assessments of learning outcomes that are based on program goals and objectives.
- Helps identify program outputs, such as number of participants and participation feedback.
- Is used to help align program inputs (e.g., materials, resources) and processes (e.g., activities, services) with program outcomes.
- Explores and investigates the program's long-term benefits and impacts.
- Encourages the use of assessment methods that include, when appropriate, informal methods (e.g., Q&A, observations), traditional methods (e.g., quizzes, tests), and alternative/authentic methods (e.g., rubrics for performance tasks and projects, portfolios).
- Makes use of curricular materials that have been carefully reviewed against national criteria, or will use these criteria to select, develop and/or revise materials.
- Makes use of evaluators and evaluation methods that involve and empower program staff.
- Allows program staff (i.e., administrators, coordinators, and instructors) to take advantage of professional development opportunities in the areas of assessment and evaluation, so that staff have greater capacity to carry out and use results from sound program evaluations.

APPENDIX F (Levin & O'Malley)

Best Practices for Educational Program Research

Effective research:

- Allows program staff to explore and recognize both the value of and the need for research that is relevant to their program.
- Is organized and communicated in ways that provide opportunities for program staff to become aware of and generally familiar with collections, reviews, and summaries and syntheses of research relevant to their program.
- Is organized and communicated in ways that permit program staff to incorporate major research findings into the design, development, implementation, and evaluation of a program.
- Is organized and communicated in ways that help program staff become aware of, explore, and share both apparent gaps in existing research and additional research needs.
- Allows program staff to take advantage of professional development opportunities that enhance their abilities to understand the implications of research for their program and strategies for making use of that research.
- Allows program staff to take advantage of professional development opportunities that enhance their research skills and thereby strengthen their capacity to become meaningfully involved in the research process (e.g., as in action research).

Using a Survey Instrument to Determine Audience Preferred Delivery Methods for Water Quality in the Pacific Northwest

Robert L. Mahler
Soil and Environmental Sciences
University of Idaho, Moscow
bmahler@uidaho.edu

Robert Simmons
Washington State University Cooperative Extension, Shelton
simmons@coopext.cahe.wsu.edu

Fred Sorensen
University of Alaska Cooperative Extension, Anchorage
dffes@uaa.alaska.edu

Abstract

A 50-question survey was developed by the Pacific Northwest water quality team to document public awareness, aptitudes, attitudes and actions toward water quality in Alaska, Idaho, Oregon and Washington. Demographic data were also collected about the survey respondents. The statistically designed survey conducted in January 2002, was completed by over 50 percent of the 1,800 residents who were solicited for this study. Several questions in this survey were used to assess needs in the region. We are using the results of this survey to guide our water quality programming priority areas and delivery methods to our clientele for the next five years.

Introduction

The states of Alaska, Idaho, Oregon and Washington comprise a region referred to as the Pacific Northwest and as Region 10 by the U.S. Environmental Protection Agency (EPA) and by the U.S. Department of Agriculture (USDA), Cooperative State Research, Education, and Extension Service's National Water Quality Program. This region consists of 920,600 square miles or 26 percent of the USA's land area. The population is approximately 11,400,000 people or 4 percent of the USA's population. Within this region are five land grant institutions: Northwest Indian College, Oregon State University, University of Alaska, University of Idaho and Washington State University. Water is considered the most important natural resource in the region.

The land grant institutions in the region have a history of addressing high-priority water needs and issues. The five land grant institutions currently have over $25,000,000 in grants and contracts associated with water resources. Many of the institutions' water research programs are internationally recognized. In addition, these institutions have an outreach structure that places local educational opportunities within reach of all residents of each state. These institutions offer many degree programs that emphasize water resources. With so much water activity, it is important to have a coordination project that can effectively link research, extension and educational activities within and between institutions in the region.

The Pacific Northwest regional water coordinating team has been active for approximately four years. In that short period of time we have developed a tradition of working together well. We realize that as individual states we can not meet all the water research, extension and educational needs. However, working as a region we can pool our efforts, minimize redundancies, set regional priorities based on thematic areas, and efficiently and effectively meet the needs of people in the region. Our regional team has forged a strong working relationship with EPA Region 10 and improved our working relationships with USDA-Natural Resources Conservation Service (NRCS), state and local agencies.

We plan to build on current working relationships and our solid foundation to take our programs to the next level. Our philosophy is to provide science-based information so that people can make decisions in their lives that will improve and/or protect water quality. Based on our four years of working together as a regional program we have made the following observations:

- Our region is a more effective and efficient unit than four or five separate state or tribal programs.
- We work together better as a team than as individuals.
- A liaison position located at EPA Region 10 headquarters helps pull our states together into a team.
- Effective partnerships with EPA Region 10 and USDA-NRCS enhance all of our water programs.
- We use all partner logos on all of our products; sharing credit is effective and encourages stronger partnerships.
- Our regional water quality program contributes to the national water quality program.
- The national water quality program contributes to our regional program.
- Our future programming efforts are positively influenced by four years of experience working as a regional team.
- TMDL targets and watershed groups need our support.
- Sharing expertise throughout the region covers gaps due to loss of positions within states.
- Citizens of the region gain from the synergism of our team.

Surveys are considered a useful tool for both determining potential audiences and determining audience educational needs. Surveys also provide necessary baseline data that can be used to assess outreach progress. We consider needs assessment surveys best educational practices (BEP).
The objectives of our study (BEP) were to: (1) design and conduct a needs assessment survey to document public awareness, aptitudes, attitudes and actions toward water quality and the environment, and (2) develop baseline data to compare successes of future programs. This report summarizes the programming needs aspects of this study.

Materials and Methods

A 50-question survey was designed to assess public attitudes about water issues in the Pacific Northwest. Based on statistical advice, a target of 900 residents of the Pacific Northwest was set as the sample size population. Surveys were sent to residents of Alaska, Idaho, Oregon and Washington on a proportional population basis. Residents from each state were randomly selected from phone books and an online directory, www.switchboard.com. Surveys were actually sent to 1,888 residents; however, 114 were returned by the post office as being undeliverable. Consequently, the actual sample population was 1,774. The survey process was designed to receive a completed survey return rate in excess of 50 percent. If more than 877 surveys were returned completed, then the sampling error can be assumed to be less than +/-5 percent (Dillman,

2000; Salant & Dillman, 1994). Three mailings were used to achieve this return rate. The first mailing, which took place in January 2002, included the water issues survey form, a business reply envelope and a cover letter that: (1) identified the survey's authors, (2) explained the purpose of the survey, (3) assured the respondent of anonymity, and (4) asked the respondent to fill out and return the survey via the enclosed business reply envelope. The second mailing occurred five weeks later (March 2002). It consisted of a postcard that stressed the importance of the survey, and reminded the respondent to fill out and return the survey sent out in the first mailing. Five weeks later (May 2002) the third mailing was sent to residents who did not respond to the first or second mailing. This mailing included a reminder letter, another copy of the water issues survey and a business reply envelope.

Survey answers were coded and entered into Microsoft Excel. The data was then copied to SPSS, a statistical software package (Norusis, 1986). Missing data was assigned the number nine on the coding system and excluded from the analysis. The data were analyzed at two levels using SPSS (Norusis, 1986). The first level of analysis was a basic data summary. This analysis showed both the total number and percentage of respondents that answered each question with a specific answer. The second level of analysis involved using cross-tabulation, or contingency tables, to isolate how specific subgroups of survey respondents (e.g., demographic groups such as gender and education level) related to specific questions. Significance was tested using chi-square distribution (Babbie, 1983). The significance level deemed valid in this study was 0.05. Statistics are not provided in the tables of this manuscript because they are secondary to the purpose of this paper. However, values in Tables 2, 3, 4, 5, and 6 differing by more that 5.0 percent should be assumed to be statistically different.

Results and Discussion

The water issues survey achieved a return rate of 52.3 percent (928 surveys, both fully and partially completed, returned out of 1,774). The individual state response ranged from 50.6 to 57.6 percent (Table 1). Fifty-six percent of the survey respondents were male. Over 32 percent of the survey respondents lived in communities of more than 100,000 people. Conversely, 18 percent of the respondents lived in towns with less than 7,000 people. Thirty-five percent of the respondents had lived in the Pacific Northwest all of their lives. Ninety-one percent of survey respondents were high school graduates. Overall, the demographics of the survey respondents (except for gender) closely reflected the actual demographics of the region. Consequently, when coupled with low sampling error, the results of this survey should be an excellent instrument to assess literacy on water issues in the region.

Table 1. *Statistical Data about the Pacific Northwest Water Issues Survey Sample Size and Completion Rate by State*

State	Sample size	Completed	Return rate (%)
Alaska	232	120	51.7
Idaho	278	160	57.6
Oregon	506	256	50.6
Washington	758	392	51.7
Total	1,774	928	52.3

When the survey was conducted there were only seven national water quality program theme areas (water conservation, management, quantity and policy were later split into two themes).

Approximately 32 percent of survey respondents were identified as rural. Based on the survey, a significant portion of the rural residents living in the Pacific Northwest wanted more information about three water quality theme areas: (1) drinking water and human health, (2) water quantity and policy, and (3) watershed management (Table 2). Almost 75 percent of the rural residents identified the need for more information about drinking water and human health. Almost two-thirds of rural residents wanted more information about water quantity and water policy. Almost half of rural residents wanted more information on watershed management. It is also important to note that when rural and urban responses were added together, drinking water and human health, water quantity/policy, and watershed management ranked as three of the top four water quality areas of interest. Conversely, there was little demand for additional information on nutrient and pesticide management and animal waste management by either rural or urban audiences.

Table 2. *Responses to the Question: "Would You Like to Learn More About Any of the Following Water Quality Issues?"*

Area of interest	**-------- Respondents wanting to learn more --------**	
	Rural	**All**
	---------- % ----------	
Drinking water	74.2	48.8
Water quantity/policy	66.2	31.9
Watershed management	48.5	27.3
Pollution prevention	26.2	30.2
Environmental restoration	20.4	27.4
Nutrients and pesticides	18.4	22.3
Animal waste management	14.3	16.5

Compared to the general population, rural residents prefer to be educated about water quality through radio, television, newspapers and printed fact sheets (Table 3). Workshops and short courses, as educational tools to learn about water quality, are not popular with rural audiences compared to the general population in the region. This is very important because workshops and short courses are traditional methods used by Extension to educate the public. The lack of willingness to attend workshops and short courses by both rural audiences and the general population is probably due to a perception of less unstructured time of both rural and urban people. Over the past two decades studies have shown that people are working more and have less free time. This lack of free time makes traditional venues of Extension programming less attractive. The surprise in this data is that rural people may be more negatively impacted by the lack of free time than the general population. This observation makes traditional Extension learning methods less relevant for what has been Extension's primary target audience. Based on this information the regional water quality coordinating team needs to seriously consider changing or modifying our traditional delivery methods if we want to increase or even reach our target audience.

Table 3. *Responses to the Question; "If You Had the Following Methods of Learning Opportunities Available, Which (Check Up to Three) Would You Likely Take Advantage of for Water Quality Learning Opportunities?"*

Learning method	---------- **Respondents** ----------	
	Rural	**All**
	---------- **%** ----------	
Radio	63	51
Television	62	55
Newspaper	62	54
Printed fact sheets	59	53
Internet (Web sites)	29	41
Demonstrations or displays	26	21
Workshops (2–3 hours)	8	20
Short courses (1 day)	4	18

Most rural residents in the region have obtained water quality information from television and newspapers (Table 4). Environmental agencies and environmental groups have also been widely used sources for water quality information. Thirty-six percent of rural residents in the region have obtained water quality information from Extension.

Table 4. *Responses to the Question: "From Which of the Following Sources Have You Received Water Quality Information?"*

Water quality source	---------- **Receiving information** ----------	
	Rural	**All**
	---------- **%** ----------	
Newspapers	72	68
Television	53	59
Environmental agencies	44	51
Environmental groups	40	46
Extension	36	28
Universities	20	25
Schools	15	20

We were also interested in the demographic factors of clientele age and community size on the impact of Extension meeting water quality information and education needs. It appears that older residents are more likely than younger people to get water quality information from Extension (Table 5). Extension has a much greater water quality impact (reach) in smaller communities than in larger cities (Table 6).

Table 5. *The Influence of Age of Respondent on the Source of Information Residents in the Pacific Northwest Use for Water Quality*

Information source	**Age**			
	< 40	**40–49**	**50–59**	**> 60**
	%			
Television	55	55	55	70
Newspapers	58	68	68	80
Environmental agencies	42	56	50	57
Extension	15	30	32	37

Table 6. *The Influence of Community Size on the Type of Information Source Residents in the Pacific Northwest Use for Water Quality*

Information source	**Community size**			
	> 100,000	**25–100,000**	**7–25,000**	**< 7,000**
	%			
Newspapers	60	60	64	57
Extension	25	25	29	42

Based on the information provided in the previous tables, our regional water quality team is making the following three major modifications in our regional program:

- Programming will be concentrated in three national water quality theme areas: (1) drinking water and human health, (2) water quantity/policy, and (3) watershed management.
- We will think outside the traditional box when it comes to program delivery. The traditional two to three hour and one-day workshops will be de-emphasized. We will emphasize printed fact sheets, satellite conferences, Internet delivery, and concentrated regional hands-on learning opportunities. We will also try public service announcements on television and place more emphasis on newspapers and radio.
- We will use several strategies that are currently under development to increase our work with younger audiences, be more successful in rural areas, and use mass media to have a greater impact in suburban and urban areas.

References

Babbie, E. (1983). *The practice of social research* (3rd ed.). Belmont, CA: Wadsworth Publishing Company.

Dillman, D. (2000). *Mail and Internet surveys*. (2nd ed.). New York: John Wiley and Sons.

Norusis, M. J. (1986). *The SPSS guide to data analysis*. Chicago: SPSS, Inc.

Salant, P., & Dillman, D. (1994). *How to conduct your own survey*. New York: John Wiley and Sons, Inc.

Agua Pura and *Los Pescadores*: Latino Youth and Families Engage in Water Resource Issues

A. Michael Marzolla
University of California Cooperative Extension, Santa Barbara
ammarzolla@ucdavis.edu

Abstract

Agua Pura (Pure Water) began in 1999 as a partnership of the University of Wisconsin Cooperative Extension's *Give Water A Hand*, the University of California Cooperative Extension (UCCE)-Santa Barbara County, 4-H Youth Development Program, and the Santa Barbara City College. The goal of the *Agua Pura* Program was to promote better understanding of how community educators and youth leaders can involve Latino youth and the Latino community in watershed protection and in adaptation of resources to meet the community's needs and interests. The objectives of *Agua Pura* are to: Increase Latino youth's interest in science and environmental literacy; provide effective watershed education programming for Latino youth in after-school, non-formal settings; create opportunities for civic engagement; and promote Latino leadership around environmental issues.

The Santa Barbara County 4-H Youth Development Program has sustained *Agua Pura*. It is assisting the Santa Barbara County Water Agency in meeting best practices under the U.S. Environmental Protection Agency (EPA), National Pollution Discharge Elimination System (NPDES), guidelines (U.S. EPA, 2003). *Agua Pura* has engaged the Latino community in watershed resource issues and continues to do so. Recently, the program embarked on a partnership with the nationally known Adopt-A-Watershed Agua Program to develop and extend a place-based curriculum dealing with salmon and steelhead known as the *Agua Pura Pescadores* (Fisher-folk) Project.

This paper describes the *Agua Pura* and the *Los Pescadores* initiatives, and the rationales for starting them. It considers the theoretical groundings that influenced the approach we've attempted to follow. Finally, it outlines what has been learned from the experience, and how that experience reflects what the research literature says should happen.

Why *Agua Pura*?

Responding to the need for programs that engage Latinos in environmental issues, *Agua Pura* (Pure Water) began in 1999 as a partnership of the University of Wisconsin Cooperative Extension's, *Give Water A Hand*, the Santa Barbara County UCCE 4-H Youth Development Program, and the Santa Barbara City College. The program's overall goal was to better understand how community educators and youth leaders could involve Latino youth and the Latino community in watershed protection. The effort has included drawing on the experience and expertise of Latino adults and youth, including their participation, adaptation and creation of strategies, and utilizing their resources to meet the Latino community's needs and interests related to watersheds (Andrews, Marzolla, Rowe, & Thompson, 2000).

Agua Pura has responded to a variety of concerns, opportunities, issues and interests. These included:

- The need for environmental educators to respond to major demographic shifts in the ethnic makeup (particularly the increase of Latinos)of the state and nation's population;

- The lack of civic engagement of many California residents, particularly Latinos, in having a voice in their community as well as in the wider state and national civic arenas;

- The need for community-based, place-based, non-formal, after-school science and environmental literacy programs that engage Latino youth and their families (Ponzio & Marzolla, 2002);

- The need to reorient environmental education at all levels, ensuring that the program would contribute to personal and community capacity building, and would address issues of environmental justice and systematically address the lack of diversity (Grass & Agyeman, 2002); and

- The desire to create a program that would integrate what Agyeman (2003) refers to as "culturally sensitive research approaches" that would be inherent in *Agua Pura* as an environmental education program.

In the remainder of this document I will elaborate on these points, touching on the theoretical reasons for this program's approach. I will also address what current research indicates and how that experience reflects what the research literature dictates. Finally, I will consider the lessons learned from the experience of implementing this program and how that experience reflects what the research literature says should happen.

Shifting Demographics and Latino Engagement in Environmental Issues

The increase in the Latino population in California is the most obvious indicator of the need for programs like *Agua Pura*. A visit to almost any school in California indicates that the demographic composition of the student population is more diverse than at any time in the State's history. Examine California's education data (Education Data Partnership [Ed-Data], 2004) and the results of the 2000 national census. The data will confirm what your eyes tell you: There is no majority ethnic group; the shift in the nation's population from a European-American majority to a more diverse society that demographers heralded for many years has arrived. According to the 2000 U.S. Census, California's population is 32.4% Latino (U.S. Census Bureau, 2000). According to the State Department of Education's 2002-2003 state enrollment data, 45.2% of the statewide student population is identified as Latino: That is 2,819,504 of a total student population of 6,244,403 students. Santa Barbara County's population is 34.2% Latino. The school-age population is an even stronger indication of this population shift as Latino students now make up the majority of the student population: Santa Barbara County's school population is 53.1% Latino (Ed-Data, 2004).

Researchers who have surveyed Latino communities have found that the majority of recent Latino immigrants are more concerned about environmental issues than the dominant culture. The research also showed that the respondents felt that environmental issues can best be addressed by community involvement (Schultz, Unipan, & Gamba, 2000). In spite of this reported interest and concern, very few Latino young people have been observed taking part in environmental clubs or environment-related community activities. Likewise, concern has been expressed nationally by the lack of Latino university graduates with degrees in science and environment related fields.

Similarly, a visit to an after-school environmental club and/or a public event that feature environmental issues, such as Earth Day in Santa Barbara County, will indicate that Latinos are generally not involved. It is safe to assume that the same can be said for most communities throughout the United States. In addition, there are very few Latino professionals in environmental leadership positions in California, or the rest of the United States, and there are very few Latino students enrolled in college level environmental science or education programs. For example, at the University of California, Santa Barbara, the Environmental Studies degree program has an estimated enrollment of four hundred undergraduates. It was also estimated that only twelve percent of these students are Latino (based on a conversation that I had with the program's administrator who indicated that the program did not record the ethnicity of the students enrolled).

Water Quality and Latino Community Engagement

Latino members of our communities are often most affected by water-related health risks. Additionally, quality of life issues and personal or community barriers may limit their involvement in local water quality protection activities. In Santa Barbara, the area of the highest Latino population density is also where the creeks are the dirtiest from upstream sources. These polluted creeks drain into the ocean along Santa Barbara's shoreline, forcing beach closures that impact everyone. Like everyone else, many of the Latino community go to the beach. Their children play in the creeks. They are definitely interested in the problem. However, because of language and cultural issues, community members are often not engaged in water protection activities. In most cases, people in charge of outreach are not Latino; they do not speak Spanish, and they have little or no experience working with Latinos. It is not surprising, therefore, that water quality education programs often overlook the Latino community (Andrews, et al., 2000).

The *Agua Pura* Program was developed to address this issue in Santa Barbara County. The Program represents a community-based watershed education program focused on engaging Latino youth and their families in local watershed/water quality issues. Supported in part by funds from the Santa Barbara County Water Agency, *Agua Pura's* efforts have helped the agency meet its NPDES requirements for best education practices. These requirements include educational outreach to underserved communities (U.S. EPA, 2003). Using educational approaches that are community-centered draws on established, research-based practices. Sources for community-based research and theory that have helped guide *Agua Pura* staff and have helped develop program strategies are discussed later in this paper.

The Unique Opportunities in Community and Place-Based Programs

If one follows a constructivist educational model that views direct experience being antecedent to learning, the case is made for direct experiences in science. It follows that participants would then work on authentic tasks and projects using their newly acquired skills in new ways (Ponzio & Marzolla, 2002). This paradigm fits well with proven pedagogical practices, such as the learning cycle (Guzzetti, Snyder, & Glass, 1992; Lawson, Abraham, & Renner, 1989), and cooperative learning strategies (Covington, 1992; Slavin, 1983) that have been found effective in science instruction and fit current brain development models (Brooks & Brooks, 1993; Caine & Caine, 1991; Sylwester, 1995). Community-based science programs also allow participants to apply their learning to a wide variety of home, neighborhood, and community situations in settings such as helping to design and implement recycling programs, raising vegetables in community gardens for senior citizens centers, or helping design family disaster-emergency response plans. These kinds of projects encourage youth to solve problems grounded in real-world contexts requiring

many kinds of complex problem solving skills suggested by advocates of "outcome-based" education (Spady, 1994). Although the diversity of projects and outcomes poses a major challenge to evaluation, it helps keep participants engaged in service learning applications of their science knowledge. The project-based outcomes also help forge a connection between "school smarts" and "street smarts" and encourage career exploration by engaging scientific thinking and problem solving skills learned and applied in community issues that are significant to the learners (Markham, Larmer, & Ravitz, 2003).

Developing educational programs based on a local context is also strongly favored by advocates of place-based education. In a recent article, Gruenewald (2003) states:

> Place-based pedagogies are needed so that the education of citizens might have some direct bearing on the well-being of the social and ecological places people actually inhabit. Critical pedagogies are needed to challenge the assumptions, practices, and outcomes taken for granted in dominant culture and in conventional education. (p. 3)

Gruenewald goes on to provide a theoretical context for this approach:

> …place-based education lacks a specific theoretical tradition, though this is partly a matter of naming. Its practices and purposes can be connected to experiential learning, contextual learning, problem-based learning, constructivism, outdoor education, indigenous education, environmental and ecological education, bioregional education, democratic education, multicultural education, community-based education, critical pedagogy itself, as well as other approaches that are concerned with context and the value of learning from and nurturing specific places, communities, or regions. (p. 3)

Creating a place-based watershed education program at the community level can have additional benefits by creating a process that can, over time, lead to civic engagement and help overcome the exclusion of Latinos (and hopefully other under-represented ethnic groups) in the decision-making processes. Research literature that focuses on civic engagement has served to inform the *Agua Pura* staff in its program efforts. For instance, the California-based Civic Engagement Project (CEP, 2003) defines civic engagement as: "…the inclusion and meaningful participation of community members in the process of deliberation, prioritization and decision-making regarding public programs, services, projects or policy-making" (p. 1).

CEP goes on to identify the benefits of this approach to communities and individuals: "A civic engagement approach to policy-making mandates that the community be considered when policy decisions are made" (p. 1). Successful civic engagement can contribute to the improvement in the quality of life of the participants, their families and neighbors.

Programs like *Agua Pura* can serve as civic engagement learning opportunities for young Latinos and their families. The program has introduced these community members to water quality resource issues where they have learned to identify and frame issues based on their personal perspective and the needs of their community. It is reasonable to expect that this process will help develop future community leaders and spokespeople.

Community-Based Programs and Science and Environmental Literacy

It is generally recognized that there is a demand for technological and scientific literacy. People are being asked to pass judgment on issues such as offshore oil drilling, the fate of endangered species, and the commercial uses of genetic engineering. Employers and employees alike are faced with choices that may affect the well being of the environment. A report from the U. S. Department of Education, National Center for Educational Statistics (1998) stated that U.S. students scored below the international average on the science portion of the general knowledge assessment and were among the lowest of the 21 countries who participated in the Third International Math and Science Survey. It is increasingly clear that schools cannot do it alone, and therefore one must ask, "What is this lack of scientific understanding costing us and our children's ability to understand their natural world?" How can we apply research findings and best practices to increase scientific literacy and environmental awareness for all of our youth?

Why After-School Hours?

When school lets out for the day, many children need after-school care while their parents finish work. These children constitute a vulnerable and needy group for continued supervision. It has been calculated that the average expense per year of after-school childcare is the same as the average cost per year of tuition at the University of California. Even with such a high cost, five times as many California children need childcare than there are available spaces. (California Child Care Resource and Referral Network, 2001). There are, in many schools and at many community-based youth centers, on site after-school childcare and youth-centered programs. Most of these programs have child safety and custodial care as a primary focus. Certain of these programs are low or no cost to participants. Many provide supervised after-school, weekend and summer youth activities for children and young people. Likewise, many of these programs are reaching Latino youth. Finally, these after-school settings can serve as ideal venues for engaging young people in watershed education. Unlike most formal school settings, after-school settings are generally more flexible, allowing more opportunities for field discovery and community engagement.

Agua Pura

Working in after-school settings, *Agua Pura* is an example of a community-based, after-school watershed education program. The Santa Barbara County 4-H Youth Development Program has sustained *Agua Pura*. It is assisting the county in meeting best practices under NPDES guidelines. *Agua Pura* has significantly contributed to engaging the Latino community in watershed resource issues in the following ways:

- A six-week, hands-on after-school watershed education program that has graduated over 560 Latino children.
- A nine-week summer day camp has incorporated watershed education into for over 1,200 Latino children.
- The local Housing Authority, whose leadership is primarily Latino, has collaborated with the 4-H program in the development and delivery of the ongoing "Splash to Trash" watershed education program. Sixty-two young Latino people from public housing have graduated from the program.
- Publication of the *Agua Pura* Leadership Institute Planning Manual has created opportunities for Latino leadership development involving watershed resource issues at national conferences and in professional journal articles. (Marzolla, 2003)

Agua Pura is working in partnership with Adopt-A-Watershed (AAW), a California-based, nationally recognized watershed education program, to develop *Los Pescadores*, a Latino youth component that will address watershed issues related to the threatened salmon and steelhead. This project is building on the experience that has been gained over the years from the implementation of the *Agua Pura* program in Latino communities. It will incorporate an experiential, place-based curriculum that will enhance the participant's understanding of this topic, engage them in their own surroundings, as well as encourage their active leadership in addressing related issues in their community. Finally, this project will be directed toward engaging youth from under-served communities, particularly Latino youth and families. The curriculum is being developed for 10-15 year-old youth participating in nonformal and formal education programs. These include after-school programs such as camps, education centers, museums, and youth programs, as well as programs for educators willing to implement Place-Based Learning programs in formal education.

The importance of Latino community input in program design and delivery was a significant lesson learned from the *Agua Pura* experience (Andrews, et al., 2000). The *Los Pescadores* Salmon and Steelhead curriculum is being developed with input from representatives of the Latino community that are serving on the curriculum design committee. Their suggestions have included the collection of local salmon and steelhead stories and lore from community elders, and sharing these stories at community celebrations. They have also stressed the importance for including families in the sharing of food and cultural celebrations in the curriculum activities. These ideas and suggestions have been incorporated into the curriculum outline. The *Pescadores* curriculum will incorporate proven instructional methods that include:

- Project-based and place-based instruction that draws on authentic issues, and the tasks will be intrinsically interesting to the participants and will relate to the real world;
- Hands-on learning in non-formal settings;
- A high probability that the students will be recognized for their work by their community; and
- Cross-age teaching, incorporating teens and college students as project leaders and instructors (Ponzio & Fisher, 1998).

Sample topics that have been included in the curriculum outline include: Community mapping, exploring the life cycle of salmon and steelhead, monitoring salmon and steelhead, and developing and designing a restoration project. Participants will create individual journals, and they will record their project with photographs, artwork, stories and poetry as well as with data collection. They will share their experiences with their families and community, with a celebration that they design and organize. It is intended that these activities will contribute to individual and group project portfolios that will serve as evidence of the project's outcome, and as a record of the individual's contribution.

When completed, it is expected that the curriculum will be distributed by the UC 4-H Youth Development Program and by AAW. It is planned that the curriculum will be available in print and on-line. It is also expected that training will be provided to educators and project leaders by both UC and AAW. When completed, this curriculum is intended to serve as a valuable resource to west coast educators from Mexico to Alaska.

Conclusion

The *Agua Pura* program has provided several valuable lessons that may be of use to agencies and individuals interested in developing water quality education programs that engage the growing

Latino population. Likewise, these experiences may be transferable to settings involving other under-served populations. Based on the experience designing and implementing the *Agua Pura* program as well as a review of the related research, the following lessons stand out:

- Effective programs are community-based, build local leadership, address local issues that impact community members;
- Water quality issues are addressed collaboratively with the community and the issues are addressed in a context that community-members identify;
- Educational programs are culturally appropriate, experiential, place-based and they are implemented in after-school settings;
- Programs develop and foster local leadership and provide opportunities for civic engagement; and
- The need to emphasize the importance of hiring a bi-lingual culturally competent staff as well as encouraging the involvement of Latino teens by providing them with leadership opportunities through internships and, whenever possible, paid positions.

In reviewing the current research, there is no doubt a critical need for more applied research in the field of community-based and environmental education as it applies to working with culturally diverse populations. There is also a growing need to extend this research to agencies and educators whose tasks include working with diverse communities. Hopefully, we can look forward to a time when culturally sensitive approaches to these programs will become inherent in environmental education research.

References

Agyeman, J. (2003). "Under-participation" and ethnocentrism in environmental education research: Developing "culturally sensitive research approaches." *Canadian Journal of Environmental Education*, *8*, 80-94.

Andrews, E., Marzolla, A., Rowe, K. & Thompson, M. (2000). *Agua pura*: *A leadership planning manual for Latino communities / Un manual de planeamiento del instituto de liderazgo para las comunidades latinas*. Madison: University of Wisconsin Cooperative Extension. Retrieved June 2004, from http://www.uwex.edu/erc/ apsummary.html

Brooks, J. G., & Brooks, M. (1993). *In search of understanding: The case for constructivist classrooms*. Alexandria, VA: The Association for Supervision and Curriculum Development.

Civic Engagement Project (CEP). (2003). *Promising practices—Innovative strategies for engaging our communities: Lessons from The Civic Engagement Project for Children and Families*. Benicia, CA: Harder + Company Community Research.

Caine, R., & Caine, G. (1991). *Making connections: Teaching and the human brain*. Alexandria, VA: The Association for Supervision and Curriculum Development.

California Child Care Resource & Referral Network. (2001). *The California child care portfolio.* Retrieved June 2004 from http://www.rrnetwork.org/rrnet/our_research/ 1046997942.php

Education Data Partnership (Ed-Data). (2004). *District reports: Santa Barbara County students by ethnicity, fiscal year 2003-2004*. Retrieved June 2004, from Ed-Data Web site: http://www.eddata.k12.ca.us/Navigation/fsTwoPanel.asp?bottom=%2Fprofile.Asp %3 Flevel%3D06%26reportNumber %3D16

Covington, M. (1992). *Making the grade: A self-worth perspective on motivation and school reform*. New York: Cambridge University Press .

Grass, R., & Agyeman, J. (2002). Reorienting environmental education for environmental justice. In *Second National People of Color Environmental Leadership Summit- Summit II: Resource paper series*. Washington, D.C.: Summit II.

Gruenewald, D. (2003). The best of both worlds: A critical pedagogy of place. *Educational Researcher, 32*, 3-12.

Guzzetti, B., Snyder, T., & Glass, G. (1992). Promoting conceptual change in science: Can texts be used effectively? *Journal of Reading, 35*, 542-649.

Lawson, A., Abraham, M., & Renner, J. (1989). A theory of instruction: Using the learning cycle to teach science concepts and thinking skills. *National Association for Research in Science Teaching*, Monograph #1.

Markham, T., Larmer, J., & Ravitz, J. (2003). *Project Based Learning Handbook. A Guide to Standards-Focused Project Based Learning for Middle and High School Teachers*. Novato, CA: Buck Institute for Education.

Marzolla, A. (2003). *Engaging Latino youth and families in water resource issues*. Retrieved June 2004, from University of California, Agriculture and Natural Resources, University of California Delivers Web site: http://ucanr.org/delivers/ impactview.cfm?impactnum=73&mainunitnum=0

National Center for Educational Statistics. (1998). *Pursuing excellence–A study of U.S. tweflth-grade mathematics and science achievement in international context: Initial findings from The Third International Mathematics and Science Study*. (Publication NCES 98-049). Washington. DC: U.S. Government Printing Office.

Ponzio, R., & Fisher, C. (Eds.). (1998). *The joy of sciencing: A hands-on approach to developing science literacy and teen leadership through cross-age teaching and community action.* San Francisco: Caddo Gap Press.

Ponzio, R., & Marzolla, A. (2002). Snail trails and science tales. *Canadian Journal of Environmental Education, 7*, 269-281.

Schultz, P. W., Unipan, J. B., & Gamba, R. J. (2000). Acculturation and ecological worldview among Latino Americans. *Journal of Environmental Education, 31* (2).

Slavin, R. (1983). *Cooperative learning*. New York: Longman.

Spady, W. (1994). Choosing outcomes of significance. *Educational Leadership, 51* (6).

Sylwester, R. (1995). *A celebration of neurons: An educator's guide to the brain*. Brookline, MA: Zephyr Press.

U.S. Census Bureau. (2000). *United States Census 2000*. Retrieved June 2004, from http://www.census.gov/

U.S. Environmental Protection Agency. (2003). *National Pollutant Discharge Elimination System (NPDES)*. Retrieved June 2004, from http://cfpub2.epa.gov/ npdes/

Drinking Water Education for Underserved Communities

LaDonna McCowan
Biosystems and Agricultural Engineering
Oklahoma Cooperative Extension Service
Oklahoma State University, Stillwater
mladonn@okstate.edu

Mike Smolen
Biosystems and Agricultural Engineering
Oklahoma Cooperative Extension Service
Oklahoma State University, Stillwater
Smolen@okstate.edu

Abstract

This proposal applies a new Extension education concept for drinking water protection programs addressed to low income, underserved, and minority populations in rural and urban areas. It follows a successful pilot project, funded by U.S. Department of Agriculture (USDA)/ Cooperative State Research, Education, and Extension Service (CSREES), that used paraprofessionals from the targeted community to reach the target audience. This proposal will employ additional techniques such as mobilizing volunteers through local community centers, minority landowner organizations, and churches; engaging small rural communities with Rural Utility Service; establishing riparian demonstration projects; promoting environmental quality incentive educational programs; using GIS techniques to explain risk assessment concepts; and promoting good decision-making techniques.

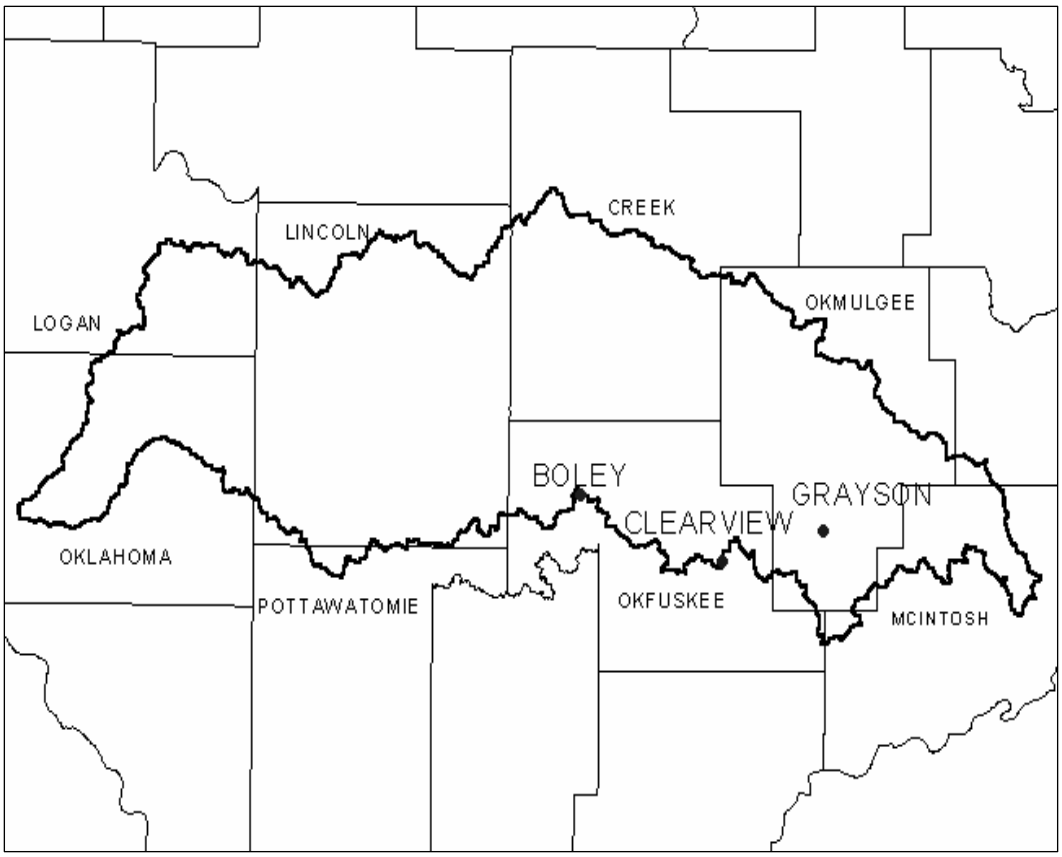
The target area is composed of two counties; Okfuskee, and, Okmulgee. These counties are among 1006 counties in the 11 Southern states with rural populations having poverty rates as high as 40% and more than 40% of working-age persons without high school diplomas. Coupled with an aging demographic and widespread distrust of government, this target audience poses challenges for any Extension educational program.

The outcomes of the project will be measurable improvements in drinking water quality as well as increased understanding of factors that determine the quality of private and community drinking water supplies

Project Description

Deep Fork watershed includes numerous underserved, minority communities in a nine-county area extending from Oklahoma and Logan counties in the west to Okmulgee County in the east (Figure 1). The area includes pockets with low economic structure, weak educational systems, and declining natural resources. This leaves open many targets for educational strategies to protect drinking water and protect and improve the resource base. Extension education in these communities can help residents to address many of their own environmental needs.

Figure 1. Target communities in Deep Fork watershed



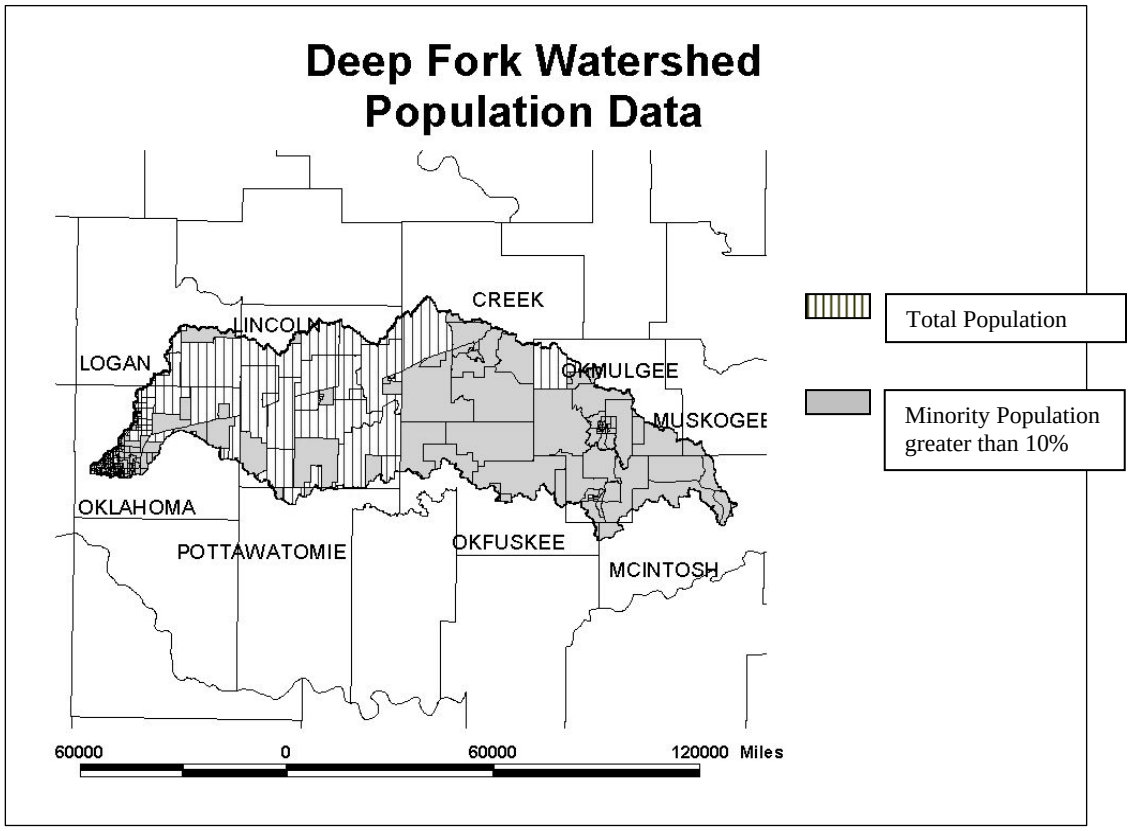
Rowley and Freshwater (1999), in a study of technology in rural areas, showed Oklahoma as one of the 11 states with non-metro counties having more than 40% of working-age persons lacking a high school diploma, more than 25% of the population in poverty, and high proportion of minorities.

Rurality includes dimensions of distance, small groupings or sparseness, unique social interaction patterns, culture, occupations, and quality of life (Wimberley, 1995). Wimberley and Morris (1995) also show that southern minority and rural counties have consistent poverty, poor employment, low incomes, limited education, poor health, and high infant mortality. Also, non-metro areas have higher percentages of both elders (over 65 years of age) and youth (under 18 years of age), thus increasing the poverty ratio.

Okmulgee and Okfuskee counties have been selected as the target area for this project because of the large number of minority communities, largely African American and American Indian. (Minority communities for this project are defined as having more than 10 percent minority populations other than white.) The 1990 Census shows a majority of the target area had communities with more than 10% minorities shown on Figure 2. The percentage of families in the target area that are below the poverty level ranges from 34 percent to 74 percent. Fifty-one percent of these communities suffer poverty rates in excess of 40 percent.

In addition to the typical characteristics noted by Wimberly and Morris (1995), Rowley and Freshwater (1999), and others, there is widespread distrust of government programs and government workers in these areas. Overcoming these obstacles requires educational materials and programs be modified to have involvement of the people from the community.

Figure 2. Population data in Deep Fork watershed



The Oklahoma Unified Watershed Assessment (Oklahoma Office of the Secretary of Environment, 1998) identified the Deep Fork watershed as needing preventive action to sustain water quality. Empowering communities to protect their own water is the best practice to insure sustainability.

Oklahoma State University together with Langston University conducted a pilot project funded by Cooperative State Research Education and Extension Service (CSREES). The study found 38% of water samples from traditionally Black communities of Creek and Okfuskee counties, contaminated by coliform organisms, therefore, not meeting the Safe Drinking Water Act standard. The pilot project further showed the need for special educational materials tailored to the learning style, educational level, and vision problems of this relatively uneducated, elderly audience. For example, many residents became frustrated when trying to read and understand the technical jargon on water analyses they received from the Department of Environmental Quality. Thus many analyses were discarded and no action was taken to clean up their water.

Using pictures of drainage areas and other visuals created by geographical information system (GIS) helps us teach about watersheds, aquifers, and risk factors. Maps and pictures produced by GIS can help show locations of rural water lines (sometimes an alternative to a poor quality well),

aquifers and other water resources, as well as available services such as the USDA Rural Utility Service (RUS), and other offices.
Community-based organizations (CBOs) in this area are committed to improving water resources and providing educational opportunities. Cooperating in this project is *The Oklahoma Landowners and Tenants Association* (TOLTA) and the *Retired Educators for Youth Agricultural Programs* (REYAP). Both of these CBOs have previously requested information on safe drinking water and best management practices to protect their drinking water and on working with OSU to educate youth.

TOLTA is a 501 (c) (3) CBO, which currently assists many federal agencies with outreach to landowners and to rural minority communities. TOLTA's mission is to define, address, and assist in the resolution of issues that affect the well being of underserved farmers throughout the state of Oklahoma. TOLTA hosts water quality meetings, identifies landowners to implement best management practices, and communicates issues addressing drinking water. Through this proposed project, the broad reach of TOLTA increases African American, Native American, and Hispanic participation in Oklahoma State University's (OSU) Extension programs.

Retired Educators for Youth Agricultural Programs (REYAP) is a 501 (c) (3) CBO with a mission to increase the number of minority youth in agricultural programs by promoting opportunities in the field of agriculture. REYAP, in collaboration with other agencies and universities, sponsors youth internships in federal programs and encourages REYAP students from across the state to participate in FFA and 4-H programs. This organization recommends the youth in the target area for internships and volunteer programs addressing water quality issues within their communities.

Historically, churches in rural minority communities serve as the nucleus for community outreach. When the local churches approve functions and organizations, synergies are generated among church members and the communities that enhance acceptance and participation of community members. Churches in the target area are requesting water quality programs and educational information. Church leaders have expressed interest in involving youth members to participate in programs addressing safe drinking water issues. Youth involvement affects the attitudes and behaviors of future adults.

This project draws on the expertise and experience of OSU to address the needs of these communities. OSU's Water Quality Extension Program serves every county in Oklahoma with resources and materials addressing drinking water quality. OSU's participation in the Southern Region Water Resources Project further expands the capability of this effort. The outcomes of the project will be measurable improvements in drinking water quality as well as increased understanding of factors that determine the quality of private and community drinking water supplies

Project Goal

The goal of this project is to educate citizens and leaders of rural minority communities to test and protect their drinking water supplies. Three objectives identified in order to meet the goal are:

1. Increase awareness and understanding of well-water protection in targeted rural and urban minority communities.
2. Determine ongoing self-sustaining water information.
3. Develop ongoing community programs to ensure communities can address their water quality issues.

Methods

This project will accomplish three measurable objectives to facilitate the goal of educating citizens and leaders of rural minority communities to test and protect their drinking water supplies.

Objective No. 1: Increase awareness and understanding of well-water protection in targeted rural and urban minority communities.

OSU is developing a unique logo for cooperative water quality education involving CBOs and OSU Cooperative Extension. OSU is also developing understandable and easily read educational materials targeted at an aging rural minority community. The materials will provide proactive action to protect drinking water through water testing to protect wells, to properly maintain septic tanks and to facilitate household waste disposal. The materials will provide simple disinfecting procedures and offer other alternatives for assuring safe drinking water. New educational materials will be developed and field-tested by members of TOLTA before printing for widespread distribution. Input will be sought to increase community acceptance and to insure the materials meet community needs.

This program is conducted through CBOs, community centers, and churches. Local community centers already provide services to senior citizens and social organizations. Churches serve as the social nucleus for most rural minority communities. CBOs represent the community and can readily reveal local water quality concerns. Public meetings are held in churches and community centers because of high attendance that increases educational program visibility. Displaying data within the communities helps citizens visualize their involvement in protecting their drinking water.

Drinking water protection education will be conducted in Boley, Clearview, and Grayson. Residents are invited to bring water samples for nitrate, pH, and conductivity testing. For each meeting, OSU and REYAP students will test water samples with a nitrate, pH meter, and conductivity meter. The water samples will be tested on site and the results reviewed and explained during the meeting. TOLTA and student interns support each meeting and provide outreach services.

Student interns from REYAP use hand held global positioning systems (GPS) to identify the location of assessments and water wells tested in this project. This information is being utilized as input to a geographical information system (GIS). The GIS procedure develops pictorial and geographical views of areas that will help incorporate Extension educational activities into communities. Educational presentations tailored to local land use are the foundation upon which the project is built.

Outcomes

Materials from this objective provide simplified visuals of complex groundwater concepts that are made available to residents and officials at local county Extension offices. The paraprofessionals and water quality educator can check out materials when visiting local sites and for demonstrations. The frequent use of these materials is an indicator of their effectiveness.

Pamphlets, written in clear, simplified styles, address disinfecting procedures and other alternatives for safe drinking water. The material has large type and space to address the elderly audience. Pictures are used in the material for easier understanding. Information addressing the

interpretation of water analysis and disinfecting procedures has been added to the Oklahom*A*Syst workbooks.

Six Oklahom*A*Syst meetings, as described in Kizer and Brown (1998), will be held in the target area each year. Reports show attendance, pictures, water test results, and updated database. A simple questionnaire is used to indicate the level of resident knowledge about private drinking water. Interns report the number of requests for assessment assistance from each meeting. This will be used to measure action residents take to improve their drinking water.

Data collected from GPS units will be displayed at meeting locations and posted in local churches. Residents see their community involvement and participation level. Displaying community pictures generates enthusiasm and promotes local activity.

The Okfuskee county Extension office serves as a local source of information. This is essential for team cooperation and program cohesion. Two county educators, the water quality educator for the project, a paraprofessional, and two summer interns have a central office facility. This also gives residents one location for referrals.

Objective No. 2: Sample wells and conduct assessments in the target communities to determine the extent of water quality problems, to ensure that the residents have safe and sanitary drinking water, and to insure that management practices in urban areas are not contributing to water pollution.

A team of one paraprofessional, one water quality educator, and two summer interns from the local communities participate in the project. This team is stationed at county Extension offices in cooperation with the county Extension educator. The team becomes an integral part of community-based professionals, making personal visits to sample home water wells for coliform bacteria and conducting inventories and assessments. The Oklahoma Department of Environmental Quality (ODEQ) analyzes water samples for bacteria content.

The paraprofessional returns a written report to participants and explains results directly on a one-on-one basis. If follow-up treatment is needed, the paraprofessional will arrange follow-up by appropriate project staff and cooperating agencies such as OSU Extension or ODEQ. Where problems are found, well users are educated about the problem and remedial actions suggested. Actions such as chlorinating water and re-testing are likely. The intern, paraprofessional, and county educator provide an inventory of upstream items with a potential for contributing to nonpoint source pollution. Simple, easy to read pamphlets are distributed with alternative methods of obtaining safe drinking water. These methods include but are not limited to purchasing bottled water, installing automated chlorine systems, and using reverse osmosis systems to obtain safe drinking water.

The water quality educator assists OSU county educators to establish water quality active groups, such as Blue Thumb, from the youth in the target communities. Drinking water quality and educational activities are made available to this group. Calculating drinking water contamination risk using the Oklahom*A*Syst program and using GPS, as well as other water quality activities, increases the water awareness of youth. Youth participate with collecting and documenting data for the project. This program helps youth become familiar with best management practices and promotes future youth environmental stewardship.

Outcomes

Accomplishing this objective will mean there will be well informed water educators with water quality expertise in a community. The community will sustain a local paraprofessional with drinking water expertise, and two interns with a working knowledge of drinking water and GPS analysis. The community will have an increased knowledge of management practices to protect its drinking water. The project will generate 300 samples tested by ODEQ for bacteria and 300 completed assessments with the results entered in a database. This database will contain geographical data, water analysis data, location, and information about surrounding potential contaminant sources. The database can be used as a future resource to research and sustain programs.

Objective No. 3: Develop a sustainable program that will enable communities to address future water quality issues**.**

Blue Thumb is a national water quality monitoring program. It is implemented through public schools, 4-H organizations, Boy Scouts, and other volunteer programs. OSU county Extension educators will be working with volunteer groups such as TOLTA, REYAP, 4-H, and church groups, to develop a Blue Thumb program in this target area. Likewise, churches will establish programs to have water tested periodically in their community.

Conclusion

Three hundred water samples for this project will be submitted to ODEQ and tested for bacteria. Through personal contact, 500 Oklahom*A*Syst risk assessments will be completed and documented. Volunteer efforts to correct problems identified from assessments will be documented. A database establishes a baseline of the drinking water results and will be used for future educational efforts.
Student interns and the paraprofessional will conduct an initial follow-up each summer to determine if residents have had water tested and if a problem identified from a previous assessment has been corrected. TOLTA and REYAP will submit an evaluation of the educational material, meetings, and information they receive resulting from the project. The organizations will also be asked for a report of knowledge gained from the project.

The water quality educator and the paraprofessional are given continuous updates and educational opportunities addressing drinking water. Evaluations are completed following each educational component to address their expertise level. In addition, the students will be given tests following their internships to directly measure their levels of drinking water knowledge.

Finally, this drinking water project for underserved communities will leave understandable educational materials, provide expertise on ground water and drinking water, increase knowledge of protecting drinking water, and develop a sustainable community drinking water program.

References

Kizer, M., & Brown, B. (1998). *Farm and ranch wellhead and ground water assessment pilot project*: *Final report.* Stillwater: Oklahoma State University, Biosystems and Agricultural Engineering Department.

Office of the Secretary of Environment. (1998, October). *State of Oklahoma unified watershed assessment: Final report.* Retrieved June 2004 from http://www.ose.state.ok.us/documents/Other/UWA98FinalReport.pdf

Rowley, T. D., & Freshwater, D. (1999). *Ready or not? The rural South and its workforce*. Lexington: University of Kentucky, TVA Rural Studies, Southern Rural Development Center. Retrieved June 2004 from http://www.rural.org/workshops/ready/laborforce.pdf

Wimberley, R. C. (1995). What's rural? *Community and Rural Development News Capsules*. Raleigh: North Carolina State University, *1*, 3.

Wimberley, R. C., & Morris, L. V. (1995). *Dependence as a factor in socioeconomic well-being: The U.S., the South, the Black Belt*. Paper presented at meetings of the Rural Sociological Society, Pentagon City, VA.

Assessing Extension Program Impact: Case Study of a Water Quality Program

James Bauder
Montana State University, Bozeman
jbauder@montana.edu

Suzanna Roffe
Montana State University, Bozeman
sroffe@montana.edu

Krista Pearson
Montana State University, Bozeman
kpearson@montana.edu

Abstract

Over a five year period, Montana State University (MSU) conducted a voluntary, Montana based, private well water test program to educate the public on water quality issues, as well as improve the decision-making skills of private well owners. The program provided an array of water quality resources including instructional videos, written instructions, sample collection and submission, and an impact assessment questionnaire. Data collected from the program were based on the following outcomes: comprehension of test results; changes in land use practices to improve water quality; purchase of point-of-use treatment systems; level of improved ability to make decisions about water quality; and overall assessment of the program. Assessments of various delivery mechanisms within the program concluded that Extension faculty could improve the effectiveness of future distant delivery education by 1) targeting specific educational resources, 2) specifying audiences by need, 3) structuring to the educational level of audiences, and 4) providing information that has immediate utility to the program.

The invaluable information MSU Extension Water Quality Program gained from the well test program has not only guided them in best education practices (BEPs) for the past ten years, but will be the basis for design and implementation of a sister program being conducted in 2004 and 2005. The revitalization of the well water test program will address the evolving water quality needs of Montana private well owners, help MSU water quality specialists continue to effectively serve the educational needs of Montanans, and provide BEPs that can be shared as a regional resource in water quality education.

Background

Montana's historic economy was built around agriculture and natural resource extraction such as gold silver, copper, petroleum, coal, and timber. Alongside tourism, agriculture has remained Montana's primary industry. However, since the end of World War II many Montana farming and ranching operations have been depleted due to a declining workforce, adverse international markets, and climatic changes hindering growth and harvest vigor.

Due to the decline in factors that sustain productive agriculture operations, many producers are selling large amounts of acreages to developers who then subdivide the land in to smaller plots.

Transitioning societies and the dominance of the "bedroom community" phenomenon in the western United States have put excess pressure on the water quality and quantity of this region due to the number of private wells installed on small acreages. In addition, most development occurs either on or adjacent to agricultural lands, emphasizing the importance of monitoring water resources in these areas. The population increase and development process will likely be a fixture in many states for some time and education pertaining to private water resource protection and management will be a necessity to preserve the integrity of the resource.

In Montana records are available for over 65,000 domestic wells, representing approximately one well for almost every 12 Montana inhabitants. Water quality is a focus of research, public education, and curriculum development throughout the USA, especially as it relates to nonpoint source pollution. Educational resources for private well owners on water quality issues and monitoring procedures is essential to protecting water resources at the wellhead.

An Extension-sponsored private well water test program was initiated in January 1989 in cooperation with MSU, the Montana Department of Health and Environmental Sciences (DHES), and several agricultural organizations. The program was prompted by the 1988 "Well Aware" program conducted by the Future Farmers of America (FFA) with *Successful Farming* magazine (Freese, 1988).

At the time of the initial MSU program, use of private well water quality test programs were reported, but not for general education. The scarcity of water quality educational resources in the public sector underscores the need for innovative approaches to collecting water quality data. The objectives of the 1989 MSU study were to assess the impacts of an Extension–sponsored, private well water test program on participant behavior and learning characteristics, and to gather information about preferred learning methods of a diverse, targeted Extension audience. Additionally, the program wanted to offer an inexpensive, nonthreatening well testing service to provide educational resources to rural and urban private well water users in Montana, as well as educate private well water users about groundwater quality issues specific to agricultural areas of Montana.

In the spring of 2004, MSU revitalized this program in efforts to establish an annual well water test program for private well owners in Montana so that they would be empowered to monitor, assess, and treat the quality of their drinking water. The current well water test program capitalizes on the outcomes and finding of the original pilot as well as on recent, similar focused educational methods for water quality education as it relates to small acreages and private well owners. The emphasis of this article is to summarize the results of the original 1989 educational program and program impact assessment, as well as the modifications and design of the more recent sister-program. Specific details of the educational impacts, well water sampling, geographic distribution of 3342 private wells sampled and tested, testing procedures, and summaries of well tests results have been reported previously (Bauder, 1993; Bauder, White, & Inskeep, 1991).

Methods and Materials

With the 1989 program, samples were submitted on a voluntary basis from 53 of the 56 Montana counties and were tested for coliform bacteria, pH, total dissolved solids (TDS) concentration, Na^+ concentration, and NO_3^- - N concentration. The program was not designed or intended to obtain a random sample of wells throughout Montana (Bauder, 1990). The testing service was offered to private well water users through county Extension offices, conservation districts, and

Farm Bureau offices. The service was part of a multi-phase, multi-media distant delivery program consisting of the following steps.

1. An educational video on water quality issues and another on sample submission procedures were developed and provided to participants.
2. Sampling and testing periods were selected for the spring and fall of 1989 and 1990. A press release containing program details was provided to each county office to modify for publicity.
3. A 12-part fact sheet series dealing with specific issues of water quality was developed and distributed to each county Extension office and printed in a statewide agricultural magazine each month for the first year of the program.
4. The DHES conducted all coliform tests and reported all results directly to participants; all other analyses were completed by an analytical laboratory at MSU and reported directly to participants by the Extension service. A statement of significance of test results, interpretation, and recommendations for action was mailed with test results to each participant.
5. Summaries of test participation and results were prepared for each county for each sampling period and for total participation in all four year testing periods.
6. A seminar series was developed and delivered to counties where high NO_3^- - N concentrations were detected. The seminar series, addressing health issues, water quality policy, NO_3^- - N contamination, well disinfection, and point-of-use treatment, was advertised locally and presented approximately 3 months after the final testing period.
7. Approximately one year after the test results and recommendations had been mailed, a questionnaire was mailed to each participant to assess program impact. The questionnaire consisted of six sections: (i) participant background, (ii) test results, (iii) participant opinions, (iv) recharge area land use characteristics, (v) program value impact, and (vi) participant demographics.
8. Questionnaire responses of each test period were summarized and mailed to each participant.

Results and Discussion

The following summarizes well owner interest in testing, perceived value of the well test program, views on sources of contamination, and water quality action taken. Return rate for the follow-up impact assessment questionnaire averaged 44%. Reports were analyzed for an entire sample and also separated by geographic location, farm vs. nonfarm, and level of education, where appropriate.

Geographically, the database was sorted into subsets consisting of well owners residing in three primary regions of Montana: 1) forested, intermountain areas of central and western Montana, 2) northern Great Plains region, and 3) southeastern and south central region. Designation of the regions was based on land use practices such as grain farming, livestock production, or nonagricultural practices.

All well owners responding to the questionnaire were asked to specify if the well tested was located on a farm. Fifty-six percent of the respondents were testing a farm or ranch well; 42.3% were located in a nonfarm environment. Responses to the questions indicated that the nonfarm audience was slightly better informed about individual responsibilities, knowledgeable of water quality issues, and action needed than the farm audience. Also, farm well owners placed significantly greater value on the education than did the nonfarm well owners. Only 11% of the farm well owners said the program was of limited or no educational value, whereas nearly 17% of

the nonfarm audience said the program was of little or no value. The difference in responses between the two groups can be explained in part by significant difference in level of education between nonfarm and farm well owners.

The entire database was sorted by educational level of participants. One subset was for individuals with some college education and the other subset comprised responses from individuals with no college course work. The results indicated that individuals with less education were more inclined to seek alternative water sources if problems existed, whereas individuals with some college education were more inclined to implement some wellhead protection. Nonfarm well owners had a slightly higher average level of education than farm well owners. Nearly 20% of the nonfarm well owners indicated that they had earned a post college graduate degree, whereas only 5.8% of the farm well owners indicated an equal level of education.

Program Participation

Fewer than 20% of the respondents indicated that they occasionally test their water supply; once every 5 yr of less. Twenty-five percent of the participants indicated that they tested only when there was an apparent need, whereas nearly 60% of the respondents said they had no record of previous testing. Well owners who previously had tested their water most commonly cited three reasons: 1) advice of others, 2) Extension publication and newspaper articles, and (3) water treatment salespersons. Participation in voluntary programs of this type may be caused by a variety of factors, most specific to the participant; and the high level of participation in the program may have been associated with the limited effort required by well owners to participate. Table 1 summarizes respondents' reasons for participating in the program.

Table 1. *Reasons for Well Owner Participation in the Montana Private Well Water Test Program (N=1408).* †

Reason for participation	Percent of respondents who said the reason affected their participation	Rank based on the most important reason for participating, according to respondents
Curiosity about quality of water	79.6	2
Concern for personal or family health	72.6	1
Cost and availability of program	55.6	3
Encouragement from concerned party	22.1	4
Questions about agrichemicals in water	20.7	6
Questions about no agrichemicals in water	18.6	5
Advice or alarm of someone else	3.8	7

†N = number of well owners responding to question

Program Value and Participant Learning

Several different approaches can be taken to assess the degree to which participants of outreach programs learn. One approach is to ask participants specific content questions about a subject.

Another way is to ask participants questions regarding their perceptions of specific subjects. Participants were asked what conclusions they reached about the quality of their water, based on well test programs results. Table 2 summarizes participant responses.

Table 2. *Conclusions about Quality of Well Water Samples and the Need for Action to Ensure the Quality of Future Well Water Supplies (N=1395)*

Conclusions from program participants	**% of respondents**
Water was okay to drink	69.1
Water quality was questionable	20.9
Water may be harmful to personal health	11.1
Need to resample and retest	6.7
Water was unfit to drink	6.7
Need to secure new source of water	2.9
Initiate regular/periodic sampling and testing	24.5

Seventy-five percent of the respondents said the results were what they expected. Only 12.6% of the respondents said they were alarmed or surprised by the well test results. Approximately 30.5% of the respondents said they did not understand the results or significance of the results.

Well Owner Opinions

Participants were asked what might be potential sources of either NO_3^- - N or bacterial contamination of well water. They selected from a list of 18 potential sources, ranging from naturally occurring contamination to fertilizer, mining, septic tanks, and soil erosion. Participant responses to this question were ranked based on which was identified as the possible contaminant source (Table 3).

Table 3. *Potential Sources of NO_3^- - N Contamination and Coliform Bacteria Identified by Private Well Owners (N=406; 743)*

Sources of contamination	**% of participants who said this was the most likely source of contamination**	**Rank**
Most likely source of NO_3^- - N		
Naturally occurring	18.2	1
Septic tanks and sewer systems	14.3	2
Livestock feeding and confinement operations	12.1	3
Fertilizer application	11.8	4
Faulty well construction	7.1	5
Most likely source of coliform bacteria		
Septic tanks and sewer systems	13.9	1
Naturally occurring	13.3	2
Faulty well construction and maintenance	10.6	3
Incorrect sampling procedure	10.2	4
Lack of well decontamination after drilling	8.6	5

Actions Taken

As part of the educational program, each participant was sent a fact sheet describing water treatment options. Well owners were asked if they knew how to treat water for various contaminants and other undesirable conditions. Well owners claimed they best understood treatment for coliform bacteria and hard water. The least understood treatment was for NO_3^- - N.

Well owners can take a variety of actions to deal with undesirable water quality. These include purchasing bottled water, modifying an existing well, drilling a new well, hauling water, or joining a water district. We asked each well owner *how much money* they spent on any of these actions, other than purchasing water treatment equipment, as a result of the information they obtained. On average, $992.00 was spent per well where action was taken, and the annual cost was about $238.00 per well. Average cost of point-of-use water treatment equipment was $425.00 per household.

Participation in the well test program and perceived benefit gained from the program appeared to be a function of the immediate usefulness of information to the participant, amount of effort needed to get the information and participate, and cost of participation. For example, we asked each participant how much they would be willing to pay for the water testing service they received if they were required to get the information from a private testing laboratory. Nearly 85% of the respondents indicated willingness to spend between $10 and $40 for the water testing service.

Program Value and Information Transfer

Nearly 55% of the respondents indicated they told an average of four people about the program. Well owners were also asked what benefit they gained from the program. According to those surveyed, the most valuable parts of the program were water test results (89.4%), costs of the program (76.2%), information on water quality protection (64.2), and specific information about treatment (50.2).

The participants were asked what extent their participation in the program affected their ability to understand water quality issues and make knowledgeable decisions about water quality. Eighty-three percent of the respondents indicated that the program increased public awareness of private well water quality issues and well water protection, a moderate amount or a great deal.

Participants indicated that printed text and communication with county agents were the preferred type of educational information offered through distant delivery. Phone communication with specialists, videos, workshops, television programs, lecture, and audio tapes were not as attractive options to respondents.

Reinstitution of the Program

The private well test program was intended to improve the decision making skills of private well owners in Montana. The impact assessment verified that by using a variety of information delivery sources and methods the program was able to improve decision making skills of participants and also to promote follow-up actions by participants. In addition, the program provided a cost-effective approach to distance delivery education of more than 3,300 Montana residents. Based on the outcomes of the initial well water test program, Extension faculty looked to improve the effectiveness of future distant delivery education for private well owners both statewide and throughout the region.

In the spring of 2004, MSU Extension Water Quality revitalized the initial well test program. The goal of the program directors is to build a stand alone, self directed, inexpensive and low maintenance annual well water test program available to Montana private well owners. More broadly, the template of private well water test program developed by Montana Extension will be a regional resource for partner states to implement and make suitable for specific state private well water quality issues.

Participants in the 2004 program included returnees from the original program, illustrating the impact the original program had on the attitude of some private well owners in Montana. The implementation of a water quality Extension Web site, designed and hosted by MSU, provided additional advertisement and recruitment for the program. Additionally, Extension offices in the ten fastest growing counties in Montana were contacted to help promote the program. Newspaper articles were provided for participant counties to advertise the program, similar to the approach taken in the initial program. Other advertising options that will be implemented in the current program include public radio and local television stations as well as statewide agricultural magazines.

Like the initial program, the 2004 program utilized a questionnaire to get the basic demographic and education information from participants. The participants were sent the survey and then instructed to pick up sampling materials from their local Extension office. Participants were provided the name and address of a contracted lab that provided testing services for half the standard drinking water analysis price. Partnership with the laboratory provides consistence in data throughout the life of the program, as well as an inexpensive testing option for participants in the program. A secondary survey was sent post-analysis asking participants what educational resources are needed to help them understand their individual well water results. Extension faculty hope to provide a more needs based approach to resources that offer information of immediate utility to program participants.

Educational methodologies that MSU Extension will use to promote future test periods of the program will include public radio, television, and newspaper advertisements. More communication and partnerships with county agents will also help facilitate program unity. Based on outcomes of participant responses in the 1989 program, private well water users prefer working with county Extension agents, thus they can serve as the liaisons between Extension programs and the public. Finally, Internet education resources, such as online training programs or instructor facilitated courses, will also provide convenient access for private well water users to obtain water quality educational tools.

The goals of the reintroduction of the program include: 1) provide an annual resource to enable private well owners to monitor the water quality of their wells, 2) provide educational resources specific to the water quality concerns of private well owners, and 3) provide a nitrate and bacteria database for Montana. Extension faculty will integrate a variety of educational delivery mechanisms into programs that provide opportunities for direct participant involvement and that offer immediate utility to program participants. With this approach, an established well water test program can be instituted in Montana and shared as a pilot template for other states with increasing private well users.

References

Bauder, J. W. (1993). Assessing Extension program impact: Case study of a water quality program. *Journal of Natural Resources and Life Sciences Education*, *22*, 133-144.

Bauder, J. W., White B. A., & Inskeep, W. P. (1991). Montana Extension initiative focuses on private well quality. *Journal of Soil and Water Conservation*, *46*, 69-74.

Bauder, J.W. (1990). Extension Well-Water Test Program. *Montana AgResearch*, Summer/Fall.

Freese, B. (1988). Well aware. *Successful Farming Magazine*, *86*(14), 32-39.

Application of Marketing Techniques to Extension Programming Decision Making: Minnesota Livestock Producers' Preferred Topics, Informational Formats, and Outreach Methods Concerning Land Application of Manure

John C. Vickery
Palmer Land Trust
Colorado Springs, Colorado
jvickery@mcg.net

Abstract

A combination of focus groups and pre-discussion surveys was employed with livestock producers to identify their preferred Extension education methods and topics. The focus groups took place in the spring and summer following a winter education program conducted at the county level that focused on manure application practices, nutrient management, and protection of sensitive areas. By exploring issues in detailed discussions with small groups of producers, we gained information and valuable insights that can guide future information, communication, and education efforts to serve this audience. We were also following an important principle of adult education: the audience or participants should have the opportunity to inform the topics or issues covered, as well as the media or format used. By discussing and surveying the practices they employ and the reasons they do not adopt recommended practices, we also gained knowledge about the topics or issues that ostensibly *should* be addressed through Extension outreach and/or through regulatory, incentives-based, or social-marketing approaches. We found that among seven suggested "educational items or opportunities," the preferred format was "publications." We present some advantageous features of the focus group–questionnaire combination of approaches, including the fact that by beginning with the questionnaire, participants had time to reflect on the questions prior to entering into discussion. We conclude that the combination is effective. However, the resources required for employing both methods is significantly higher than for one method alone, suggesting that the use of the combination is more appropriate for relatively larger projects or programs.

Project Background

A combination of focus groups and written survey was employed with livestock producers to identify their educational preferences with respect to land application of manure. The focus groups took place in the spring and summer following a winter education program on manure application practices, nutrient management, and protection of sensitive areas. The detailed report of the results of those sessions was reported by Vickery (2002).

In 2000, the Minnesota Pollution Control Agency (MPCA) promulgated revisions to the state feedlot rules (Minnesota Pollution Control Agency [MPCA], 2000). The rules address feedlot registration, permitting, and design, manure-nutrient application rates, management of manure in environmentally sensitive areas, and other environmental topics of concern. The University of Minnesota Water Resources Center and Extension Service (Extension) coordinated with state agencies to secure funding for and plan an education program. In the first year of the program (2001), information was delivered on feedlot registration, permitting, discharge restrictions, and

other basic requirements. Workshops in the second year focused on the requirements for land application of manure.

The new rules came about because of: 1) the growing public concern in the 1990s about the increase in numbers of large feedlots, and the associated environmental and human health effects; and 2) a legislative audit report of 1998 described in the MPCA Feedlot Program Overview (MPCA, 2003, p. 1). One of the primary conclusions of that report was that the feedlot rules, last revised in 1978, were out of date.

During the second year of workshops, the project leaders decided that rather than further evaluate the training program per se, the remaining resources should be applied to learning what was to be done next: What did the farmers want to learn or find out, and in what format did they want to get the information?

Theoretical Context Brief

Principles of Adult Education, "Andragogy"

Our common sense interest in asking the target audience what they wanted has support in the theoretical literature of adult education. For example, among the principles espoused by Knowles, one of the best known adult education theorists and popularizers (see e.g., Friedman, 2002), are the following as summarized by Atherton (2003):

- **The need to know**—adult learners need to know why they need to learn something before undertaking to learn it.
- **Learner self-concept**—adults need to be responsible for their own decisions and to be treated as capable of self-direction.

An external motivator, the new state regulations, was the primary need-to-know standpoint of the two years of educational programming preceding the questionnaire-focus group study. Future outreach efforts could or should also rely on internal or self-interested, need-to-know motivators such as environmental ethics, farm management efficiency, and financial benefits.

Knowles popularized the concept and practice of andragogy, the adult education version of pedagogy. Peter Jarvis (2001) has described Knowles' development of androgogy as "the first major attempt in the West to construct a comprehensive theory of adult education." A relevant, but simplistic, synoptic comparison here is "In pedagogy, the concern is with transmitting the content, while in andragogy, the concern is with facilitating the acquisition of the content (Clark, 1999). Although, he originally described them as distinct fields with a dichotomy of methods, Knowles later emphasized a relationship better treated as a continuum and that each field could borrow methods from the other in appropriate contexts.

Learning Styles

There are many analytical frameworks for understanding an individual's preferences with respect to learning, communication, and interaction. In Robert Smith's, *Learning How to Learn* (1982), 17 learning styles inventories are characterized in an appendix.

However, an education/information format preference is influenced by factors other than "learning mode preference." A farmer may not necessarily prefer to learn by reading documents, but the practical thing to do may be for him to skim a newsletter or a fact sheet during a lunch break. Producers can visit an Extension Web site at their convenience, for an hour during the evening or when the weather is bad. Travel is not necessary and if something comes up, the learning session can be resumed or postponed until another day. But, that is not the case for a

workshop or a field day. Thus, while it is reasonable to assume that the learning style of our producer respondents were reflected in their questionnaire answers, we should also recognize that there are other, unrelated influences. Therefore, standard or simple analyses of questionnaire responses can lead to incorrect interpretations. This is why qualitative approaches like focus groups and interviews are used.

Although there is considerable information on learning style preferences for the general population and for numerous subgroups, relatively little information is available on farmers. Trede and Miller (2000) studied a selected subset (a "purposive" or "judgment" sample) of Iowa farmers via mail survey. In addition to being concerned specifically with the learning styles and preferences of farmers, the Trede and Miller study was conducted relatively recently (1999). It involved a reasonably large sample size (289), and of course, concerned a participant sample or audience that is very relevant with respect to water outreach programming. The similarity in the participant sample for our two, unrelated studies of farmers in neighboring states is significant. The present author's sample was narrower, however, being limited to livestock producers.

For a mail survey, the Iowa study was quite lengthy, with components that address the following objectives:

- To determine the learning style of the Iowa farmers participating in this study using the Kolb Learning Style Inventory (Kolb, 1999) and to examine the distribution of these styles among the respondents.
- To determine the preferred learning mode of the respondents for selected agricultural topics.
- To determine the perceived effectiveness of selected learning activities and the impact of learning style on those learning activities (Trede & Miller, 2000, p. 340).

Using the Kolb Learning Styles Inventory, Trede and Miller (2000) found that:

> The preferred learning style for the respondents was the Assimilator style with nearly half of the respondents preferring this style. Individuals with this learning style prefer to grasp knowledge through abstract conceptualization (using logic and analyzing information) and then transform it by reflective observation (learning by watching others). They tend to learn best by inductive reasoning and testing theories and ideas. This implies that educational providers in agriculture should plan and implement programs that emphasize logic, ideas, concepts, and problem-solving rather than just "learning by doing." For example, educational meetings for farmers that include presentations emphasizing the theory and application followed by panel discussions, case studies, and other methods which allow participants to conceptualize, reflect, and adapt the presented information to their individual situation would be most effective. (p. 346)

Many might expect farmers to generally have learning styles that emphasize the concrete and practical. It turns out that such is the case, but not for all topics. The results relating to the second objective listed above demonstrated that the farmers' preferences varied by topic:

> … active experimentation (learning by doing) seemed to be the preferred learning mode for agricultural topics related to physical farming resources (land, crops, livestock, machinery, and buildings) while abstract learning (by observing others) [was] the preferred learning modes for more critical thinking activities such as markets and prices, whole farm planning, and financial management. (Trede & Miller, 2000, p. 338)

Methods Synopsis

Eight farmer focus groups were conducted in four counties in different parts of the state. Each pair of focus groups in a county consisted of one group who attended a winter workshop ("Attenders") and another group of participants who had not attended ("Non-Attendees"). The focus group proper was preceded by a three-page questionnaire to get the participants thinking about issues that would be explored in more detail during the course of the discussion. The participants retained the questionnaire through the discussion and were asked to refer to it at different points during the session. The focus group sessions were recorded on audiotape. Abbreviated transcripts for each session were prepared. The key findings from the focus groups were developed from the transcripts using the "long table analysis" procedure described by Krueger and Casey (2000).

Selected Results

Questionnaire components

The three-page questionnaire consisted of three sections:

1. Adoption of recommended practices
2. Preferences for education topics
3. Preferences for education or information delivery methods

Selected Results and Summary: Topics

Summary results for the second and third sections listed above are given in Table 1.

Summary

The topics of relatively higher interest based on both the "counts" (16 or 17) and "percent" statistics ("yes" + "maybe" > 80%) were:

- F. Field selection: soil P levels and manure application rates
- G. Managing sensitive areas
- I. Applying and incorporating manure

Selected Results and Summary: Format Preferences

Table 2 illustrates the selected results of participant preference for informational formats and educational opportunities.

Summary

- "Publications" is the item or opportunity for which there is the most interest. Nineteen of 51 participants gave it a rank of "1" (with the next highest item with "14"). It had the second lowest number of "last" rankings at 5 (Workshops and Farm tours had 4 each). Publications also had the lowest "average of the median rank" at 1.81.
- There is relatively low interest in a "Comprehensive Web site" or in "Nutrient management computer software". These items had the highest number of "last" rankings (17, 22), the lowest number of "first" rankings (4, 6), and the highest "average of the median rank" values (3.37, 3.81).
- Farm visit or one-on-one assistance had somewhat mixed results, receiving high to intermediate numbers of both "first" (13; range: 4-19) and "last" (14; range: 4-22) rankings and a high-to-intermediate value for average of the median rank (2.69; range: 1.81-3.81).

Discussion

The farmers' preferences can be analyzed from a number of perspectives and theoretical frameworks such as:

- Instructor-centered versus learner-centered teaching
- Information delivery versus education
- Thinking style
- Learning style preferences
- Multiple intelligence

The top and third highest ranked formats, "Publications" and "Newsletter," are the ones that are most strictly informational in nature. In terms of one way of categorizing thinking styles (reflective, creative, practical, and conceptual) these two "formats" are the ones best suited to the "practical" style (Rochester Institute of Technology [RIT], 2000). "Farm tours/demonstrations" and "workshops" are the ones that are probably best identified as "educational". Depending on their design, they could be instructor-centered or learner-centered, although the former is probably more common in practice. Depending on design and user preference, "Farm visit" and "Web site" can likewise serve in both or either fashions. If we shorten the list of learning style preferences to those most applicable in the present context, visual, auditory, and kinesthetic, we find that the questionnaire results indicate a relatively even balance between visual and auditory formats among the top four choices. There was an intermediate level of preference for the two formats that typically could offer the most opportunities for kinesthetic learning, "farm tours" and "one-on-one."

Table 1. *Producers' Assessment of Likelihood of Attending or Participating in Educational Programming: Results for All Questionnaire Respondents (N = 51) and Top Choices for Topics*

Lettered topic / questionnaire item	**All participants**			
	Count	**Percent**		
	Top choice *	**Yes**	**Maybe**	**No**
A. Calibrating my manure spreader	**9**	18	47	35
B. Manure sampling and nutrient content analysis	**17**	29	49	22
C. Soil sampling and testing	**10**	20	29	51
D. Manure application record keeping	**11**	31	51	18
E. Using UM Extension tables to calculate application rates	**7**	24	67	10
F. Field selection: Soil P levels and manure application rates	**16**	33	61	6
G. Managing sensitive areas	**16**	41	43	16
H. Written nutrient management plan	**12**	35	57	8
I. Applying and incorporating manure	**17**	34	58	8
J. Determining total acres needed for all of my manure	**7**	47	35	18

*****For "Top" choice, respondents were allowed to list up to three choices. Most gave three.
Results are given as counts or number of times listed or named.

Table 2. *Participant Rankings of Informational Formats and Educational Opportunities*

Item or opportunity	All eight focus group sessions combined		
	Average of the median*	N = 51	
		No. of times ranked	
		First	Last
Publications	1.81	19	5
Farm tours/demonstrations	2.25	14	4
Newsletter, "update", or periodic bulletin	2.25	11	9
Workshops	2.44	12	4
Farm visit by specialist or consultant OR one-one assistance	2.69	13	14
Comprehensive Web site	3.37	4	17
Nutrient management computer software	3.81	6	22

*The mean of the median of the rank assignments from the eight participant groups.
Not adjusted for the number of participants in each group (varied from 4 to 7) or otherwise.

From the educator's perspective, "software" and "one-on-one", followed by "tours", "workshops" and "Web site" are most likely to be "learner-centered". Characteristic of learner-centered instruction are interpretation of knowledge, learning through discovery, learners setting their own pace, and instructors coaching and mentoring students to facilitate their learning (RIT, 2000).

In the study cited earlier by Trede and Miller (2000), the investigators asked the farmers to rate the effectiveness of some 26 categories of learning activities (see Table 3), whereas in the present study, we used only seven formats or activities (see Table 2). While we used ranking, they used a Likert scale of 1 to 5 where 1=very ineffective, 2=ineffective, 3=no opinion, 4=effective, 5=very effective. The means were in the range of 3.00 to 4.05. "Rating high was the use of consultants or specialists, attending field days, tours, and demonstrations, attending a single or series of meetings on a specific topic, and studying and analyzing a problem on my own" (p. 338). In general, our results were not especially similar, but then our methods, the categories/activities and their number are not especially comparable. If we conflate field days, demonstrations, and (farm) tours, then this is one category for which there was high or moderate-to-high interest according to the results of both studies.

Focus Groups

The focus group discussion was guided by a question sequence or "question route" with three sections, including:

- Part 1. Covered barriers to adoption of Extension recommendations, with emphasis on application rates, record keeping, and the rules for sensitive areas
- Part 2. Covered education topics, methods and formats

Key Findings and Notes

The key findings were chosen from among the themes, comments, and suggestions offered by the participants. They were chosen on the basis of frequency, length or amount of time spent on

them, and "extensiveness" (number of counties and sessions). Participant comments are summarized in Vickery (2002), where the supporting quotes are given for each finding.

Selected key findings and explanatory notes:

- Nutrient Management Plans (NMP): Assistance needed; involve private sector, agricultural professionals
- Those producers with some experience with NMP recognize that it not something they can readily do or would want to do themselves. They know they need assistance or training. In some cases, it is not clear where this assistance will come from. The participants suggest that more private sector agricultural professionals be trained to provide this service.
- Web site as a source of information: important to some, but most farmers are not keen to use

There is quite a range in the level of interest and proficiency when it comes to computers and the Internet. However, most of the participants are not likely to use an Extension Web site very often.

Table 3. *Learning Activity Categories, from Trede and Miller (2000, p. 345)*

Talking with a consultant or specialist	Doing my own research on something new or different
Attending field days, tours, demonstrations	Reading and studying trade publications and technical journals
Attending a single meeting on a specific topic	Using a consulting or marketing service
Attending a series of in-depth meetings on a specific topic	Attending a meeting over the ICN
Studying and analyzing a problem on my own	Listening to radio broadcasts on specific topic
Participating in an educational activity that enhances lifelong learning	Watching a video tape
Experimenting on my own	Attending class sponsored by local high school
Attending a seminar/class sponsored by the Extension Service	Participating in community college credit class
Watching others and learning from them	Participating in credit class at university
Trying out new technologies/practices on my own	Watching a television program
Attending a seminar/class sponsored by an agribusiness firm	Listening to an audio tape on specific topic
Talking with family, friends, neighbors	Reading the newspaper
Reading and studying popular farm publications	Being the first in my neighborhood to try something new

Discussion

It turns out that these key findings concerned the items or formats for which there was the least interest according to the questionnaire results. A likely interpretation here is that even though producers might not personally use, have need for, or prefer a particular service or item, they may

well be able to provide relevant advice and recommendations or convey preferences, either from their own perspectives or from what they know of other producers.

Qualitative and Quantitative Methods in Combination

Introduction

For our study, we used one qualitative and one quantitative method. Some general aspects of relevant comparison of the two approaches are summarized in Table 4.

Table 4. *Comparison of Qualitative and Quantitative Methods*

Aspect of comparison	**Qualitative methods**	**Quantitative methods**
methods of survey	focus group discussions	questionnaire
method of analysis	content analysis	descriptive statistics
point of view	the subject	the investigator
disciplinary paradigm	social sciences	natural sciences
logical reasoning	inductive	deductive
“language”	verbal, soft data	mathematical, hard data

Theoretical Considerations

Much has also been written in the form of comparison and contrast of qualitative and quantitative methodologies, as well as in regard to their use in combination. Although, many or most researchers use strictly one or the other approach, the nature of the two does not have to be treated as a strict dichotomy. As noted by Pedersen (1992, ¶5):

> Observation, interviews, questionnaires and other tools, under the title of research methods, are not necessarily quantitative or qualitative *per se*. Second, any attempt to quantify involves a qualitative judgment, and vice-versa. Qualitative statements imply a certain hierarchy, number and magnitude that give form to meaning.

In an article exploring the paradigmatic underpinnings, limitations, and strengths of each, models of combination, and examples of application, Schulze (2003) describes three models of combination as formulated by Creswell (1994):

- Two-phase model
- Dominant less-dominant model
- Mixed methodology model

Our study is of the last category: both approaches were preplanned, carried out in conjunction, and received approximately equal resources and importance. Schulze takes a bit of a cautionary slant, noting: 1) that some may find problematic the combination of methods that have incongruous theoretical underpinnings; and 2) that mixed methods are best left to those who are

experienced with both methods and fully understand the underlying paradigms. Caution notwithstanding, others feel that the use of both methods can lead to better or more comprehensive understanding and that furthermore, the results of one method can help refine investigations using the other. This last idea, employed purposefully, has been termed "triangulation" (Scandura, 2002).

Combination Approach and the Present Study

Preferred Learning Formats

"Farm tour/demonstrations" was one of the preferred education formats identified by the questionnaire. However, from the focus group discussions, we learned that most participants would probably not attend. Farm tours just ranked high compared with the response choices offered.

Why Producers Do What They Do (or Why don't they follow official recommendations?)

According to our questionnaire results, there were only a few practices for which the survey results predicted that the implementation rate in 2004 would be less than 80 percent:

- Calibrate manure spreaders (74%)
- Follow recommended rates for nitrogen (71%, Non-Attenders)
- Adjust for phosphorous (62%, Non-Attenders)
- Properly manage sensitive areas (75%, Non-Attenders)
- Develop/update manure management plans (70%, Non-Attenders)

For most of these practices, the focus groups provided input on the reasons for relatively low rates of implementation and/or what Extension should do about it. With respect to rates, for example, they expressed doubt about the ability to closely match crop needs, because of the variability in the first- and second-year availability of nutrients. One recommendation was that more on-farm, nutrient rate demonstrations or experiments are needed, especially in parts of the state that are not well represented by Experiment Stations.

Findings Summary

Focus groups and questionnaires are not typically used in combination with the same set of participant-respondents. We found the combination useful in that:

- By beginning with the questionnaire, participants had time to reflect on the questions prior to entering into discussion.
- Since the farmers retained the questionnaires through the course of the session and were allowed to make changes in their responses, the questionnaire results could more accurately portray the participants' practices and preferences.
- The discussion phase helped us to better interpret the questionnaire results.
- By using two methods, we are more confident in the reliability of the results and our interpretation, even though the sample size was relatively small for survey methods.

The first and second points are only logical inferences. We did not try to measure systematically nor characterize anecdotally, the degree to which reflection and amendment took place. Probably more important was that by allowing the participants to retain their questionnaires, there was greater opportunity for the moderator to review the completed instruments on an individual basis

to check for: 1) omissions, errors, and legibility; 2) correctness of interpretation, especially in cases where the respondents provided answers or annotations in their own words.

Summary and Conclusion

Focus groups have become a mainstay of qualitative research in the social sciences. Long used for marketing research in the for-profit sector, this method is now frequently employed in the public and academic sectors, often in the context of social marketing. Surveys, including written questionnaires, are the quintessential quantitative method in the social sciences. The use of the two methods in combination is not common. In the present study, we gave equal emphasis to each method, carrying them out on the same occasion with the same study subjects/participants. We found the combined approach useful, for we were able to be more confident in our conclusions, given the relatively small sample size. However, for each method, the development, administration, compilation, and analysis phases are time-consuming. Thus, investigators must keep in mind the potential value of the outcomes, before deciding to allocate the resources necessary for the combination approach.

Acknowledgements

The work reported here was supported by a contract with the Water Resources Center, University of Minnesota. The author thanks project manager, Leslie Everett, for insightful project guidance and Elaine Andrews for constructive comments on this paper.

References

Atherton, J.S. (2003). *Learning and teaching: Knowles' andragogy: An angle on learning.* Retrieved May 10, 2004, from http://www.dmu.ac.uk/~jamesa/learning/knowlesa.htm

Clark, D. (1999). *A time capsule of training and learning*. Retrieved Sept. 19, 2004, from http://www.nwlink.com/~donclark/hrd/history/andragogy.html

Creswell, J. W. (1994). *Research design: Qualitative & quantitative approaches*. Thousand Oaks, CA: Sage Publications.

Friedman, J. (2002). 1970, Malcolm Knowles publishes The Modern Practice of Adult Education: Andragogy vs. Pedagogy. In D. Schugurensky (Ed.), *History of education: Selected moments of the 20th century*. Retrieved May 28, 2004, from University of Toronto, Department of Adult Education, Community Development and Counseling Psychology, Ontario Institute for Studies in Education Web site: http://fcis.oise.utoronto.ca/~daniel_schugurensky/ assignment1/1970knowles.html

Jarvis, P., Ed. (2001). *Twentieth century thinkers in adult and continuing education* (2nd ed.). Sterling, VA: Stylish Publishing.

Kolb, D. (1999). *The Kolb Learning Style Inventory* (Version 3 [MCB100K]). Boston, MA: Hay Resources Direct.

Krueger, R. A., & Casey, M. A. (2000). *Focus groups: A practical guide for applied research* (3rd ed.). Thousand Oaks, CA: Sage Publications.

Minnesota Pollution Control Agency. (2000). *Minnesota rules: Chapter 7020, animal feedlots*. Retrieved June 2004, from http://www.pca.state.mn.us/hot/feedlots.html

Minnesota Pollution Control Agency. (2003). *2002 feedlot rules: Report to the Legislature.* Retrieved June 2004, from http://www.pca.state.mn.us/publications/reports/lr-feedlot-02.pdf

Pedersen, D. (1992). Qualitative and quantitative: Two styles of viewing the world or two categories of reality? In N. Scrimshaw & G. Gleason (Eds.), *Rapid assessment procedures: Qualitative methodologies for planning and evaluation of health related programmes*. Boston: International Nutrition Foundation for Developing Countries. Retrieved May 29, 2004, from http://www.unu.edu/unupress/food2/UIN08E/uin08e06.htm

Rochester Institute of Technology [RIT]. (2000). Instructor-centered versus learner-centered teaching. In *Some characteristics of learners, with teaching implications.* Retrieved May 29, 2004, from RIT, Online Learning Web site: http://www.rit.edu/~609www/ch/faculty/learner.htm

Scandura, T. A. (2002). *Triangulation: Establishing construct validity through mixed methods.* Retrieved May 29, 2004, from Academy of Management, Research Methods Forum Web site: http://www.aom.pace.edu/rmd/2002forum/editorial.pdf

Schulze, S. (2003). Views on the combination of quantitative and qualitative research approaches [Electronic version]. *Progressio*, *25*(2), 8-20. Retrieved May 29, 2004, from http://www.unisa.ac.za/contents/faculties/service_dept/bld/progressio/docs/schulze.pdf

Smith, R. M. (1982). *Learning how to learn: Applied theory for adults.* New York: Cambridge Book Company.

Trede, L. D., & Miller, K. S. (2000). *Assessing the learning styles of Iowa farmers*. Paper presented at the 27th Annual National Agricultural Education Research Conference. Retrieved June 2004, from http://aaaeonline.ifas.ufl.edu/NAERC/2000/web/g2.pdf

Vickery, J.C. (2002). *Land application of manure: Minnesota livestock producers' practices and educational needs–focus group and questionnaire results* (Project report). Retrieved June 2004 from University of Minnesota, Water Resources Center Web site: http://wrc.coafes.umn.edu/outreach/focus-groups.htm