Outreach That Makes a Difference

Target Audiences for Water Education – A Research Meta-Analysis

Appendix D. Target Audience Matrix Analysis

A study conducted for the National Extension Water Outreach Project.

Based upon work supported by the Cooperative State Research, Education, and Extension Service (CSREES), U.S. Department of Agriculture, under Agreement No. 00-51130-9714, and by the University of Wisconsin Cooperative Extension.

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Supporting Reference	Study Location	Resource Issue	Target Audience	Education/ Outreach Theory	Education Provider	Education Purpose & Behavior Change Method	Type & Quality of Evidence* (research methods)	Concept Comparison	Research Purpose	Measure	Significant Findings	Body of Literature	Search Source
Al-Jamal, Samis, & Ball (2001)	USA: NM	• Water quality • Groundwater contamination	• Farmers	• Diffusion of innovation	NM CES agents	Education • Demonstration	Single program measure of a small, targeted sample of farmers (five technology diffusion (opinion) leaders) using water & soil monitoring and economic analyses R: MODERATE [11.5] A2, B3, C1.5, D2, E1, F2	N/A	• To evaluate BMP demonstration project for nitrate-chloride technique for monitoring Nitrogen loading in the groundwater and irrigation efficiency	• Farmer cropping systems and management practices • Nitrate-Nitrogen concentrations in the soil • Nitrogen load in the ground water • Cl- concentrations in the soil and water • Crop type	• Farmers chose profits over ground water quality. Farmers rejected the adoption of the technology because they felt the costs [in money & time] might outweigh the benefits. Consequently, transfer of the technology to the farmers failed. • The farmers indicated that they would adopt the technology only if forced by a regulatory agency. • Analysis showed that the costs did not outweigh the benefits. • The nitrate-chloride technique for monitoring Nitrogen loading in the groundwater is feasible and can help farmers increase profits while protecting water resources from nitrate-nitrogen pollution. NOTES: • Results are not generalizable due to small sample, but these farmers demonstrated "risk averse" behavior.	Agricultural Engineering	AGRICOLA {c2}
Ashby, Beltrán, Guerrero, & Ramos (1996)	Colombia	• Soil conservation	• Farmers	• Technology transfer/ diffusion of innovation	State Natural Resource Agency (CBC) Extension Agents	Education Capacity Building • Participatory research	Participatory research including evaluation interviews with participating farmers R: MODERATE [13.5] A3, B3, C1.5, D2, E1, F3	(Policy A to policy B) Participatory research vs. credit and technical assistance	• To determine if participatory evaluations by farmers of available technologies identify adjustment to recommended techniques for life contour barriers and increase their adoption	• Adoption of live contour barriers	• Involving farmers in preference ranking for potential conservation techniques and decision making about implementation was a more effective approach than the use of credit or technical assistance to promote use of the soil conservation technique • In the pilot area where participatory evaluations were tested, the number of farmers who establish barriers independent of any credit incentive increased dramatically from two farmers in 1991 to 261 in 1994	Resource conservation (soil & water)	Water Resources Abstracts (WRA) {D237}
Beiswenger, Sturges, & Jones (1991)	USA: WY	• Water	• Teachers (K-12) • Students, K-12	Capacity building Education	Teachers (K-12)	Education • Curriculum development	One-shot mail survey to unidentified sample of Wyoming teachers R: MODERATE [14.5] A1, B(3), C2.5, D4, E2, F2	N/A	• To assess: -teachers' knowledge of water topics -teachers' priorities for including water topics in curricula -incentives needed for teachers to include water topics in curricula	• teacher knowledge of water topic areas • teachers' priorities for including water topics in curricula • what topic areas teachers would be willing drop to accommodate addition of water topics to curricula	• A majority (60%) of teachers reported having average or extensive knowledge of less than half of the topic areas (9 of 22). • Teachers indicated highest level of knowledge regarding the water cycle and the lowest regarding water law (an issue in Wyoming). • Teachers' highest and lowest priorities for including water material in their curricula matched their highest and lowest reported knowledge of the areas. • 60% of the teachers said they would integrate water topics into their current curricula, 30% would not delete any current topics to accommodate added water topics. • 40% of the teachers favored predeveloped materials, hands-on activities, and software specific to grade level as incentives to help them integrate water topics into their curricula	Environmental Education	Elaine

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Berry, Markee, Steward, & Giewat (1996)	USA: AZ, NV, & VT	• Water	• Decision Makers, Local	N/A	N/A	Capacity building	One-shot survey & interviews: R: MODERATE [14.5] A2, B3, C2.5, D4, E1, F2	(Population A to B to C) Commissioners representing urban, rural, & mixed urban & rural counties	• To examine county commissioners' knowledge on water issues and the means through which their knowledge is acquired (Audience analysis)	• Sources of info used • Personal & professional characteristics	• Four elements stand out as influencing the basis for commissioners' water knowledge -a high level of general concern about water issues especially when coupled with direct experience with water issues -the informal designation of an expert commissioner(s) on water issues, -a strong preference for local information sources -the means for filtering "objective" from "biased" information sources.	Water resources	WRA {D227}
Boiarsky, Long, & Zimmerman (1999)	USA: CO	• Pollution prevention	• Business and Industry Water Users (small business)	• Tech transfer & diffusion of innovation • Social marketing • Non-economic social sciences	Colorado State University	Information	Telephone survey of 300 randomly sampled small businesses from 14 standard industrial categories (SICs) R: MODERATE [12.5] A1, B1, C2.5, D4, E2, F2	N/A	• Preproduction formative evaluation to help develop a pollution-prevention campaign targeting small business in the state	• Companies' beliefs about: -pollution prevention -information sources -incentives & barriers to pollution prevention practices • Companies pollution reducing actions over the past year	• A majority of decision makers in small businesses studied could define pollution prevention, could distinguish it from others ways of handling pollution, and had taken preventive actions within the last year • Manufacturers engaged in significantly fewer pollution prevention actions than did retail or service-oriented businesses • Different industries had different responses about whether they wanted more information. Those that had taken more action already believed they needed more information. • The most valuable sources of information for small businesses in CO were frequent contacts with topical expertise. These were primarily suppliers, publications, and other companies. • Cost is the most serious barrier to pollution prevention • Government regulations are also a barrier as businesses perceived them to be hard to understand and comply with; government was not perceived as a good source of information • The most commonly referenced incentives were intrinsic (moral and ethical) motivations, the second most was government subsidies of pollution prevention activities. Profits were not the most important incentive	Environmental Education	TOC browse of last 10 years of The Journal of Environmental Education (November 2002)

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Bosch, Cook, and Fuglie (1995)	USA: NE	• Water quality (ground water-non point source pollution)	• Farmers	• Profit maximization: policies affect the probability of adoption by either influencing a farmer's perception of the value of using the new technology, or by requiring its use and imposing a penalty for noncompliance	USDA Water Quality Initiative: • Water Quality Demonstration projects • Hydrologic Unit Area projects • Water Quality Special project	Capacity Building • Share cost of adoption of practices Information • Provide technical information ?? • Persuasion	Empirical data from USDA 1991 Area Studies Survey and interviews of farm operators using a random sample of fields containing sample points that were weighted to make them representative of the area surveyed. R: STRONG [7.5] A1, B1, C1.5, D2, E1, F1	(Policy A to policy B) Voluntary to Mandatory means for promoting farmer adoption of BMPs	• To determine the relative effectiveness of incentive projects and regulation to promote both adoption of nitrogen (N) testing and the use of information from the tests to adjust N fertilizer use	• Adoption & use of nitrogen (N) testing & N fertilizer use	• While regulation leads to higher levels of adoption of nitrogen testing, it does not have an "educational" effect on adopters. Regulated testing does not lead adopters to using test results as a tool for nitrogen application decisions. • Incentive policies do not appear to have a strong influence on adoption. However, adopters in the USDA project areas made significantly higher use of the information from N tests in making N application decisions compared to adopters outside project areas • USDA project area activities focused on providing technical information, cost-sharing for adoption practices, and persuasion methods. These outreach methods appear to have increased farmer motivation to adopt new technology.	Agricultural Economics	AGRICOLA {c98}
Brody (1995)	USA	• Water	• Teachers	• Principles of youth education	• Teachers • Natural resource managers	Education • Project WET curriculum	Two-round, mail-survey delphi study of recommended and interviewed natural resource agency managers and educators with expert knowledge of natural resource research and management education R: STRONG [9.5] A1, B3, C1.5, D2, E1, F1	Region A to B to C . . . (8 regions of United States) Educators to Natural resource agency managers	• To identify the basic nature and content of a water and water resource curriculum • To identify what K-12 educators, teachers educators, scientists, and natural resource managers believe to be essential content of such a curriculum • To identify regional differences in beliefs • To identify differences in beliefs between educators and content specialists (scientists and natural resource managers).	• What concepts respondents believe should be taught about water • What skills they believe audiences need to understand water and to manage water resources What affects they believe should be considered when learning about water	• The field of water and water resource education requires a body of knowledge that is distinct from that embodied in traditional education programs. Among the most important characteristics of this body of knowledge are interdisciplinarity, relevance and integration of concepts, skills, and affect. • The Delphi study identified 80 criteria for water and water resource education. Research results led to incorporation of these factors into a proposed curriculum framework, Project WET, built on concepts, skills and affect. • There was high consistency in ranking the identified criteria among delphi participants. • There were some regionally correlated difference among the beliefs of delphi participants, the most distinct of these were between participants in the Southwestern US and participants from other regions. • There were differences in criteria ranking between educators and natural resource managers. Closest agreement areas were: water resources are managed, resources exist within a social construct, and people have values toward water and water resources. But educators valued teaching about the physical and chemical qualities of water more than natural resources managers. Educators, more than managers, also valued teaching about other basic water science concepts, the need to study cultural contexts, and techniques for studying water such as effective investigations, selecting and recording information, interpreting results of data collection.	Environmental Education	Academic Search Elite (September 2002)

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Brody (1996)	USA: OR	• Marine natural resources	• Students, K-12	• Principles of youth education	N/A	N/A	Interviews & follow-on interview analysis & concept mapping R: MODERATE [13.5] A1, B3, C2.5, D2, E2, F3	(Knowledge among grade levels)4th-, 8th-, & 11th-grade student knowledge related to marine resources	• To determine what 4th-, 8th-, & 11th-grade students know about Oregon's marine resources	• Knowledge of geological, ecological, physical, & chemical processes and natural resources related to Oregon's marine resources	This study investigated student knowledge of geological, ecological, physical, & chemical processes and natural resources related to Oregon's marine resources. Results indicate that students exhibited an understanding of concepts that correspond to American Association for the Advancement of Science Benchmarks for Scientific Literacy, including: geological structure and process, energy, nutrients, and food webs. But it was clear from the study that student understanding of physical and chemical characteristics, processes and effects did not progress beyond the early grades. (observations not supported by research reported in this article) • Meaningful learning in formal education settings requires that the teacher determine what the learner already knows.• Teachers should continue to: -identify relevant real-world events that can help form the focus of instruction -conceptually analyze science knowledge related to those events	Environmental education	Elaine
Burger & Waishwell (2001)	USA: Savannah River (GA & SC)	• Water quality • Adverse effects from eating contaminated fish	• Ethnic Groups • Recreational Water Users -anglers	N/I	Fish fact sheet provided in person by researchers	Communication: • Fact sheet	One-shot census survey R: STRONG [10.5] A2, B2, C2.5, D2, E1, F1	N/A	• To determine efficacy of fish fact sheet as a method of risk communication	• Msg. obtained from fact sheet • Who should be target audience • Who should be concerned about risk of fish consumption • suggestions for best methods of disseminating information	• Querying people fishing along the river about information on a Fish Fact Sheet on a personal level to identified almost 100% interest in receiving information or sharing the information with others. • The majority of people obtained at least one correct message from the Fish Fact Sheet. • Audiences had different content interests. Blacks were interested in health risk levels from contaminated fish and wanted to know where to get more fact sheets. Whites were interested in the level of contamination in the fish.	Environmental research	PA {K34}
Caffey & Kazmierczak (1994)	USA: LA	• Water quality	• Aquaculture	• Tech transfer & Diffusion of innovation	Extension agents	N/A	Multi-dimensional logit modeling of data obtained through personal, structured interviews R: STRONG [10.5] A2, B3, C1.5, D2, E1, F1	(Technology A to B to C) Predicted vs. actual adoption of technology	• To identify factors that influence the adoption of technology in aquaculture production systems.	• Decision to adopt a certain level of technology for soft-shell crab production	• Decisions to adopt particular technologies were related to structural factors (larger producers; producers whose labor was family; producers with increased management skills). • No significant relationship found between adoption and information provided by university or Extension, which is not surprising given long time since the conduct of the last formal education programs. • Lack of formal information use suggests that university research and Extension may be able to enhance the adoption of more water-quality-friendly technologies with development and conduct of focused education programs • Effectiveness of new educational programs may be hindered by insular nature of communities in which most producers live.	Agriculture and applied economics	AGRICOLA {f383}

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Cameron-Howell (1992)	USA: SD	• Water quality • Soil conservation	• Farmers	• Communication • Education - practice • Diffusion of innovation	• Soil Conservation Service now Natural Resource Conservation Service • Cooperative Extension Services	Capacity Building • Cost share • Technical assistance Communication • Agency contacts • Farm visits Information • Media coverage	Post intervention survey sent to census of operators with RCWP water quality plan from 1982 to 1990. R: STRONG [8.5] A2, B2, C1.5, D1, E1, F1	(Before & after intervention) Farmers' use of BMPs before & after implementation of RCWP	• To assess the influence of the Rural Clean Water Program (RCWP) Project on Farming practices within and around the Oakwood Lakes/Poinsett area	• Adoption of BMPs	• Using agency contacts, media coverage, and farm visits, the SCS influenced and educated participating farmers to permanently change tillage practices • 65% of farmers adopted conservation tillage as a result of their experience in the program • Cash incentives were a primary reason why farmers chose to participate in the conservation tillage implementation program • Increases in one-on-one contact with farmers correlated with increases in program participation	Symposium Proceedings	AGRICOLA {e90}
Chaloupka & George (2002) (U.S. EPA)	USA: CA	• Water quality • Nonpoint source pollution	• Farmers (ranchers)	N/I	• Extension agents • California Cattlemen's Assoc.	Education • short course	Evaluation R: WEAK [15.5] A2, B2, C2.5, D4, E2, F3	N/A	• To evaluate workshops (summative evaluation)	• Number of ranchers enrolled in workshops • Number of completed rangeland water quality management plans	N/A to BEPs	Government agency report	AGRICOLA {I38}
Cobourn & Donaldson (1997)	USA: NV	• Water quality• Soil conservation	• Landowners (owners of small, non-commercial suburban ranches) • Farmers	• Education	• Extension educators (University of Nevada Cooperative Extension)• The Washoe-Storey Conservation District• NRCS USGS• Program volunteers	Education • Workshops Communication • Home visits Capacity Building • Hands-on work partiesInformation • Newsletters and publications • On-farm demonstrations	Pretest and post-test with no control (but no data provided, the author did not do a good job of reporting the research) R: MODERATE [14.5] A2, B2, C1.5, D4, E2, F3	(Before & after intervention)Knowledge gained over two years of program	• To develop and test methods for reaching new target audience	• Change in knowledge of small ranch BMPs• Documented changes in behavior	• Documented behavior change on 76 properties. Success stemmed from the following factors: -close collaboration between members of the inter-agency coalition group, which helped extension understand the needs and idiosyncrasies of the new audience -studied local audience with interviews; tried to identify topics of interest -engaged property owners in planning -focused on meeting rancher needs — good for water quality as well as for animal health and appearance, value of property -used an array of teaching methods, including workshops, classes, individual home visits, and numerous printed materials -kept audience interested, motivated, and encouraged through day-to-day assistance and feedback from education coordinator	Extension	ERIC {E42}

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Constance, Rikoon, & Ma (1996)	USA: MO	• Water quality	• Landowners (Landlords of rented cropland) • Farmers	• Social Marketing	N/A	information to help characterize relevant target audience	One-shot interviews & mail-survey R: STRONG [9.5] A1, B1 & B3, C3.5, D2, E1, F1	(Population A to Population B) Local to Absentee landlord participation in pesticide management decisions	• To investigate landlord participation related to responding to environmental issues on rented cropland	• Level of responsibility in the selection of pesticides for use on cropland	• Landlords do not have much control over their land. • Local and absentee landlords are equally involved in organization and management of their rented cropland • Social ties are important predictors of involvement in environmental decision making for local landlords but not for absentee landlords • Economic factors is a more important predictors of increased participation for both local and absentee landlords • Perceptions of environmental risk are not significant explicators of increased landlord involvement.	Rural Sociology	AGRICOLA {e46}
Contant & Young (1990)	USA: IA	• Water quality	• Farmers	N/I	• ISA Extension • Farming organizations	Information • field demonstrations	Program Evaluation based on: -stratified random sample of 'neighbors' -census of 'cooperators' R: MODERATE [11.5] A1, B1 & B2, C2.5, D4, E1, F2	(Cohort A to B) 'cooperating' farmers to 'neighboring' farmers	• To establish pretest baseline for study of Integrated Farm Management (IFM) Demonstration Program (long-term) • To measure farmers' use of information sources to inform modifications to on-going program information dissemination (near term)	• Value of information sources • Baseline data on: -farm operations -attitudes regarding: • water quality • use of ag chemicals	• Farmers expressed strong concerns about quality of rural drinking water supplies and want groundwater to be protected. They are particularly concerned about the risks of handling and application. • More than nine of ten respondents wanted to reduce use of ag chemical use. Many reported reluctance to change practices out of concern that such change will result in losses in profit. • Sources of information — depends on the issue, but self and sales dealers rated the highest • Reliability of information — self, Extension, SCS • The qualities of information most valued by farmers: tell of risks; are: -easy to understand, -from a trusted source, -scientifically valid, -balanced, (gives both sides on an issue), -up-to-date, -directly applicable, -consistent with beliefs • Analyses suggest that process of providing information to farmers occurs in three stages. These are: -information to stimulate farmer interest; target message to particular farmers through preferred source -have contact with farmer to provide new farming practices that are viewed as solutions to their problems -providers work collaboratively and cooperatively with the farmer in the adoption of new practices -target message to particular farmers through preferred source.	Extension report	AGRICOLA {c139}

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Cooper, Giebink, & Olson (1995)	USA: MN	• Water quality	• Farmers • Agribusiness dealers • Crop consultants • Gov't agency professionals • Homeowners	• Technology transfer	Minnesota Extension Service Agents	Capacity Building • Project-assisted integrated pest management (IPM) field scoutingCommunication -Irrigation hot line toll-free phone service for producers needing daily climatic information in order to implement more efficient irrigation water application methods • Conference • Tours • Field days Education • On-farm demonstrations of best management practices (BMPs) • Two-hour septic operation and maintenance class • Workshops	Post intervention evaluation of agricultural practices Post intervention evaluation of audience satisfaction Post intervention self reported changes in homeowner water and septic system use R: MODERATE [13.5] A1, B2, C2.5, D4, E2, F2	(Before & after intervention)	Report on outcomes for extensive outreach initiatives with a variety of audiences in the Anoka Sand Plain, MN using audience specific outreach techniques• To review progress and effectiveness of two projects design to protect water quality in the Anoka Sand Plain	• Reductions in the use of nitrogen and Atrazine use on enrolled fields within the project area• Audience self-reported behavior changes	• Over a three year period (1992-1994) nitrogen was reduced an average of 27 lbs/acre• Atrazine use was cut by 1/3 in 1993 • Home owners reported taking specific actions to improve management and maintenance of their septic systems, reduced their water use, and their use of home cleaning polluting products	Conference proceedings	AGRICOLA {c90}
Curtis & DeLacy (1995)	Australia: Victoria	• Natural resource conservation	• Landowners • Env/consv NGO's • Land care groups	Partnership between government and local communities; emphasis on grass roots approach	Government department of conservation and natural resources	Evaluation Assessment of impact of land care groups	Literature review summary Group response to specific indicators identified through previous studies via a reporting process LR & R: MODERATE [13.5] A2, B2, C2.5, D4, E2, F1	N/A	• To evaluate landcare group activity	Indicators: • The extent to which groups had mobilized community action likely to increase awareness, develop a stewardship ethic, or develop land management skills and knowledge • Construction of an index of group effectiveness and community cooperation -- Number of work activities undertaken -- Number of group activities undertaken	Mobilizing community cooperation: • High participation of membership and additional people assisting or studying landcare work (89% groups had visitors assisting; 93% of groups had visitors studying or observing; 58% of members participated in group activities; 55% of properties were members of a group) • Majority of groups had an outreach program that included: newsletters, promotional activities, displays, tours, books/kits, junior landcare programs • Groups received external assistance from non governmental sources such as business (43% of groups), farm groups (30% of groups), conservation groups (28% of groups), education groups (25% of groups) *More than 70% had conducted two or more of the following activities: -- 53% of groups prepared a "whole catchment plan" -- 50% of groups established demonstration sites -- 62% of groups conducted field days *33% of groups had not established annual priorities *There was a positive correlation between group promotional activities and work undertaken	Soil & water conservation	Agris {k349}

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											Work undertaken: • Positive correlations of group involvement and actions were recorded for the following activities: -- Tree planting and fencing (e.g. groups planted 3.2 million trees; erected 7.7 thousand km of fencing in 1992-93) -- perennial pasture improvement -- Specific land degradation problems -- Whole-farm planning -- Conservation cropping -- Government funding of landcare groups -- Success with participation of women -- Group leadership and performance (low burnout and successful turnover) -- Affirmation of agency-group relationship (e.g. 70% of groups indicated that agency contact officers regularly attended group activities; 59% indicated that contact officers played an important role in group decision making; 92% reported that contact officers showed respect for knowledge and skills of members; 98% that land management information was adequate; 82% reported that assistance with group management was adequate. However 45% reported that government assistance in money and materials was inadequate; 49% reported inadequate government assistance with leadership and organizational skills training) • Working with groups is an effective approach to extension • Most of the volunteer groups assisted the move towards more sustainable land use • The strength of agency-group relationship is fundamental to land care • Agency staff must acknowledge the uncertainties associated with best-bet practices they promote and tap into the indigenous knowledge of local landcares in participative approaches to research and extension.		
Davis & Clatterbuck (2003)	USA: TN	• Water quality	• Loggers	N/A	N/I	Education • N/I	• Comparing intervention and control groups from stratified random sample R: STRONG [8.5] A2, B1, C2.5, D1, E1, F1	(Practices of Cohort A to Cohort B) Logging practices of loggers certified by TN Master Loggers Program (TMLP) and practices of loggers who are not certified (control).	• To determine the effectiveness of the Tennessee Master Logger Program (TMLP) in 1997-1998.	• Post-logging conditions of: -haul roads -skid trails -log decks -streamside management zones (SMZs) in areas of completed logging jobs on non-industrial private forest land	Logger education may impact the degree of BMP implementation during logging operations. • "Master" loggers logging on private lands achieved significantly higher implementation of BMPs than non-trained loggers. • Crew type and size and affiliation with the forest industry may have also affected ability to implement BMPs due to the costs of equipment or practices • All loggers scored poorly in stream protection BMPs suggesting a need for improved education in this area or better attention to barriers to accomplishing recommended goals.	Applied forestry (resource management)	AGRICOLA {f8}

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de Bruijn & Hofman (2000)	Netherlands	• Pollution prevention	• Business and Industry Water Users	Communication Capacity building	partnership networks	Capacity building • Partnerships and collaboration between companies and trade associations, municipalities, or both.	Evaluation studies comparing multiple cases through literature reviews; face-to-face, semi-structured interviews; written material from companies; conversations with consulting agencies and other research groups that implemented projects R: MODERATE [12.5] A2, B3, C2.5, D2, E1, F2	(Method A to B)PRISMA (project for success in pollution prevention in industry) method of engaged effort to assess pollution prevention needs to 'quick-scan' method	• To identify the factors that contribute to successful pollution prevention by small & medium-sized enterprises • To make recommendations on how to improve partnership networks and the effectiveness of various partners within the networks.	• Change in environmental management from before to after pollution prevention project	• Pollution prevention assessment methods have shifted from internal projects to quick-scan methods conducted by external partners • The amount of time invested by a company is positively correlated to the quality of options produced. • Most companies indicated a positive relationship between knowledge and pollution prevention. • A majority of companies followed up on the results of the external assessment, but most did not use the assessment method again. • Trade associations were the most important sources of information. Suppliers were second most important. • Partners --Trade associations were most preferred; municipalities were second • Requirement that pollution prevention analysis be implemented before a permit is issued has been less productive in terms of cost, etc. than other methods. • Little engagement by companies involved in quick-scan methods, but this method may be effective in arousal of interest	green business management	
Dietz, Clausen, Warner, & Filchak (2002)	USA: CT	• Watershed • Water quality	• Homeowners • Neighborhood Residents • Project volunteers (community members)	N/I	• UConn, Depts. of: -- Cooperative Extension -- Plant Science -- Natural Resource Mgmt & Engineering • Project volunteers (community members)	Capacity Building • Site assessment • Recommendations by trained volunteer	Pretreatment & post-treatment with control R: STRONG [8.5] A2, B2, C1.5, D1, E1, F1	(Practice A to control) Education programs vs. control	• To determine if the quality of runoff from a suburban neighborhood would improve as a result of educating homeowners about residential BMP	• Change in quality of storm water runoff • Change in resident behavior	• Volunteer lead site assessments did not lead to a significant behavior change as compared to control • The concentration of nitrogen significantly (p=0.001) decreased by 60% in the treatment watershed following education; apparently as a result of the few people who did change NOTE: Volunteer assessment and communication skills were not tested.	Extension	Kadi Row at UWEX via Elaine Andrews AGRICOLA {c1}

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Dijksterhuis (1996)	Caribbean: Jamaica, Barbados, Saint Vincent and the Grenadines, Trinidad and Tobago, Saint Lucia, Dominica	• Sustainable use of coastal resources	• Teachers (K-12) • Community groups • Students, K-12 • Youth clubs • Business and Industry Water Users • Recreational Water Users • Farmers • Women	N/I	N/I	Education • workshops • seminars • teacher training programs • environmental programs • national forums • sustainable development centers • comprehensive environmental education programs	One-shot mail survey of a small targeted sample R: MODERATE [12.5] A2, B3, C2.5, D2, E2, F1	N/A	• To assess the extent and nature of environmental education used to develop awareness of sustainable development of costal ecosystems and resources and to prevent their damage. • To evaluate the success of environmental education in achieving the above stated objective. • To assess the potential for developing the environmental education provided.	• Qualitative changes in the environment • Improvements in resource management • Changes in number of animal and plant species • Changes in number of visitors to resource sites • Changes in economic performance • Changes in the affect of tourism • Changes in media coverage of environmental issues • Changes in student scores on environmental tests • Changes in teacher knowledge • Changes in teacher attitudes • Changes in teacher practices	Findings were descriptive only: • Environmental education was most commonly used to educate broader groups - economic users received les attention even though they depend on the coastal zone for their livelihood and can be main generators of coastal ecosystem damage Note the author's recommendations for documentation: "Documentation and publication of educational work, including the outcome and evaluation of specific projects and programs, are important (British Council, 1993a). . . . This will help providers of environmental education to exchange knowledge and establish a database of the work that is being done, as well as to share their experiences with different approaches and methods. It also will provide a knowledge base and source of educational materials, so that not every organization will be forced to develop its own materials. . . . (p. 349) "An evaluation component needs to be included in every environmental education project or program. The objectives must be clearly defined and the means for measuring achievement of objectives decided in advance . . . By monitoring the results that are achieved, educational strategies can be adjusted regularly, which also will lead to improvement in methods of environmental education. (p. 351)	Coastal management	ASFA {i206}
Dow & Loomis (2002) (U.S. EPA)	USA: RI	• Water quality • Nonpoint source pollution	• Homeowners • Wastewater management professionals	N/I	URI on-site wastewater training center personnel	Information • demonstration projects • demonstration systems Education • licensing program course	N/A	N/A	N/A	N/A	N/A	Government agency report	AGRICOLA {I38}
Dresner (1989/90)	USA: CA	• Energy conservation	• Students, Higher Education	• Tech transfer & Diffusion of innovation • Principles of education	college/university professor	Education • simulation game	Pretest & posttest with control of what author uses as generalizable sample, but I view as a census R: STRONG [9.5] A2, B2, C1.5, D2, E1, F1	(method A to B) Simulation exercise to class lecture	• To explore factors that motivate an individual to act in a local context on energy conservation and renewable energy planning.	• Social influence among participants • Perceived political efficacy • Likelihood of action	• Game participants preferred options that benefited the group • Participation in the simulation influenced students' intention to get involved and to take action. • Participants in the simulation changed preferences for energy options, whereas students in the lecture group who received the same factual information did not. • Students' perception of political efficacy was significantly correlated to participation in the simulation game. (NOTE: "perception of political efficacy" is reviewer's translation of "interest in perceived political efficacy.")	Environmental Education	Table of Contents browse of last 10 years of The Journal of Environmental Education (November 2002)

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Duram & Brown (1999)	USA: 26 states concentrated in Midwest	• Water quality • Water quantity (watershed management)	• Gov't agency professionals • Landowners • Agricultural producers • Recreational Water Users • Env./ conservation NGOs • Business and Industry Water Users • Specific ethnic groups (tribes) • Developers (partnerships)	• Citizen participation/ community involvement	• Watershed project managers	Information • newsletters • pamphlets • videos Communication • door-to-door contact • surveys • information Programs • public Meetings	One-shot mail survey of 126 federally funded watershed planning initiatives R: MODERATE [14.5] A1, B3, C3.5, D4, E2, F1	• Success to failure • One-way communication (information) to two-way communication (communication)	• To investigate resource managers' perceptions of the effectiveness of public participation in federally support watershed planning initiatives	• Information and communication methods used by stakeholders • Perceived effectiveness of information and communication methods	• Two-way communication methods were deemed to be more successful in soliciting participation than one-way communication (information) methods, particularly door-to-door contact. • 58% respondents were employed by a government agency and most commonly worked in agriculture • Partnerships were commonly initiated to address goals; 65% were established by federal, state, or local government • 75% of watersheds used newsletters, public meetings and informational programs. Newsletters, meetings and door-to-door contact were seen as most effective. • Most important issues to respondents: stakeholder awareness, agriculture land use, interaction between local interests and state and federal agencies • Perceived effect of public participation -- best use to reach plan goals (62%); other good uses include arriving at consensus on a formal plan, legitimacy of final plan, organizing capacity of local committee • Perceived effect of watershed based planning -- public awareness and interagency coordination (88%); data availability; legitimacy of final plan; reaching community consensus; data dissemination	society and natural resources	ASE simple keyword search {1,2,3,4,&5} in full text
Dwyer, Lemming, Cobern, Porter, & Jackson (1993)	USA & Australia	• Water conservation at home • Energy conservation at home & office • Reduced gasoline consumption • Use of public transportation • Car pooling & ride sharing • Recycling • Reducing Litter	• Households • Homeowners • Recreational Water Users • Students, K-12 • Students, Higher Education	• Non-economic social science (e.g. behavior analyses & change)	Multiple • Researchers • Tour guides • Political leaders Home energy auditors	Information • videotaped modeling of home energy use • meetings • mass-media techniques • television campaign Education -workshops	Literature review of behavior change research LR: STRONG [8.3]† (A1&2, B1&2, C1&1.5, D1&2, E1, F1&2) † We estimated the strength score by summing the averages of ratings gleaned from descriptions of the reviewed studies	Different behavioral intervention techniques grouped as: • Antecedent Interventions • Consequence Interventions	• To integrate and evaluate environmental-behavior-change research published in the 1990s	Multiple studies, multiple measures	• Much of the research was not designed to allow meaningful comparisons of intervention strategies • Few studies measured interventions over meaningful time periods • Some intervention strategies identified in the study taxonomy of behavior-change techniques were largely ignored in the reviewed literature • Commitment, modeling (and demonstration), and goal-setting (and prompts) strategies (specific antecedent conditions) showed promise for use as instigators of environmentally responsible behavior • Most of the consequence-condition interventions (feedback, reward/incentives, penalties) were notably beneficial over the short run of interventions, but, in studies that continued measuring behavior after terminating the study interventions, the desired behaviors did not persist. Feedback was particularly effective. • None of the successful techniques were always successful • Environmentally Responsible Behaviors was more often successfully achieved when more than one intervention was applied to the situation	Environmental behavior	ASE simple keyword search

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Egemen, Edwards, & Nirmalakhandan (1998)	USA	• Water quality	• Students, Higher Education	• Principles of adult education	college/university professor	Education • computer simulation models	N/A	N/A	N/A(presents case for adopting computer simulation models as an education tool)	N/A	• Case study exploring the use of a wastewater treatment plant simulation with engineering students • Stresses problem-based learning, peer teaching, and emphasis on critical thinking. • Open-ended problems have more than one solution.	Water technology	WRA {A7}
Fackler (2003)	USA: KY	• Water quality	• Teachers	N/I	• County Extension professionals • Other program partners	Education • one-week professional development workshop	Pretest, posttest, & long-term posttest using census of workshop participants R: MODERATE [12] A2, B2, C1, D4, E2, F1	(post-intervention to before) • Participant confidence after workshop to confidence before	• To test the change in teachers' level of confidence in and long-term use of program topics and field-based investigations.	• Changes in teacher confidence ratings for: -use of program technologies -use of instructional strategies -use of field-based investigations -ability to teach program topics • Change between teachers' pretest and long-term posttest use of: -field-based investigations -teaching of program topics	• Teachers participating in the workshop reported sustained increases in their: -use of field-based investigation techniques -ability to teach program topics • Teachers participating in the workshop reported that they continued to use newly introduced technologies at high rates.	Conference proceedings	Elaine
Feather & Amacher (1994)	USA: CA, FL, MD, MN, NC, NE, TX, WI	• Water quality • Farm profitability	• Farmers	• Economic uncertainty	USDA	Education • Demonstration projects	Survey of producer BMP adoption behavior R: MODERATE [13] A2, B(3), C3, D3, E1, F1	(Population A to Population B) Farmers aware of demonstration projects, demonstrated BMPS, or both to Farmers not aware of demonstration projects, demonstrated BMPS, or both	• To investigate the role of information in influencing the adopting of improved farm management practices	• Adoption of demonstrated BMPs	• The knowledge of the demonstration project program has a significantly positive influence on BMP adoption rates • The success of information programs depends on improved practices being economically appealing as well as environmentally sound • Producers in different regions respond differently to information about the benefits of BMPs. Care must be taken on designing an efficient incentive program that accounts for these regional differences in water quality problems and crop production particulars. p.169	Agricultural Economics	AGRICOLA {c109}

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Fedler (2001)"An Examination of . . ."	USA	• Water resources	• Recreational Water Users • Teachers	Environmental Education	• Aquatic educators • Education service providers • Gov't agency professionals • Education brokers	Various	LR: STRONG [10] † A1&2,‡ B1,‡ C3.5, D2, E1, F1 † Score based on assumptions described in the note below. If we assume the use of small samples and nonrandom sampling, the overall rating would be MODERATE with a score of [13]. ‡Level assumed based on the quality of the study-evaluation categories D, E, & F described in the review.	• Involvement in outdoor recreation to Environmental concern	• To define the meaning of stewardship • To find ways to instill or increase the ethic of stewardship • To determine the state of knowledge about ethics-based aquatic stewardship education • To identify effective education programs for replication • To design new programs to meet stewardship education needs	• Involvement in outdoor recreation • Environmental concern	• Reviewed studies were inconclusive in their efforts to establish a relationship between outdoor recreation participation and environmental stewardship. • In several studies, involvement was one of the least efficient predictors of environmental concern. Individual characteristics were often more correlated to expressions of environmental concern. • Socio-economic characteristics of participants was a better predictor of participation in outdoor activities than the level of resource utilization • The association between outdoor recreation and concern for protecting aspects of the environmental necessary for pursuing such activities is somewhat stronger than the association between outdoor recreation and other general environmental issues; individual characteristics account for most of the variation in pro-environmental behavior, however. • Effects of age, education, gender, and income were discounted as having an effect on the relationship between participation and environmental and recreational attitudes by many studies • Engaging in environmental behaviors is a better predictor of likelihood of engaging in outreach recreation than is attitude • In general, studies of the attitudes of all kinds of outdoor recreation participants were inconclusive and generally not helpful in understanding the relationship between outdoor recreation participation and environmental stewardship Social factors that influence the choice of activity and the interpretation given the recreational experience are important variables to predicting the relationship between recreational behaviors and environmental concern • "Recreational specialization" or the "social world" sphere of interest and involvement of the recreational participant is a meaningful way to describe a hierarchy of recreational behavior • There is a strong correlation between the level of specialization of anglers and support for natural resource management and other environmental behaviors. More specialized anglers (such as fishing club members) are more supportive than general anglers. And once an individual becomes involved in fishing (measured by purchase of a license a strong tie to aquatic resources develops and persists even when participation wanes. • Studies of non anglers indicate: -- Greater confusion about what is good or bad about the environment than ex-anglers, inactive anglers, and active anglers -- Non anglers believe that technology would be able to solve environmental problems -- Felt more helpless in dealing with water quality problems	Foundation report	Elaine

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											• Active anglers express greater concern for environmental conditions than non anglers, ex-anglers, and inactive anglers. • Recommendations for future research (1) Clearly identify goals and objectives for aquatic and environmental stewardship programs that include changing attitudes, values, and behaviors (2) Conduct basic research to develop valid and reliable indicators of program and curriculum influences on attitudes, values, and perceived stewardship responsibilities, behavioral intentions, and behaviors. (3) Study the relationship of attitudes and values to environmental behaviors to help answer questions like: -- Under what circumstances can attitudes and values that lead to aquatic stewardship be changed? -- Are these circumstances uniform for different populations? (4) Identify long-term stewardship programs that: address entry-level, ownership-level, and empowerment-level variables; include social support and apprenticeship experiences for learners; and integrate these variables into formal and nonformal learning situations. (5) Create longitudinal experimental studies to track changes in environmental attitudes and behaviors over time for cohorts of program participants and non-participants.		

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Fedler (2001) "Fishing, Boating and Aquatic . . " in Defining Best Practices . . .	USA	• Water resources	• Recreational Water Users Environmental educators • Outdoor recreation educators	Education Communication	Various	boating, fishing and stewardship education	• Collected recommendations of educational experts for best education practices that would affect change in aquatic resource and environmental knowledge, attitudes, and behaviors. The recommendations were supported with scientific research, peer recommendations, and practical experience. • Conducted workshop with experts and professional boating, fishing, and aquatic education administrators and practitioners to reach consensus on basic principles and best practices based on experts' recommendations and groups' collective practical experience R: WEAK [17.5] A2, B3, C3.5, D4, E2, F3	N/A	• To identify best practices for education programs that attain the skills, knowledge, attitudes and behavioral goals that environmental and outdoor recreation educators' seek to reach. • To empower these educators to offer the guidelines as evidence to decision makers, administrators, and the public that best education practices exist that the educators are accountable to use.	modified Delphi technique	• Guiding principles for boating, fishing, and aquatic 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. • Study also provides Best Practice recommendations for: program development and implementation, professional development for teachers/youth leaders, and program evaluation.	Foundation report	Elaine
Fleming (2003)	USA: NM	• Water quality • Watershed health	• Students, K-12	N/I	• Water resource professionals	Education • workshops	Pretest & posttest surveys of unspecified census or sample (seems to be census) R: MODERATE [11.5] A2, B2, C1.5, D2, E2, F2	N/A	• To evaluate an example watershed monitoring program	Summary of literature reported by others • Change in student knowledge over the course of the school year	No author specific research findings • Encourages: -water monitoring as a hands-on project for students -use of monitoring as an inter-disciplinary approach to watershed planning (land impacts on water quality) -development of scientifically credible field methodologies	Environmental Education	Elaine

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Force & Bills (1989)	USA: NY	• Water quality • Soil quality	• Landowners (owners of cropland)	• Social Marketing	N/A	information to help characterize relevant target audience	Survey questionnaire of random sample and census R: STRONG [8.5] A1, B1 & B2, C2.5, D1, E1, F1	(Population A to B to C) Program enrolled farmers to program enrolled nonfarmers to farmers not enrolled in the program	• To clarify factors that influence program (Conservation Reserve Program (CRP)) enrollment decisions (Audience analysis)	• CRP enrollment	Very few studies address land tenure issues. Most look at operator issues. • Focused on identifying characteristics of on-farm and off-farm landowners that could influence interest in conservation Reserve Program enrollment • Outreach efforts should focus on opportunity costs, which are relevant to both off-farm and on-farm owners • Concepts that influence off-farm owners: USDA estimates of cropland erosion; benefits of cropland preservation; think erosion is a serious problem; think chemicals can cause problems • Concepts that influence on-farm owners: potential interests differ depending on how cropland is used; target large land holdings, acreages eligible for price support; low opportunity cost Relate to the piece above about landowners of rented cropland by Constance, Rikoon & Ma (1996).	Soil & water conservation	Agris {K487}
Fortner & Corney (2002)	USA: Great Lakes Region	• Water	• Teachers (K-12)	Education	N/I	Education • Workshops	One-shot mail survey of stratified, random sample of teachers in seven Great-Lakes regions R: STRONG [8.5] A1, B1, C2.5, D2, E1, F1	• Workshop participants to nonparticipants • Region A to B to C . . . . to G • Early to late responders	• To establish a baseline assessment of teachers': -priorities for Great Lakes topics -knowledge of the topics -current level of teaching on topics -preference for format of training and materials on regional topics	• Importance of teaching topic • Teacher knowledge of topic • Extent of current teaching on the topic	• Related to priorities for teaching about Great Lakes topics, there were few notable differences among responses of comparison groups so data was analyzed and generalized to common population • Environmental responsibility was rated as very important for students to learn by 72.1% of respondents. The water cycle, water use and conservation, air pollution, and water quality rounded out the top five topics for students to learn • The water cycle, environmental responsibility, water uses and conservation, aquatic food webs, and water quality were the five topics best understood by teachers with 80% or more respondents considering themselves knowledgeable or very knowledgeable about each • Only the water cycle and environmental responsibility were reported as taught 'somewhat' or 'thoroughly' by at least two thirds of the respondents. Five others were taught at these levels by at least 50% of the respondents. Fifteen of the twenty-two topics listed in the survey were not taught at all or merely introduced by at least 50% of the respondents • Topics that were taught the least were taught less either because they were not already part of the curriculum or because the teacher lacked knowledge about the topic, or both. • Teachers reported the greatest difference between topic importance and their knowledge of the topic for toxic chemicals, water quality, environmental responsibility, and air pollution. The greatest difference between importance and thorough teaching was reported for environmental responsibility, water quality, toxic chemicals, water uses and conservation, and air pollution.	Regional Research	Elaine

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Fortner & Lahm (1990)	USA: OH	• Estuary protection & preservation	• Students, K-12	Education	• Teachers (K-12) • Visitor center and sanctuary staff	Education • In-school slide presentation • In-school study packet • Field trip to visitor center • Estuary hike	Pretest & posttest with control (do not describe procedures for selecting samples of fourth- and fifth-grade students) R: STRONG [8.5] A1, B(3), C1.5, D1, E1, F1	• Factual knowledge • Conceptual knowledge • Attitudes	• To test if treatment program increases students' knowledge of ecosystem reserve and to improve the attitudes that participating students hold about the estuary reserve	• Knowledge change over period of program implementation • Attitude changes over period of program implementation	• Knowledge about the estuary increased with each part of the program. Students exhibited greatest gain in learning facts rather than concepts. • Knowledge increase was greatest after the in-school program and before the estuary field trip but continued throughout the program. Knowledge gains were reported after the estuary visit as well. • The research showed significant improvements in attitudes towards the estuary between pretest and post visit, but not between pretest and previsit or between previsit and postvisit. The significant gains occurred as a result of the total program rather than any one piece of it. • The research showed moderate and positive association between knowledge and attitudes. • Researchers postulate that "cueing" of attention is simpler in a classroom than on a field trip where novel surroundings interfere with focus. Worksheets for on-site cueing can help, but can also reduce motivation.	Environmental Education	Elaine
Fortner & Mayer (1991)	USA: OH	• Oceans • Great Lakes	• Students, K-12	Education	Teachers (K-12)	N/A (research was not directed to specific interventions)	Longitudinal study with control using stratified random sample of schools & classrooms R: STRONG [8.5] A1, B1, C1.5, D1, E2, F2	• Time (t)1 to t2 to t3 • Fifth graders to ninth graders	• To assess changes in Ohio's in-class marine and aquatic education efforts	• Attitude • General knowledge • Most important source of information or instruction for teaching them about oceans and the Great Lakes	• Within-grade general knowledge scores increased slightly over time, but limited rise is an indication of little progress in increasing general awareness of water over test period. • Scores on content specific to Oceanic Education Activities for Great Lakes Schools (OEAGLS) increased, but only one-third of the questions were answered correctly. • Attitudes of ninth graders were consistently more positive about oceans and less about Great Lakes than fifth graders. Ninth-grader attitudes about Lake Erie were slightly negative by the end of the study. Their attitudes toward oceans were still positive, but declining. • Importance of influential sources for teaching about oceans and Great Lakes changed over time from greater importance of movies and TV at t1 to greater importance of selected classes in school, newspapers, and public aquaria displays at t2 and t3. NOTE: Knowledge level increases still resulted in low % mastery. Were missed knowledge areas relevant or actually important?	Environmental Education	Elaine
Gamon, Roe, & Campbell (1994)	USA: IA	• Water quality	• Households	• Information	Extension educators	Information • videotapes	One-shot telephone survey R: MODERATE [13.5] A2, B1, C2.5, D4, E2, F2	N/A	• To find out if informational videotapes were being used	• Number of times six-tape water quality video series was: -promoted -distributed	• County offices differed in their use & promotion of water-quality videotapes. In particular, the attitudes of office assistants responsible for directing citizens to sources of information in answer to their questions were influential in their use. • Tapes were most used by higher educated/high income residents.	Applied communications	AGRICOLA {c108}

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Gerakis (1998)	USA: MI	• Water quality (groundwater)	• Gov't agency professionals (soil conservation agencies)	• Program evaluation (summative)	N/I	Education • Workshop	Program Evaluation (pretest/post-test design with control) R: STRONG [8.5] A2, B2, C1.5, D1, E1, F1	(Intervention Population to Control) Change in knowledge & attitudes with training to changes without training	• To evaluate workshops (summative evaluation)	• Changes in knowledge and attitudes	• Participants learned in only one of three workshops • Testing the audience at the beginning of the workshop enhances subsequent learning in groundwater education workshops • Training did not change attitudes towards groundwater conservation	Environmental Education	WRA {D185} ASE {srch 1,2,& 4}
Giannotti & Rozum (2002) (U.S. EPA)	USA: CT	• Water quality • Nonpoint source pollution	• Decision Makers, Local	N/I	• Extension agents	Education • workshop presentations • publications • Web-based services	N/I	N/A	N/I	• Areas of open space protected • Forest stewardship plans developed • Site plan changes to: -reduce amount of impervious surfaces -control of nonpoint source pollution • Complete natural resources inventory	• After eight years of program activity, municipalities are giving greater consideration to water quality in their land-use planning and regulatory programs than in the past	Government agency report	AGRICOLA {I38}
Grudens-Schuck (2000)	Canada: ON	• Ecosystem health	• Farmers	• Citizen participation/ community involvement	Nonprofessional grassroots educator teamed with extension educator from Ontario Ministry of Agriculture, Food and Rural Affairs	Capacity Building • Hands-on environmental self-assessment Education: • Participatory education • Lectures	Cultural anthropology/ participatory research R: WEAK [16.5] A3, B(3), C1.5, D4, E2, F3	N/A	• To determine the effects of farm leaders' ideas on program design	• Ways in which local people analyze their situation	• Extension educators may support stakeholder engagement more fully if they anticipate a political dimension in addition to a focus on subject matter. This emphasizes Cervero and Wilson's (1994) democratic approach to program planning whereby adult educators talk openly about social and political aspirations of interested parties in addition to content matter objectives • Learners bring different meaning to ordinary dimensions of educational practice • Educator suppositions, like 'make things easy for farmers' should be questioned and not applied uniformly to all program decisions	Conference proceedings	Elaine

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Harding & Anadu (2000)	USA: OR	• Water quality (drinking)	• Households	• Information	Local government agencies/departments	Information • public notices	Random sample, telephone survey with control R: STRONG [9.5] A1, B1, C2.5, D1, E2, F2	(Context A to Context B) Public response to notices of chronic vs. acute water problems	• To probe differences in resident response to public notifications of water quality problems • To examine residents' evaluations of information source reliability	• Actions taken in response to notification • Sources used to obtain information about city drinking water	• Public notice efforts about chronic vs. acute water problems were highly effective. Newspapers were most common source of public notice information with direct mail (from valued sources) and family also significant • In this study, credible sources were: city water utility, county health department, newspaper • Notices were more effective in the community where the language and appearance of notification materials were adapted to reflect the diversity of those being notified and took into account the literacy level of the group. • Notices were more effective in the community where the exact nature of the water quality problem was explained • Notices were more effective in the community where they were accompanied by a recommendation for action and provided explicit instructions for recommended actions the residents should take. The recommendation will not be adopted, however, if it is perceived as too hard, in terms of time or energy.	Water utilities	WRA {G6}
Holsman & Krueger (2002)	USA: MI	• Water quality (groundwater pollution prevention)	• Farmers	• Recent action • Risk perception	Trained groundwater technicians	Communication • Farm*A*Syst -risk assessment -education program workbook	State-wide base-line surveys to random samples of farmers in 1996 & 2000 and annual post-intervention surveys of a census of farmers who participated in Farm*A*Syst program R: STRONG [8.5] A1, B1 & B2, C1.5, D1, E2, F2	(Practice A to control) Education programs vs. control	• To assess the effectiveness of the Farm*A*Syst program in Michigan	• Satisfaction • Use of recommended farm practices	• Survey results: a) Over 75% of the respondents made at least one management change to protect groundwater b) Most changed more than one farm management practices as a result of program participation c) Over 75% of the respondents applied for program cost-shared dollars in order to make changes d) Less than 25% of the respondents said they read the fact sheets dealing with substantive knowledge of each groundwater topic before completing the risk-assessment worksheets • The results of the two studies suggest that Farm*A*Syst is a successful intervention for promoting certain farm management practices in Michigan. However, the program appears have little affect on groundwater literacy. • From informal interviews with groundwater technicians (the educators) and from reevaluating the survey results, the authors suspect that behavior changes are being manipulated through cost-share incentives rather than through "education" offered during or after the Farm*A*Syst program • The authors recommend: a) a refocus of training for groundwater technicians to emphasize the instruction on on-farm risk assessment by farmers rather than completing it for them b) deferring recommendations about cost-share practices until farmers complete their risk assessment and have reviewed strategies for mitigating high-risk management practices	Extension	AGRICOLA {c11}

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Holsman (2001)	USA: 11 New England & Mid-Atlantic States & DC	• Aquatic resources	• Recreational Water Users -anglers -young people -teachers -adults	• Principles of youth education	Various	Various	LR: MODERATE[12.75]† A(1-3), B(1-3), C1-3.5, D1-4, E1-3, F2 † We estimated the strength score by summing the averages of ratings gleaned from descriptions of the reviewed studies	meta analysis of research literature	• To provide quick documentation for managers needing to justify existing programs and methods • To provide general tips and considerations for how to apply standard practices that emerged from the literature • To reveal gaps in the research and evaluation of aquatic education methods and practices	Multiple, reviewed literature about effectiveness of: • Teacher training workshops • Aquatic ecology education, including residential camp experiences, field studies, classroom activities • Publications and museum displays • Angler education workshops, focusing on: planning, method, impact, angling ethics • Ecomanagement and issue investigation	• Published studies that investigated specific education methods were relatively uncommon. • Overall, programs which achieved their objectives provided a well-developed explicit set of objectives that target outcomes for specific audiences and monitored progress • The literature supports many current practices like: -field trips (when integrated into classroom study) -guided discovery methods -cooperative learning -construction of mental models -visual aids -personal investigations -role-playing -investigation and evaluation modules and community action research where students have the opportunity to exercise citizen action skills. • Several methods are less effective including: -lectures (must be optimized through interactive activities) -field trips in isolation -outcome based experiments -values clarification or moral reasoning as a way to teach ethics	US government agency report	Elaine
House & Fordham (1997)	UK	• Water quality • Riparian management	• Recreational Water Users • Households	InformationCommunication	UK Environment Agency and Middlesex University	Information • user preference surveys	Literature Review/meta analysis of multiple studies conducted using structured questionnaires and semi-structured interviews LR & R: WEAK [15.5] A1, B(3), C3.5, D4, E2, F2	N/A	• To identify types of river-corridor features the public prefers • To assess public perception of and attitudes toward aspects of river management	• Perceptions • Preferences	• The quality of the river is important to residents who perceive a locational benefit (visiting and nearness) • The surveyed public has clear opinions and strong preferences for certain river landscape features, with a preference for naturalness and diversity • The "public" can have a strong focus or highly value local features. They do not want the local landscape to be impacted. Surveys and interviews can help highlight these preferences. • Most important factors -- effect on the landscape, effect on recreational opportunity, wildlife habitat, safety • Flood relief schemes were not necessarily preferred • Residents want to be able to react to several proposals rather than just one • Most valued river water improvements were -- cleaner water, improvements in appearance (less litter), more natural vegetation and wildlife	Landscape research	ASFA {K140}

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Howard & McGregor (2000)	Australia	• Water quality	• Households also, secondarily: -industry -agriculture -local governments	• Information • Communication	• Partnerships of: -neighborhood councils -state agencies -federal government	Information • multimedia advertising campaigns • feedback	Pre & post education random sample mail & telephone surveys R: STRONG [7.5] A1, B1, C1.5, D2, E1, F1	(Program A to Program B) success of two different add campaigns	• To compare the success of two different 'Phoswatch' public education campaigns	• Changes to survey response over time	To be successful, phosphorus public information campaigns need: • Clear simple messages • Sufficient media exposure to outline the seriousness of the collective problem • Some sort of feedback to the target audience (in this case, the feedback demonstrated what other people were contributing to achieve the desired collective goal) • Exposure through multiple outlets which seems to produce an atmosphere of social pressure and the feeling that people can do more	Environmental Conservation	CAB {I184}
Howell & Habron (2004)	USA: MI	• Water • Watershed conservation	• Landowners	• Information • Tech transfer and diffusion of innovation	Extension	Communication • Farm meetings • Visits to resource office • Personal visits by resource person to homes of landowners • Landowner visits to universities • E-mail Information • Newsletters • Printed bulletins • Fact sheets • Field days • Demonstration tours • Newspapers • TV • Radio • Videotapes • World Wide Web • Computer software packages Education • Workshops	One-shot mail survey of a random sample of landowners in purposefully selected, comparative watersheds R: STRONG [9] A1, B1, C3, D2, E1, F1	Population A to B Landowners in active watersheds to landowners in less active watersheds	• To determine the role of communication (communication, information, & education) preferences on MI agricultural landowners with respect to watershed conservation	• preference for traditional and technological communication (communication, information, & education) strategies	• Agricultural landowners preferred traditional forms of communication to more technical (that is, written forms of communication, such as newsletters, printed bulletins, and fact sheets, over computer and Internet) communication strategies for learning about watershed conservation. • Preference for technological communication is increasing • Younger, more educated, and higher income landowners tend to prefer computer and Internet communication strategies more than other landowners • Preference for the Internet communication strategy is significantly related to having home or work access to the Internet. • Landownership in an active versus less active watershed does not appear to influence preferences for communication strategies	Extension	Elaine

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Iams & Marion (1991)	USA: AZ	• Water quality	• Adults	Education	Extension faculty	Education • Rented videotapes • Meetings/workshops • Home-study courses Information • Bulletins	One-shot mail survey of University of Arizona employees aged 40-65 R: MODERATE [12.5] A1, B(3), C3.5, D2, E1, F2	(Information delivery method & services A to B to C) Information dissemination methods	• To determine how populations would be willing to receive information about community issues	• Preference for educational delivery method	• By order of importance, respondents considered priority issues to be: (1) availability of safe and plentiful water, (2) affordable energy, (3) safe waste disposal, (4) air pollution,mass transportation systems, (5) protection from crime • By order of preference, delivery methods preferred were: (1) videotape rental, (2) educational meetings/workshops, (3) educational bulletins, (4) home study courses• U of AZ employees were willing to drive 10 miles or less to learn information about a problem • Study authors encourage Extension to use alternative delivery methods for education about environmental and policy issues, especially a home study course using video	Extension	??
Johnson & Jacobs (1994)	USA: WI	• Water quality • Farmland preservation	• Landowners	• Social Marketing	County-based Extension agents & campus-based Extension specialists	Education • public meetings • one-on-one personal contact	Ex-post, semi structured interviews of agents and specialists instrumental in educational efforts for farmland preservation R: MODERATE [14.5] A2, B3, C2.5, D2, E2, F3	(Successes to Failures) (. . . though not a formal comparison. Rather the study includes educators involved in both successful and failed projects in the sample)	• Evaluation to help guide development of new educational programming	N/A	(1) Public education is successful when it responds to real or perceived need. Education of this type cannot be pushed upon citizens and communities that do not believe they need it. (2) In order to facilitate education, educators need to know their communities well, and identify and work with supporters and opponents of the substantive issue early in the education effort. (3) The availability of accurate, objective information is critical to the credibility of the education effort. (4) A policy program that clearly facilitates local control increases receptivity to public education about the program or issue. (5) Individual educators must be aware that some actions may be perceived as advocating rather than educating. When educators are perceived as advocates, especially of a controversial issue, conditions exist for them to lose effectiveness by becoming alienated from their community. (6) Potentially controversial subjects such as growth management require process skills training for educators in areas including communication, social psychology and conflict management. (7) Sufficient and explicitly administrative and financial support for local public education is essential. Higher levels must be willing to back up local educators as they extend themselves in the growth management area. (8) Locally elected officials are a key constituency for public education, and are among the most difficult to reach if there is community controversy about the issue. (9) These issues require long-term education efforts, and will not respond well to demands for short-term results.	Resource Conservation	AGRICOLA {d9} CAB {Search 1,2, & 3, #196} November 2002

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Karlen, Ditzler, & Andrews (2003)	Worldwide	• Soil quality	• Farmers	N/A	N/A	N/A	N/A	N/A	• To describe soil quality concept and review its use in research and education	None	N/A	Geology	Current Contents {D25}
Kelly-Begazo (2002) (U.S. EPA)	USA: FL	• Water quality • Nonpoint source pollution	• Homeowners	N/I	• Extension agents	Information • radio and TV broadcasts • newspaper articles • exhibits • demonstration landscapes • pamphlets • presentations Education • on-site workdays • workshops	Program Evaluation R: MODERATE [13.5] A1, B(2), C1.5, D4, E(2), F3	After to before intervention	• Program evaluation	• Number of homeowners trained • Number of properties certified as "Florida yards" • Percent of participants adopting practices for efficient watering and irrigation • Percent of participants adopting Florida Friendly Landscape management practices	N/I	Government agency report	AGRICOLA {I38}
Knox, Jackson, & Nevers (1995)	USA: AR, MN, WI Canada: ON	• Water quality	• Farmers • Ranchers (Producers)	• Technology transfer	Various	Education	Summary of post intervention mail surveys of program pilot-tests participants to rate the usefulness of the program, participant satisfaction with the program, and identify changes in practices planned or already made by participants R: MODERATE [11.5] A1, B(2), C2.5, D2, E2, F2	N/A	• To review implementation and effectiveness of Farm*A*Syst program	• Use of and satisfaction with Farm*A*Syst program	Wisconsin Pilot• 94% rated the program as useful or very useful• 88% would recommend the program to other farmers• farms made changes in 1 - 6 management categories; changes in each particular management category took place on 3 - 21 % of the farms, depending on the management topicOntario, Canada workshop• Participants were satisfied that materials could help with self-evaluation of farms, assist in developing future priorities, and increase knowledge of environmental problemsOther evidence suggested use by private corporations	Conference proceedings	AGRICOLA {c88}

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Kraft, Lant, & Gillman (1996)	USA: IA, IL, IN, MO, WI (corn belt)	• Water quality	• Farmers	• Communication	N/A	Capacity Building • Research Communication • One-on-one assistance Education • Demonstration Assistance • Incentive programs (within a voluntary framework) to encourage farmers to try new ideas	Self-administered survey questionnaire of targeted sample R: MODERATE [12] A1, B3, C3, D2, E1, F2	N/A	• To improve understanding of farmers' assessment and willingness to participate in USDA water quality improvement program (WQIP) (Audience analysis)	• Farmers' willingness to participate in a water quality incentives program	• As farmers feel increasingly negative about government involvement, the less likely they are to want to participate in WQIP • As percentage of gross farm sales increases, it is more likely that the farmer wants to participate • As farmers increase contact with NRCS, the more willing they are to participate • This study suggests that only 3.3% of the eligible farmers would participate in the WQIP on its current terms • These results, combined with the general lack of enthusiasm on the part of the surveyed farmers, suggest that WQIP as a voluntary program might have limited acceptance from the agricultural community	Resource conservation (soil & water)	WRA {D225}
Kromm & White (1991)	USA: High plains KS, NE, OK, TX	• Water quantity (conservation)	• Farmers (Irrigators)	• Information • Communication • Diffusion of innovation	N/A	Information • Mass media Communication • One-on-one consultation	Self-administered survey questionnaire of systematically selected stratified sample of irrigation farmers from 10 counties in high plains of four states. R: MODERATE [11.5] A1, B3, C3.5, D2, E1, F1	(Beliefs to Behavior) Beliefs about importance of different sources to the adoption of water saving practices	• To measure farmers beliefs about the importance and reliability of different source of information about water-saving practices • To identify information sources strongly correlated with adoption of water saving practices	• The importance and reliability of different sources Information about effective management of water use. • The adoption of water saving practices	• Advisor/oriented sources and information from media specific to the farming practice are much more significantly linked to adoption than interpersonal sources such as, friends and neighbors • The three sources that best discriminate adoption behavior are: a) Private agricultural consulting firms b) University research stations c) Trade magazines • Both adoption of water saving practices and reliance on information sources are regionally biased. Preferences were related to the availability of a source, absence of a common knowledge base, and the activity of local opinion leaders	Rural Studies	Agris {d360}

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Lanyon, Kiernan, & Stolzfus (1996)	USA: PA	• Water quality	• Farmers • Agribusinesses (fertilizer & ag. Chemical dealers)	N/A	CES Agents	Capacity Building • N/I (paper evaluated participation rather than effectiveness of education practices)	Process evaluation using focus groups of dealers and farmers R: MODERATE [12.5] A2, B1, C2.5, D2, E2, F3	Population A to B beliefs & perceptions of farmers eligible, but not participating in USDA Farm Services Agency Water Quality Incentive Program-Integrated Crop Management (WQIP-ICM) to beliefs & perceptions of eligible, but not participating fertilizer and ag-chemical dealers.	• To investigate barriers to fertilizer and ag.-chemical dealer participation in WQIP-ICM	• Beliefs and perceptions	• Fertilizer and ag-chemical dealers already provide responsible product use advice. They have difficulty separating their advice from ICM recommendations, in terms of how they describe their own service. • Consultants who provided most of the local ICM advice requested by farmers, had been involved in developing the guidelines and may have been more confident about how the ICM program worked. • Farmers already use dealers to verify consultant recommendations. • Barriers to involving fertilizer and ag.-chemical dealers as Integrated Crop Management (ICM) educators may be more related to concerns about over committing resources in experimental programs and jeopardizing their ongoing business. Dealers indicated that if they served as educators, they could significantly adversely impact long-term client relations if the recommendations they provide were not fully tested or if dealers were "spread too thin" in terms of their understanding and ability to communicate. • Few farmers knew about the WQIP ICM program • Farmers are more aware of typical ICM activities, than in the specific program • Farmers are reluctant to participate in government programs they perceive as giving the government too much control over the details of the way they farm. This is especially true when farmers had already demonstrated concern about water quality and had already reduced nutrient and pesticide input based on decisions about costs and local experimentation with nutrient amounts	Natural resource and life-science education	AGRICOLA {b4}
Leach & Pelkey (2001)	Australia, Canada, & USA	• River, stream, & watershed management	• Decision Makers, Local • Env/consv. NGOs • Gov't agency professionals (partnerships)	• Citizen participation/ community involvement	N/A	N/A	LR: MODERATE [14.5] A1,2,&3, B1,2,&3, C3.5, D2,3,&4, E1,2,&3, F1,2,&3, "The overall quality of the existing research varies widely" (p. 380).	• Case to theory • Case to case • Success to failure	• To assess to public policy theories relevant to partnership structure & function • To develop a set of practical suggestions for designing successful partnerships	Multiple	• Four main factors influence partnership success: -maintaining balance between partnership resources and scope of activity -pursuing flexible and informal process -attention to alternative dispute resolution processes -attention to institution analysis and development processes • Also important are: -local circumstances -managerial assets like funding and effective leaders, facilitators, and coordinators - interpersonal assets like participators who are cooperative and committed to the process and trust the other members of the partnership	Water resources planning & management	CC {H95}

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Lefko, Rice, and Pedigo (1999)	USA: IA	N/A	• Farmers	• Information • Communication • Diffusion of innovation	N/A	N/A	Self-administered survey questionnaires completed by samples of two populations (one sample, at least, was random). R: STRONG [8.5] A1, B1, C2.5, D2, E1, F1	(Specific to a general population) Early adopters of resistant alfalfa to general population of alfalfa producers	• To understand producers': -Perceptions of • alfalfa pests • the tactics used to manage these pests -Knowledge of potato leafhopper resistant alfalfa (Audience measures)	• Perceptions of alfalfa pests • Tactics for managing pests • Knowledge of potato leafhopper resistant alfalfa	• Early adopters were farmers with higher yield losses. They understood how the leafhopper caused loss, but were not better at differentiating leafhopper damage from drought stress. • Knowledge of how a leafhopper caused loss was independent of experience • Greater ability to identify and differentiate injury symptoms was linked with more frequent and more efficient use of scouting and pest management decision guidelines. • Motivation for adapting leafhopper-resistant alfalfa is increased yield (economic benefit), and knowledge of the resistant mechanism is unimportant.	Production Agriculture	AGRICOLA {f99}
Lieberoff (2002) (U.S. EPA)	USA: IL	• Water quality • Nonpoint source pollution	• Students, K-12 • Zoo guests/visitors	N/I	• Zoo staff	Information • demonstration wetland • graphic signs • interactive devises • giant storybook	N/A	N/A	• (Will be) summative program evaluation	N/A	N/A	Government agency report	AGRICOLA {I38}
Line, McLaughlin, Osmond, Jennings, Harman, Lombardo, & Spooner (1998)	N/A	• Water quality (surface & ground)	• Farmers (agricultural producers)	N/A	N/A	N/A	Review of literature on nonpoint-source pollution concentrated on Ag producers (farmers) LR	N/A	• To review literature about: -quality of water resources -BMPs -nonpoint source modeling and monitoring	No meta analysis was attempted	No mentions of results related to educational programming	Environment research	WRA {D164}
Lovett (2002) (U.S. EPA)	USA: WY	• Water quality • Nonpoint source pollution	• Teachers • Gov't agency (Soil & water conservation district) professionals	N/I	N/I	Education • workshops (three-weeks)	N/I	N/I	N/I	• Commitment of participants • Data submitted by monitoring programs • Positive feedback provided by program participants • Number of enhanced & expanded monitoring programs	N/I	Government agency report	AGRICOLA {I38}

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Lowrie & Greenberg (1997)	USA: NJ	• Water quality	• Business and Industry Water Users	• Tech transfer & Diffusion of innovation	N/I	Information • mail • on-site visits	Pre-intervention quantitative mail survey Post-intervention interview comparison with control (small N) R: MODERATE [11.5] A1 & A2, B3, C3.5, D2, E1, F1	(Intervention A to B to C) On-site visits vs. mail vs. no delivery of pollution prevention information	• To investigate the relationships between actions to prevent ground water pollution and: -the internal characteristics of small businesses -the external relationships formed by small businesses -the features of the innovation -the type of information delivery (highlighting this last item) • To test whether more hands-on and direct delivery of information will encourage adoption of pollution prevention measures for small businesses in industries other than farming.	• Receptivity, interest, and actions toward pollution prevention	• Small businesses are a difficult audience to reach -- limited staff, busy schedules, financial constraints; many will not take the time to return phone calls that are considered non-essential and many do not read mailed solicitations • Majority of businesses practices 50-90% of the pollution prevention practices -- because they were mandated by regulation or were easy to do • Businesses on septic systems who had more expertise and financial resources were more active in implementing pollution prevention practices • Business with concern about liability were more active • New and younger owners were most likely to adopt innovative measures • "Active" businesses were more likely to have external relationships, such as franchise arrangements, trade membership, and course enrollment • "Active" business wanted more forms of assistance via demos, technical assistance, written information • Most small businesses expressed strong negative sentiments about government handling of small business problems and were skeptical of greater government involvement in their affairs • Small N in post intervention study could not provide evidence required to determine whether one information delivery mechanism is any more effective than another in influencing adoption (note small % of surveys returned)	water resources	CC {D269}
Marlowe & Trathen (1996)	USA: NC	• Lead exposure (contamination)	• Households -families -young people (preschool children)	• Principles of youth education • Principles of adult education	• Researchers -researcher-educated parents -parent-education children	Education • workshop • parent workbook • home information leaflet • "Lead Commander" cartoon book with exercises	Pretest-posttest with control (see critique by Tsuji & Nieboer, 2001) R: STRONG [7.5] A2, B1, C1.5, D1, E1, F1	(Intervention Population to Control) intervention using education program and material vs. no intervention	• To examine the effectiveness of family-based environmental education program	• Hair-lead levels • Parent ratings on WPBIC (Walker Problem Behavior Identification Checklist) • Teacher ratings on WPBIC	"A modest and nonsignificant decline in children's hair-lead levels was associated with participation in the program. . . . Although limited by the modest numbers, these data point to the value of family-based environmental education as a primary prevention tool in preventing lead poisoning before it occurs" See critique by Tsuji & Nieboer (2001)	Environmental Education	TOC browse of last 10 years of The Journal of Environmental Education (November 2002)

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May (2000)	USA	• Natural & environmental resources	• Teachers • Students, K-12	• Principles of youth education • Social cognitive (learning) theory	• Teachers	Education • entire framework outlining elements of success in environmental education	Interviews & mail survey of recommended sample of environmental educators R: WEAK [15.5] A1, B3, C3.5, D4, E2, F2	N/A	• To determine what teachers identify as the factors that foster student growth in environment-related knowledge, attitudes, skills, and responsible behaviors.	• Teacher approval of researcher-defined elements of success in environmental education	• Teacher competencies and teaching conditions and practices are important and interrelated • Teachers identified the following elements as highly important for effective environmental education (EE): (1) flexible curriculum, (2) collaborative learning environments, (3) students' bearing the consequences of the behavior, (4) teacher competency in listening and questioning, (5) diverse instructional strategies (6) resourcefulness in accessing resources, (7) creativity--knowledge of how to do without, (8) facilitation skills, (9) ability to make connections, (10) understanding of local-to-global connections, (11) ability to integrate curricula, (12) using personal/student strengths/passions, (13) experiential teaching orientation, (14) cooperative and inclusive learning, (15) nurturing a sense of place, (16) consistent can-do vision, (17) infectious passion for EE and teaching in general, (18) humor in the classroom, (19) practice of environmentally responsible behavior, (20) risk taking, (21) recharging oneself • The EE framework elements of success provide an inventory of conditions, competencies, and practices that can help teachers and teacher educators to chart personal and collective paths to greater efficacy in EE teaching and learning. • The framework has direct utility in many aspects of teacher education. • Individual teachers can use the framework to guide their professional development • Teacher educators may use it as a target for teacher education programs. The framework is flexible enough to accommodate diverse contexts while guiding teachers along their paths toward better teaching. • Additional research should be conducted to broaden its educational validity and utility.	Environmental Education	TOC browse of last 10 years of The Journal of Environmental Education (November 2002)Elaine

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McKenrick, Ii, Lawrence, Kaufmann, & Marshall (2003)	USA: WA	• Water quality	• Business and Industry Water Users	Communication	• Environmental health specialists from state & county public health agencies	Education • field visits w/ educational material • site inspections • one-on-one technical assistance & feedback	Pre-intervention/post-intervention on-site visits & water quality monitoring of sample-frame census R: MODERATE [12.5] A1, B2, C1.5, D4, E2, F2	(before and after intervention) compliance with regulated activities and BMPs for hazardous waste before and after educational visit	• To gather baseline information on how hazardous wastes were generated and handled by the auto repair industry • To evaluate and record changes made between initial and return site visits	• Changes in: -storm-water discharge -performance of hazardous waste: • disposal methods • disposal documentation • secondary containment • spill prevention • labeling	• 51% of businesses required only one visit; these were already handling hazardous waste correctly • Specifically: Education visits and technical assistance produced 76% correction of discrepancies noted in first visit; hazardous waste management and disposal practices markedly improved • Generally: -Direct outreach to the community, wide distribution of necessary educational material, and eliciting cooperation can positively change hazardous waste management practices. -Business-government collaboration is important in pollution prevention	Environmental health	CC{D2}
Mechenich & Shaw (1994)	USA: WI	• Water quality	• Homeowners	• Education planning	N/A	N/A	Mail & telephone survey R: MODERATE [12.5] A1, B2, C3.5, D2, E2, F2	N/A	• To characterize the amounts and variety of products used for household cleaning, maintenance, and for lawn and garden care	• Types and quantities of chemicals used for home and yard care	Descriptive study Attitudes did not predict practices	Environmental health	WRA {F457}
Mercer (2003)	Canada: ON	• Water quality	• Homeowners	• Social Marketing	N/I	Information • Social marketing Education • Social marketing Capacity building • Social marketing	N/A	N/A	N/A	N/A	This article provides a description of the "5 elements" social marketing campaign. The description is well written and provides a useful example for how to apply social marketing principles.	Conference proceedings	Elaine

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Michelsen, McGuckin, & Stumpf (1999)	USA: Southwest	• Water conservation	• Households	• Information • Communication • Education	• Area water utility	Information • printed material • public service announcements & advertisements on: • billboards • public transport • television programs • commercials • radio announcements • measurement & reporting programs • home water surveys • conservation hotlines • speakers bureaus • zeriscape programs & demonstration gardens • new homeowner information programs • suggested (voluntary) water use rotation schedules • neighborhood watch programs Education • presentations • information & materials that can be used in school curricula	Econometric modeling & interpretation (maximum likelihood regressions of city water demand) of representative sample of cities R: MODERATE [12.5] A2, B3, C3.5, D2, E1, F1	(Program A to Program B) Effectiveness of price vs. non-price water conservation programs	• To empirically investigate the effectiveness of nonprice conservation programs in reducing water demand across southwest region of USA and in individual cities.	• Residential water demand	• In addition to the information and education programs listed in the "Education Purpose & Behavior Change Method" column, non-price programs include retrofit programs and permanent and temporary ordinances and legislation• Nonprice conservation programs can significantly reduce residential water use, but insufficient information about the specific programs applied in each situation limits ability to distinguish the effectiveness of any single program.• The data indicates that per-program effectiveness of nonprice conservation programs may decline with increases in the total number of programs implemented in a given city (declining marginal benefits), but since single program methods were not described, this cannot be verified	Water resources	CC {I295}
Miller & Smith (1991)	USA: MD	• Water quality • Water quantity	• Gov't agency professionals	N/I	N/A	Capacity building	Program Evaluation R: MODERATE [13.5] A(2), B(3), C2.5, D2, E2, F2	(Population A to Population B) Compare academics from a county that chose to participate with those from a county that chose not to.	• To verify model of events • To improve water program • To more accurately predict and affect decision-making in future issues-based programs	• Choice to participate or not	• A county Extension educator chose to implement a priority program when: -They felt they understood the program -When resources were made available. Lack of support from any level of administration was a negative. -They had a choice to participate -The program fit their work description -The program had social significance -The program was part of work in a team	Extension	AGRICOLA {k255}

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Milton & Cleveland (1995)	USA: CT	• Water ecology • Urban ecosystem • Wildlife	• Students, K-12	• Education	• Graduate students	Education • indoor laboratory exercises • outdoor field studies	Formative evaluation: pretest/post test with control R: STRONG [10.5] A2, B2, C1.5, D1, E2, F2	(Curriculum A to control) 3-unit curriculum with each 75 minute class divided into inside laboratory activities & exercises and outside ecosystem observation & interpretation	• To evaluate curriculum success in aim of increased ecological knowledge and improved social skills among students in experimental group. Curriculum included studies of park ecology, park watershed, pond, water treatment facility, water lab, and river site. Techniques include required student "interpretation of park and ecosystem	• Change in student knowledge • Change in student attitude toward the environment • Student satisfaction with the program	• Knowledge gained by treatment group was significantly greater than control • No conclusive improvement in attitude observed in either treatment or control groups. • Qualitative observations indicated improvements in social skills of students in treatment group. No comparison was made to improvements in social skills of students in the control group. • Parents were impressed by student outcomes (student "interpretation" of park ecology); teacher interns enjoyed teach the class; museum staff noted knowledge and enthusiasm of students when they visited Overall, the program appeared to have met its goals. The children felt connected to the park, the park rangers, the interns and their university, the project coordinator, and their teachers. They not only announced that the park was theirs, but encouraged their younger schoolmates to feel ownership, too. Signs of their growing sense of efficacy included the increasing rapidity with which they took on new challenges and the fact that students continued to volunteer for work in the park two years after completing the program.(p. 5 of 9)	Environmental Education	ASE simple keyword search
Muesseler, Terry, & Holcomb (2000)	USA: OK	N/A	• Business and Industry Water Users	• Principles of adult education	N/I	Education • short-term workshop	Pretest/posttest evaluation of a census of workshop participants R: MODERATE [11.5] A2, B2, C1.5, D4, E1, F1	(before and after intervention) Changes in attitude & knowledge Relationship between test scores and demographic characteristics	• To identify selected personal and professional characteristics of workshop participants • To assess change in knowledge resulting from participation in the workshop • To assess changes in attitude resulting from participation in the workshop • To determine what relationships exist between the characteristics of workshop participants and their change in knowledge and/or attitude related to topics presented in the workshop.	• Changes in: -knowledge -attitude	• Attending workshop for agricultural entrepreneurs resulted in a significant increase in participant knowledge, but no produced no statistically significant change in attitude. • Neither personal nor professional characteristics of the participants had an affect on the overall change in their knowledge or attitudes.	Conference proceedings	Elaine

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Mullan, Gardiner, Rosenman, Zhu, & Swanson (1996)	USA: MI	• Skin cancer prevention & detection	• Farmers	N/A	• National Institute of Occupational Safety and Health supported regional and community advisory boards • Regional Health Care professionals • Local American Cancer Society staff • News media	Education • Half-day continuing medical education program on skin cancer screening for physicians in program counties • 20-minute videotape with accompanying training guide presented to and evaluated by farm groups Information • A series of news paper articles on skin care prevention and screening • Information and screening booths at county and Ag community fairs • Dissemination of skin cancer prevention information to students • Student T-shirt design contest featuring skin cancer prevention messages	Pretest and Post-test with control using random samples R: STRONG [6.5] A1, B1, C1.5, D1, E1, F1	(Intervention Population to Control) Farm households receiving information to Farm households not receiving information	• To study the effect of education program on skin cancer prevention and detection beliefs and practices among adult farmers in Michigan	• Skin-cancer prevention & screening behaviors	• The intervention had little impact on the goal to improve prevention behavior and medical care seeking except for a small increase among older people and people with higher education • The intervention seems to have been more successful in encouraging farmers' adoption of personal preventive practices and readiness to seek medical care than in increasing screening in the community • Other factors, such as previous history of cancer, age and gender were more closely related to increased cancer prevention practices	Rural Health	Agris {d167}
Murray and Butler (1994)	USA: OR & WA	• Sustainable agriculture	• Farmers	• Communication • Capacity building	• An implementation team of research and extension personnel from OR & WA state universities from various fields	Capacity Building • Whole farm case studies • Focus groups	Critical reflection R: WEAK [16] A2, B3, C2, D4, E2, F3	N/A	• To review two complementary participatory strategies for systems-oriented sustainable agriculture research and education programs	N/A	• Focus group activities led to development of new partnerships and teams and were seen as a valuable mechanism to understand and interpret how different people see a particular situation or idea • Whole farm case studies identified many research and education needs, especially the need to include diverse stakeholders in planning and implementing a project. • Both approaches generated in-depth insights, suggest innovative solutions to problems and built participants' ownership of outcomes • Both approaches helped to identify farmer innovations and experiences that are of value to other farmers, interest groups, and research and education programs • Both approaches were seen as valuable tools for understanding sustainable agriculture problems and whole farm systems. The techniques are also useful for building interdisciplinary teams and for strengthening partnerships between the land-grant universities and diverse interest groups	Alternative agriculture	AGRICOLA {c105}

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Napier & Bridges (2002)	USA: OH	• Water conservation• Soil conservation	• Farmers	• Diffusion of innovation • IETS provision (i.e. provision of **I**nformation, **E**ducation, **T**echnical assistance, and economic **S**ubsidies)	• Coalitions of local, state, and federal conservation groups	Education • Environmental education • Extension programs • Canoe trips down Darby Creek Information • Local print media releases	Examination of secondary data about the two study areas Visits to two study areas Structured-questionnaire survey of farmers in two Ohio watersheds (sample was not random, but a percentage of census) R: STRONG [7.5] A1, B1, C2.5, D1, E1, F1	(Program area to Control) Farming practices in Darby Creek watershed with IETS program to practices in Scotio watershed without IETS program	• To compare adoption of conservation production systems between farmers in a watershed with IETS conservation program to farmers in watershed without	• Adoption of program-recommended farm practices	There was no significant difference between farm water quality management practices employed in the upper Scioto River watershed (no identified intervention) and the Darby Creek watershed (education and communication interventions). Findings from these and other studies call into question whether conservation initiatives that rely on information, education, technical assistance, and economic subsidy (IETS) programs, like those employed within the Darby Creek watershed, are effectively applied.	Resource conservation (soil & water)	WRA {C9}
Napier & Johnson (1998) "Awareness . . ."	USA: OH	• Water conservation • Soil conservation	• Farmers	• Information • Communication • Education	Operation Future (a local conservation organization)	Capacity Building • Aid farmers in search for financial & technical assistance Education • Organize watershed canoe trips Information • Develop & disseminate information • Organize local meetings about soil & water conservation	Structured-questionnaire survey administered to a systematic random sample of farmers in Darby Creek watershed R: STRONG [7.5] A1, B1, C2.5, D1, E1, F1	(Population A to Population B) Farmers aware to Farmers not aware of Operation Future	• To evaluate the impacts of a local conservation organization, Operation Future	• Values, perceptions, & behaviors of farmers in two populations	• There was no difference between the values of farmers who were familiar with activities sponsored by the organization and those who were not aware of the activities or the source of the activities • 35% of farmers familiar with the organization and its activities thought that the organization had influence • Only a small proportion of respondents indicated that they had received financial support, one of the goals of the organization	Resource conservation (soil & water)	AGRICOLA {e21} WRA {D187}
Napier & Johnson (1998) "Impacts . . ."	USA: OH	• Water quality • Soil conservation	• Farmers	• IETS provision	Public and Private conservation groups	Capacity Building • Promote and assist farmers in no-till production technologies • Provide economic subsidies to farmers for purchase of necessary technologies Education • Organize watershed canoe trips and other demonstrations of the unique ecosystem within the watershed	Comparison of farm-production systems used at the beginning and three years into program implementation R: STRONG [9.5] A1, B1, C1.5, D4, E1, F1	(Pre- & post-intervention behavior) Farm production systems employed before & after watershed conservation initiative	• To measure change in farmers' use of conservation production practices during implementation of IETS conservation program	• Farmer adoption of conservation production systems	• IETS approach used to motivate farmers to adopt conservation production systems was not very successful • Efforts by conservation agencies within the study region had little impact on conservation behaviors of study participants • The ultimate test of conservation program effectiveness should be whether or not production practices are actually implemented and whether or not practices adopted actually improve environmental quality	Resource conservation (soil & water)	AGRICOLA {e26} WRA {A5}

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Napier, Robinson, & Tucker (2000)	USA: OH, IA, MN	• Water quality • Soil conservation	• Farmers	• Diffusion of innovation	N/A	N/A	Self-administered survey administered to systematic random samples of farmers in three Midwest watersheds R: STRONG [9.5] A1, B1, C3.5, D2, E1, F1	(Population A to B to C) Probable adopter to probable non-adopters of precision farming techniques	• To identify for prediction purposes, the characteristics of adopters vs. non-adopters of precision farming techniques (Audience analysis)	• Self-reported likelihood of adoption	• The ability to adopt and the value placed on conservation information tend to be predictors of farmers intention to adopt precision farming techniques within all three studied watersheds • Diffusion programs designed to facilitate adoption (PFTs) should focus on farmers: a) who have higher farm incomes b) who place more importance on use of conservation information when making farm-level decisions c) who perceive that their children will be operating their farms in the future • Strategies to diffuse PFTs should include information about soil and water conservation benefits to be derived from adoption of the technologies	Resource conservation (soil & water)	AGRICOLA {f58}
Napier & Sommers (1996)	USA: OH	N/A	• Farmers • Ethnic Groups	• Farm structure model • Social Learning Theory	N/A	N/A	Structured-questionnaire survey administered by personal interview to a systematic random sample of farmers in Darby Creek watershedSecondary data on farm structure R: STRONG [9] A1, B1, C3, D2, E1, F1	(Population A to Population B) Mennonite to non-Mennonite farmers	• To compare structural differences between Mennonite and non-Mennonite farm operations	• Personal & farm structure characteristics	• Mennonite farmers rely on "traditional" farming which has been established as producing high output. Traditional farming for this group usually includes fall tillage, deep plowing and winter application of manure, which are not associated with good conservation measures, but can also include conservation tillage in certain areas. • Cultural and farm-structure factors are useful for predicting group identity and for developing intervention strategies. The farm-structure model considers whether the adopter has participated in a national farm program, made investments in human capital and production technologies, the number of acres, and gross income.	Resource conservation (soil & water)	AGRICOLA {f316}
Nelson & Trede (2000)	USA: IA	N/I	• Farmers	• Principles of adult education	• High-school ag. teachers • College teachers • NRCS county conservationists • Agribusiness professionals	Education • Class instruction • One-on-one instruction • Mass media	Survey of education providers R: MODERATE [12.5] A1, B2, C3.5, D2, E2, F2	N/A	• To identify the educational needs of beginning farmers in Iowa as perceived by providers of agricultural education • To identify what was being offered by providers and how it was being presented	• Educator ratings on: -usefulness of various educational institutions -usefulness of various media -frequency of use of three methods of delivery for selected agricultural topics	• Educators differed on their use of education delivery methods: -High school ag. and college teachers used meetings or classes most frequently, one-on-one less frequently, and mass media much less frequently. -NRCS county conservationists and agribusiness professionals consistently used one-on-one much more frequently than teachers. -Extension directors and specialists reported using all three methods for different topic areas in a more balanced approach. • The different provider types rate each other highly and appear to agree more frequently than they differ on educational priorities. • All providers recommend instructional methods that include input from farmers and focus on problem-solving and production agriculture skill development. • Providers rated the use of the Internet to deliver information very highly. Distance education, or satellite delivery was not preferred. • Providers most commonly used one-on-one training for conservation and sustainability education.	Conference proceedings	Elaine

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Newton (2001)	USA	• Water quality • Water & soil conservation	• Landowners • Farmers • Students, K-12	Information Communication Education	• Government agency professionals (NRCS)	Information • nationally distributed documents (e.g., job sheets) & videotapes • national advertising campaigns • demonstration projects Communication • one-on-one conversations • kitchen-table talks w/ community residents Education • school activities	Descriptive review of NRCS efforts N/R: WEAK [20] † F3 † A score of 19.5 is the lowest possible rating for original research. We provide this score for comparison purposes only	N/A	• To review the effectiveness of various outreach and education techniques based on experiences of the NRCS	Summary of NRCS activity reports based on numbers of participants or requests for materials and a focus group study Lessons learned represent author's summary of results from 20 years of outreach activities	• Documents and videotapes are most effective when they are clearly tailored to the local landscape (no evidence provided) • National backyard conservation media campaign led to 65,000 calls for information and distribution of 500,000 copies of a booklet that describes conservation practices • Focus student respondents did not generally understand conservation terms. Out of 13 terms, participants believed that they understand 3 (conservation, natural resources, and water quality). A in-depth question about the term "conservation" demonstrated that most did not think in terms of private land conservation, but instead in terms of recycling, endangered species, forest preservation, waste management, and water conservation. • Demonstration projects are believed to be effective, but are hard for NRCS agents to implement • Senior citizens have been effectively engaged in NRCS work through the Earth Team volunteer program which included about 30,000 volunteers in 1999	Biological science	ASFA {f71}
Nowak, O'Keefe, Bennett, Anderson, & Trumbo (1997)	USA: CA, FL, MD, MN, NC, NE, TX, WI	• Water quality (surface & ground)	• Farmers	• Diffusion of innovation	USDA: • Cooperative Extension • NRCS • Farm Service Agent (FSA)	Communication • Communication campaigns Education • Demonstration projects	Qualitative & Quantitative Evaluations of Demonstration Projects Sampled producers were selected on the basis of their ownership of individual fields selected through random spatial sampling R: STRONG [6.5] A1, B1, C1.5, D1, E1, F1	(Practices to controls) USDA water quality demonstration project areas to nearby matched geographic comparison areas	• To evaluate the early performance of demonstration projects relative to USDA's objective to quickly accelerate adoption of water quality practices	• Adoption of demonstrated practices	• Statistically significant increases in adoption of practices in demonstration area relative to comparison area. • Correlations between: a) Awareness of demonstration project and: exposure to information about specific BMPs; awareness of, familiarity with, and likelihood to be users of designated subsets of project BMPs b) Recent exposure to information and belief that practices increase profitability, are practical to use, protect water quality, are easy to get information about correlated at 50% or above of applicants. • Lack of correlation between exposure to information and a belief that the practices were easy to use • Producers exposed to information about BMPs were more likely to be familiar with the BMPs than to assess them favorably • Only scatted net increases occurred in producers' awareness, familiarity, and use of BMPs relative to increases in the comparison areas • Project results and feedback from staff members suggests that a 9 to 10 year time frame may be necessary to move from identification of BMP demonstration projects to wide spread adoptions of the demonstrated BMPs	USDA Project Evaluations	AGRICOLA {f238}

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Obahayujie & Hillison (1988)	USA: VA	N/A	• Farmers (beef)	N/A	Extension agents	Information • Multiple methods grouped by type of contact: -individual -group -mass	one-shot survey of random sample with random-sample follow-up of nonrespondents R: MODERATE [11.5] A1, B1, C3.5, D2, E2, F2	(Population A to B) Dissemination methods preferred by: part-time vs. full-time beef farmers	• To determine how part-time and full-time beef farmers assess methods used by Extension ag. Agents	• Farmer ratings of the effectiveness of various dissemination methods	• Part-time and full-time beef farmers should be reached by different methods. • Part-time beef farmers ranked individual contact methods, such as on-farm demonstrations and farm and home visits, to be more effective than others. • Full-time farmers ranked mass contact methods, such as newsletters/publications, bulletins, radio programs, and leaflets/pamphlets, to be more effective than others. • The two groups ranked visits to universities, news stories, posters, clinics, computer messages, and cartoons as the least effective methods for disseminating information.	Extension	Referenced in Coburn & Donaldson (1997)
Padgitt (1989)	USA: IA	• Water quality	• Farmers	N/A	N/A	Information • field demonstrations	Random sample survey of Iowa farmers R: MODERATE [13] A1, B1, C3, D4, E2, F2	Within pretest : -current differences among farmers based on: • types of farm products • substate-regional location of farmOver full study: -changes in farm practices	• To establish pretest baseline for study of Integrated Farm Management (IFM) Demonstration Program	• Baseline data on: -farm structure -farm practices -attitudes regarding: • tillage • water quality • use of ag chemicals	• Farmers top four priorities as follows: -profitability of agriculture; -quality of drinking water in Iowa; -agriculture health and safety; -controlling soil erosion • The sources of information that most influenced their views on problems associated with groundwater and ag chemical use were: -farm magazines and newspapers; -general newspapers and news on radio and television; -educational/research agency reports; -personal observation • Farmer perceptions that groundwater pollution is serious — not serious on their farm, but serious in the U.S. [relates to Tucker and Napier findings about lack of sense of risk when the source is familiar, voluntary, controllable] • Sources of threats — insecticides, herbicides, nitrogen were identified as somewhat to a great deal of a threat; phosphate, potash were identified as very little to somewhat of a threat • Six of ten respondents reported awareness of special tillage, fertilizer, or herbicide demonstration plots sponsored by ISU Extension or Experiment Station, but only two in ten said they were 'very likely' to visit a demonstration. Five of ten said they were either likely to or would possibly visit. • On farm health concerns are as great or a greater source of concern about effects of the operation on groundwater pollution. • Lack of market incentives was seen as the number 1 impact on conservation management, but all choices provided by the survey were important • Policy reactions — favored restricting nitrogen application and urban uses: opposed taxing or restricting fertilizers and pesticides • There are hints in the data that farmers feel entrapped by current farm practices from making changes to alternative practices.	Extension report	AGRICOLA {f484}

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Padgitt (1990)	USA: IA	• Water quality	• Farmers	N/A	N/A	Information • field demonstrations	Baseline study of farmers in Des Moines County, IA using a stratified random sample R: MODERATE [12.5] A2, B1, C3.5, D2, E2, F2	N/A	• To obtain baseline indicators of current practices and attitudes of farmers in Des Moines Co. for use in long-term study of Iowa Integrated Farm Management (IFM) Demonstration Program	• Baseline data on: -farm structure -farm practices -attitudes regarding: • tillage • water quality • use of ag chemicals	• Top four priorities for Des Moines Co., IA, farmers are as follows: -profitability of agriculture, -quality of drinking water in Iowa, -agriculture health and safety, -controlling soil erosion • The closer groundwater being assessed was to farmer's home the less likely water pollution was to be viewed as very serious and the more likely it was to be viewed as not at all serious • Farmers are likely to reduce chemical use under the following circumstance (listed in declining order of likelihood) -when regulations penalize misuse of farm chemicals -when research shows that: • farm chemicals contaminate area groundwater • alternative farm methods would have no adverse affect on profits • alternative farm methods would result in no more than a modest decline in yield -government provided short-term cost-sharing for costs related to reduced chemical use (opportunity to visit a farm demonstration or attend a local workshop were least likely circumstances to lead to reduced chemical use due to lack of concern that groundwater pollution was a problem) • Primary sources of ag-chemical information that most influenced their views on problems associated with groundwater and ag-chemical use were: -farm magazines and newspapers, -general newspapers and news on television, -personal observation, -education/research • Respondents were more aware of demonstration plots sponsored by chemical dealers and seed companies than local college and Extension service	Extension report	AGRICOLA {d371}
Petersen (2002) (U.S. EPA)	USA: CO	• Water quality • Nonpoint source pollution	• Households (Colorado citizens)	N/I	• League of Women Voters • CO Water Protection Project personnel	Information • bus advertisements • newspaper articles • pollution prevention pamphlets • television (30-second message)	Pre- & post-intervention surveys w/o control (sampling techniques not provided) R: N/I A(N/I), B(N/I), C1.5, D4, E2, F2	Presence to absence of education program	• To measure change in citizen knowledge due to information program	• Change in citizen knowledge of water pollution sources	N/A to BEPs	Government agency report	AGRICOLA {I38}

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Petrzelka, Korsching, & Malia (1996)	USA: IA	• Sustainable agricultural land use	• Farmers	• Noneconomic social sciences	N/A	N/A	Mail survey of census of members of Practical Farmers of Iowa who use some form of sustainable agriculture practice R: MODERATE [13.5] A1, B3, C3.5, D4, E1, F1	N/A	• To determine the consistency of attitude-behavior relationship among Iowa farmers practicing reduced chemical use • To examine the affect of social influences on sustainable agriculture • To provide educational program & policy recommendations suggested by findings	• Self-reported chemical use	• Attitudes in favor of sustainability for the environment and rural communities exist among the studied group • Attitude variables selected for the study were not significant predictors of chemical use but are positively associated with low chemical use • Social influences (organization memberships and information sources) were not instrumental in affecting attitudes about sustainability or chemical-use. • Use of information sources committed to sustainable ag issues and practices did not facilitate the relationship between sustainable attitudes and low chemical use. • Conventional information sources, age, and gross farm income were the best predictors of increased chemical use. • Among sustainable farmers, there was a great diversity of chemical use and use of large amounts of chemicals • The analysis raises questions about the extent to which attitudinal research on farm operators should be relied on to predict individuals' behavior.	Environmental Education	TOC browse of last 10 years of The Journal of Environmental Education (November 2002)

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Petrzelka, Padgitt, Connelly, & Miller (1995)	USA: IA	• Water quality	• Farmers	Communication	Extension agents	Communication • continuous dialogue between project crop consultant and individual farmers	Pretest & posttest with control & long-term follow-up using mail surveys, interviews, illustrative cases, and telephone interviews (for follow-up) R: STRONG [7.5] A1, B2 & B3, C1.5, D1 & D2, E1, F1	• Population A to B to C (Cooperators to former cooperators to control) • Time (*t*)1 to *t*2 • Changes within groups from 1989 to 1992	• To evaluate outcomes of Model Farms experience for promoting intensive management • To determine if changes were made by participants over lifetime of the project	• Changes in: -crop yields -nitrogen applications -pesticide applications -record keeping -attitudes	Compared project "cooperator" and "former cooperator" (program drop outs) outcomes: • Corn and soybean acres increased significantly for former cooperators; yields increased significantly for all three groups. • Nitrogen -- per-acre rates of nitrogen application on corn/soybean rotations decreased significantly for cooperators; former cooperators increased nitrogen application rates on corn/corn rotations • Pesticides -- cooperators reported significantly larger increases in integrated crop management (ICM) practice of scouting before treatment, spot treating rather than broadcasting, using post-emergence herbicides, using less than manufacturers recommended rates, and banded application. • Management records -- significantly more cooperators reported keeping detailed crop management records than former cooperators. • Cooperators significantly increased their agreement that agricultural pesticides, if used as directed, are no threat to the environment • Former cooperators increased their agreement that savings made in more precision application are not worth the added time and money, and decreased their agreement with wanting to use some means other than chemicals to protect crops from weeds, insects, and diseases. • Over 60% of former cooperators indicated that they dropped out of the project for one or both of these reasons (1) they did not see an economic benefit to their participation and (2) they could no longer afford the service. • Cooperators stayed in the project due to opportunities for on-farm refinements and economic benefit of refinements. 97% continued practices after the project was done.	Extension report	Follow-up of previous research

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Petrzelka, Padgitt, & Miller (1994)	USA: IA	• Water quality	• Farmers	Iowa Model Farms Demonstration Program and other farm management outreach initiatives	Extension agents	Information • Farm magazines & newspapers • Personal observations & experience • Educational/research agency reports • Newspapers, TV, & radio news • Farm chemical industry information • Friends & neighbors • Regulatory agency information reports • Demonstration projects • Farm tours	Longitudinal study using state-wide survey of random sample of Iowa farmers R: STRONG [9.5] A1, B1, C1.5, D4, E1, F1	• Time (*t*)1 to *t* 2	• To compare farm practices and attitudes of farmers before and after implementation of Integrated Farm Management Demonstration Program (IFMDP)	• Farm structure • Farm practices • Farmer attitudes regarding: -tillage -water quality -use of ag chemicals	For farms involved in Extension outreach programs, response changes from 1988 to 1992: • Corn acres treated with herbicide increased • Pesticide management practices changed for less than a majority, but included increased use of post-emergence herbicides, increase in scouting before treatment, increase in use of commercial applicators, banding, and restricted use pesticides • Rates of nitrogen application remained about the same for half for those surveyed, the rest increased or decreased their application. Decreasing rates outnumbered increasing by a ratio of 6:1 • Profitability, agricultural health and safety, and the quality of drinking water remained the farmers' top three priorities. • Econ development to create jobs & improve highways was a lower priority, but increased in importance compared to four years earlier • Concern about the threat of ag chemicals and fertilizer impacts on groundwater declined. • Respondents viewed groundwater pollution problems as less serious on their own farm than elsewhere • The source of information that most influenced farmers' views on problems associated with groundwater and ag chemical use remained farm magazines and newspapers. Personal observation and experiences moved from fourth to second most influential. Educational/research agency reports remained third, and general newspapers and news on radio and television fell from second to fourth most influential source. • Most (81%) of the farmers reported receiving ISU Extension information by reading newsletters or news articles; 76% reported using the information for crop production decisions. • Fifty-five percent of farmers indicated that they were aware of ISU fertilizer and herbicide demonstrations and farm tours, 36% visited the plots; only 32% reported being specifically aware of the integrated farm management demonstration program.	Extension report	Follow-up of previous research
Pflugh, Shaw, Yacovelli, & Hagen (1995)	USA: NJ	• Health risks of water pollution	• Recreational Water Users • Ethnic Groups • Young people	• Information	NJ Dept of Env. Protection	Information • Brochures provided at shops and in-person at events • Signs • Ads in publications	Needs assessment that identified community leaders & assessed their knowledge & concerns through a phone interviews & meeting discussions. Resulted in initiatives that were evaluated mid-project. R: WEAK [15.5] A2, B3, C1.5, D4, E2, F3	N/A	• To design and test a community-based outreach program about local fish advisories	• Awareness of fish consumption advisories	• Program was not reaching some sectors of the communities, e.g. -non-English speaking residents -people of low economic status -subsistence fishers	Conference proceedings	ASFA {i241}

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Poe, van Es, VandenBerg, & Bishop (1998)	USA: NY & WI	• Water quality	• Households	• Communication	• Researchers	Information • well-testing results feedback • fact sheet specific to well test results	Pretest & posttest in two area studies R: STRONG [7.5] A1, B1, C1.5, D2, E1, F1	(Before and after intervention) Perception of health risks before and after well-test intervention	• To demonstrate that households update their exposure and health risk perceptions based on test results and associated information provided by well-water testing & education programs	• Perceived safety of exposure to water contaminants	• Individuals use nitrate testing results and interpretive information to update their exposure and safety perceptions • Individuals who had not previously tested their water place more weight on the new information.	Soil & water conservation	CC {I319}
Pompelli, Morfaw, English, Bowling, Bullen, & Tegegne (1997)	USA: TN	• Water quality • Soil conservation	• Farmers	• Farm structure	• Soil Conservation Service (SCS) agents • Extension agents	N/A	Personal interviews of farm operators in three TN watersheds, and collection of their farm characteristics. R: MODERATE [11.5] A1, B(1), C3.5, D4, E1, F1	(Population A to B to C) Farmers in East Tennessee to farmers in Middle TN to Farmers in West TN	• To analyze audience (Audience analysis)	• Perceived "usefulness" of soil conservation information from the SCS	• Personal contact by SCS personnel, extension service personnel, or both have a positive effect on the likelihood that a TN farm operator is going to consider SCS soil conservation information useful. • Influence of information differs across regions within state.	Production Agriculture	Agris {d126} WRA {D203}
Randhir (1999)	USA: MA	• Water quality	• Decision Makers, Local	N/A	N/A	N/A	Case examples of model application: R: WEAK [16.5] A1, B3, C3.5, D4, E2, F3	N/A	• To theoretically explore how to address the knowledge gap between scientific information and use in policy decisions	N/A	A model based on landscape and watershed information represents various processes in watershed decisions. The model is postulated to function best when decision-makers and communities are involved in problem definition, identification of important variables, collection of local information, identification of essential constraints, development of multi-objective framework and evaluation of the results	Science & policy	CC {I262}
Ransley (2003)	USA: WA	• Water quality • Water quantity • Aquatic habitat	• Landowners	• Social Marketing • Sustained Engagement • Outreach Continuum	State agency staff	Information • direct mailing Education • workshops Technical Assistance • one-on-one, on-site consultations	Audience analysis • Telephone survey • Focus groups • Feedback form • N/I for program evaluation R: MODERATE [14.5]† (A1&2, B2&3, C2.5, D4, E2, F2) † We estimated the strength score by summing the averages of ratings extrapolated from the limited description of the study	N/I	• Audience analysis • Program evaluation	• Participant progression through outreach continuum• Known BMP implementations • Program service feedback	• Using an integrated programmatic emphasis on a particular audience helped achieve a better progression compared to a continuum. • Good targets lead to good results (know your audience). Determine and profile ready and willing residents• Identify road blocks to change and learning: a) where to get information and how to get it; b) constraints, such as lack of information, time constraints, how to make an impact; c) distrust of government assistance and leniency by regulators; d) gender difference in application of BMPs • Stewardship for children is a motivator• Get audience attention, provide the information they want, maintain core theme, overcome demotivators, and focus on audience values of trust, time, financial affects, family, peer pressure, and tangible outcomes. • Keep the goal in mind• Integrate education strategies to help participants move to the next level of the continuum. • Evaluate and adapt before, during, and after education or outreach intervention.	Conference proceedings	Elaine

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Rhodes, Leland, & Niven (2002)	New Zealand	• Riparian management	• Farmers	• Information and incentive	• Various but specific list not provided	No specific education practice studied	• Post-intervention survey • Simple correlations between: a) receipt of information & intent to act b) receipt of money or knowledge of potential to receive money & intent to act R: STRONG [10.5] A1, B3, C2.5, D2, E1, F1	(Specific to a general population) • Exposure to information & intent to act and • Between knowledge of, or receipt of, funding & intent to act	• To determine if informing farmers about riparian management has any effect on adoption of specific riparian management measures	• Receipt of information • Receipt of financial assistance • Intent to act	Economic determinants appear to override environmental ones for farm practices. Economic determinants include: • Immediate financial constraints • Long-term profitability of management options.	Environmental Management	Current Contents {D56}
Ribaudo & Horan (1999)	USA	• Water quality	• Farmers	N/A	N/A	Education Economic • Economic/Profit • Technological improvements	Conceptual assessment using economic model & interpretation using conclusions of extant research: Authors did not use sampling & data collection in research. R: WEAK [19.5] † A3, B3, C3.5, D4, E3, F3 † lowest possible score for original research	N/A	• To provide a general indication of how effective educational programs might be in improving water quality	N/A	• Educational programs will only be effective in improving expected water quality levels if the information provided to producers encourages them to take actions that lead to water quality improvements. • The conditions for education to be effective exist when: a) actions that improve water quality also increase profitability, b) producers have strong altruistic or stewardship motives, or c) on-farm cost of water quality impairments are shown to be sufficiently large. However, none of these three conditions guarantees an expected improvement in water quality.	Agricultural Economics	AGRICOLA {c26}
Ryan, Mathew, Anda, & Yuen (2001)	Australia: Western Australia	• Water quantity (conservation)	• Ethnic Groups • Teachers (K-12) • Students, K-12 • Households • Gov't agency professionals	InformationCommunicationEducation	Remote Area Development Group, Murdoch University, Australia	Education • Workshop Information • Video • Booklet	R: WEAK [16.5] A2, B3, C2.5, D4, E2, F3	N/I	• Program evaluation	N/I	• On-site measurements and workshop discussions identified unique needs of the studied rural population • Taking a broad approach to delivery of educational practices is beneficial. • When taking a broad approach, activities should include hands-on activities. • Water-conservation training on communities should include community members, essential service operators, environmental health workers, administrators, teachers, and regional service providers • Information on water conservation should be included in school curricula so that children become aware of the need for water conservation and can grow up with the correct perceptions of water and its use. • The best way to convey water conservation techniques for these audiences is through hand-on training and talking through questions in a workshop style.	Water science & technology	CC {l146}

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Ryder & Swoope (1997)	USA: WA	• Stream channel quality	• Students, Higher Education	Education	Washington State University	Education • team building • site restoration project	Pretest-posttest using census of participating students R: STRONG [10] A2, B2, C2 & C5, D2, E1, F1	(Cohort A to B) • Natural resource students to landscape architecture students	• To evaluate a cross-disciplinary, university course for formative purposes	• Perceptions of working in teams • Perceptions of usable • Perceptions of knowledge of riparian ecology	Landscape architecture students were teamed with natural resource students to learn about riparian restoration while they designed the technical specifications for rehabilitation of a deteriorate ed stream channel • Landscape architecture students caught up with natural resource students in knowledge level • Both groups improved equally in riparian restoration skills • Landscape architecture students were more positive about their ability to work in a group • Student groups had different perceptions of what they could bring to a project.	Natural resource and life-science education	AGRICOLA {f165}
Salamon, Farnsworth, Bullock, & Yusuf (1997)	USA: IL	• Sustainable agriculture	• Farmers • Farm families	N/A	N/A	N/A	Cross-sectional study with control using semi-structured interviews and on-farm observation of a representative sample (of a relatively small number) of sustainable farm families R: MODERATE [12.5] A2, B3, C3.5, D2, E1, F1	(Characteristics of farm families in cohort A to cohort B, control) families using sustainable farming practices to families using conventional farming practices	• To analyze audience (Audience analysis)	• Farm characteristics -social & cultural characteristics -physical characteristics of property -detailed production information -economic information	• A paradigm shift did not occur among the sample when adoption of sustainable farming systems took place. • Families using conventional farming practices and characterized by prudence, a dislike of chemicals, an inclination for experimentation, and related traits are potentially those best targeted with educational programs. • Perceptual differences about the same traits are barriers to adoption of sustainable practices among the farm families characterized above.	Resource conservation (soil & water)	WRA {D201}
Sandness (2002) (U.S. EPA)	USA: ND	• Water quality • Nonpoint source pollution	• Students, K-12 • Teachers (K-12)	N/I	N/I	Information • tours • presentations • demonstrations Education • outdoor activities	N/R	N/I	N/I	N/I	N/I	Government agency report	AGRICOLA {I38}
Schwartz, Waterman, Lemley, Wagenet, Landre, & Allee (1998)	USA: NY	• Water quality	• Homeowners	• Education planning	Cooperative Extension	N/A	Random sample audience analysis involving: septic system site inspections, water quality testing, & written questionnaires & interviews of homeowners in three rural NY counties R: MODERATE [11.5] A1, B1, C3.5, D2, E2, F2	(Population A to B to C) Compared counties with different median income and education levels	• To assess the status and condition of private water supplies & septic systems in several rural communities • To develop a better understanding of the knowledge, perceptions, and practices of homeowners concerning their water supplies and septic systems	• Income • Education • Water quality • Characteristics of water supply • Characteristics of septic system • Homeowner knowledge & perceptions	• Results suggest a relatively high level of false assurance on behalf of rural residents regarding the quality and safety of their private drinking water supplies. • Socio-demographic factors may affect the ability or decision of homeowners to seek help from the health department or use the services offered by a testing lab. • High income/high education communities were more likely to have applied good practices, such as testing drinking water, pumping septic systems	Soil & water conservation	WRA {D188}

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Shaffer & Meade (1997)	USA: VA	• Water quality	• Loggers	N/I	Instructors from VA Tech Dept. of Forestry`	Education	Post intervention comparison of loggers randomly assigned experimental and control groups R: STRONG [9.5] A2, B1, C2.5, D2, E1, F1	(Performance of experimental cohort to control cohort) Performance of Trained loggers (experimental) to untrained loggers (control)	• To evaluate the impact of harvest planning training and the preparation and use of written timber harvest plans on BMP compliance, landowner satisfaction, and weather-related downtime	• Compliance with written harvest plans • Landowner satisfaction • Number of scheduled harvest days missed due to weather related downtime	• Trained loggers achieved a higher mean score than control group loggers in BMP implementation and landowner satisfaction, and had less weather-related downtime, but both groups had high BMP implementation scores • Extensive logger training in the area may have led to increased performance for all groups -- trained and non-trained • Training evaluations indicated that loggers felt that they had improved their planning ability and planned in more detail NOTE: Results are not generalizable due to small sample	Forest products (resource management)	AGRICOLA {f156}
Shay (2003)	USA: TX	• Water quality	• Homeowners • Gardening retailers	Social marketing Tech transfer	• Grow Green Program staff	Information • point of purchase fact sheet distribution to homeowners • bimonthly fax alerts for sales staff Education • in-house video training of sales staff • homeowner soil tests • neighborhood and staff meetings and trainings	Case description R: WEAK [18.5] A3, B3, C3.5, D4, E2, F3	N/A	• To describe "Grow Green" program	• Number of fact sheets distributed • Number of Website hits • Number of neighborhood residents who changed their lawn care practices	• "Grass roots" research project • Used information about fertilizer runoff (nitrate, phosphorus, potassium) and neighborhood soil test to develop research question about appropriate products. • University scientists compared fertilizer treatment options • Fertilizer recommendations changed and were promoted • Good BEP application	Conference proceedings	Elaine

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Shepard (1999)	USA: WI	• Water quality (nonpoint source pollution in watersheds)	• Farmers	• Information • Communication • Education strategies	local, watershed-based educators	Communication • One-on-one information transfer (northern): -on-farm visits -individual farm trials -individual farm consultation -work with local COOP agronomists from the watershed's three main farm supply dealers • Diffuse approaches (southern) -working with influential "peer" farmers -working with watershed citizen advisory committee -working with news media -working in schools -farm tours -farm field days -watershed events Education • on-farm demonstrations Information • project newsletters	Pre-intervention/ post-intervention comparison of two projects in two Wisconsin watersheds (without control) Responses from 75% of watershed farmers in baseline (pretest) measure of field conditions and nutrient management Random sample of 75% for post-intervention, follow-up surveys of farm management behaviors R: STRONG [8.5] A1, B1 & B3, C1.5, D2, E1, F2	(Practice A to B) (Population A to B) • Diffuse communication campaign to one-on-one information transfer • Farmers in southern WI watershed to farmers in northern WI watershed	• To compare the effectiveness of two education practices (diffuse communication campaign to one-on-one information transfer)	• Rate of adoption of nutrient management strategies	Compared outcome of outreach work in two watersheds. One emphasized one-on-one communication, the other emphasized work with influential peers, events and media. • Both watersheds had reductions of excessive nitrogen application, but the reduction in the north was statistically significant • The north had a significant reduction of phosphorous • Northern farmers were more likely to use nutrient crediting and increased soil testing; southern farmers had no change in crediting behavior and a modest increase in soil testing • Northern farmers reduced nitrogen purchase by 26-32%; southern farmers by 1% • Both watersheds showed an increase in environmentally beneficial practices	Extension	AGRICOLA {c15}

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Siemer & Knuth (2001)	USA	• Water	• Recreational Water Users • Students, K-12	Education	• Agency professionals • Partner organization professionals	Information • no specific info provided Education • no specific info provided Capacity building • no specific info provided	One-shot survey of non-random sample w/ control R: STRONG [9.5] A1, B3, C2.5, D1, E1, F1	(Program A to B) Full to partial programs	• To provide quantitative information about the effects that fishing education programs have on the antecedents of environmentally responsible behavior	• Fishing interest • Participation in fishing • Fishing knowledge • Fishing skills	• Participation in fishing can influence entry-level stewardship variables. • Use of the full Hooked on Fishing Not on Drugs program is more likely than a partial programs (with no fishing activities) to influence entry-level stewardship variables including environmental sensitivity (more likely to want to fish more; high importance to thinking about or going fishing; more likely to believe their skills were strong and that their skills had improved; higher overall knowledge of fishing and specific concepts such as those related to ecology or regulations; believed their understanding had increased) • Full programs were more likely to stimulate some ownership level stewardship skills (how humans affect fish; importance of caring for habitat) • Neither group was confident about some ownership level stewardship skills (whether their actions affected the environment; whether it was their responsibility to take action to protect the environment; what they could do personally) • Students in full programs were more likely to know to: fish without bothering others; limit impact on the environment while fishing; learn things they can do to help • Because students in control group fished and few full programs involved multiple fishing experiences, it is difficult to draw definitive conclusions about the affect of full programs on environmentally responsible behavior compared to the control group.	Environmental Education	Elaine
Sommers & Napier (1993)	USA: OH	• Water Quality	• Farmers • Ethnic Groups	• Diffusion of Innovation • Farm Structure model	N/A	N/A	One-shot measure (with control) of a systematic, random sample using structured interviews. R: STRONG [9.5] A1, B1, C3.5, D2, E1, F1	(Cohort A to B) Amish to all other farm owner-operators	• To analyze audience (Audience analysis)	• Characteristics of primary farm operator • Beliefs about farm-related ground-water pollution	• Characteristics and beliefs of primary farm operator are somewhat useful in differentiating Amish and non-Amish farmers. • Both cohorts are somewhat willing to participate in educational programs designed to reduce application rates of pesticides. • Both cohorts are willing to adopt lower application rates if it can be demonstrated they would achieve the same level of output. • Both cohorts are basically unaware of the extent of ground-water pollution in their counties. • These findings question the commonly held belief that Amish people are unaware of contemporary environmental issues due to their social isolationism.	Rural Sociology	AGRICOLA {f414}

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Stanley (1992)	USA: FL	• Water quality	• Farmers	N/A	Local Coordinating Subcommittee including: • Agricultural Stabilization & Conservation Service county director • County CES water quality specialist • South FL Water Management District representative.	Communication • One-on-one contact with potential participants • Farmer meeting Information • Articles about Rural Clean Water Program (RCWP) in news media & agency newsletters	Description & critical reflection on single program R: MODERATE [15] A2, B3, C2, D4, E1, F3	(Practice A to B to C) Strategies for encouraging participation in RCWP	• To assess strategies for inducing farmer participation	• Number of farmers under contract for implementation of BMPs	The most successful strategy was one-on-one contact with potential participants.	RCWP national symposium	AGRICOLA{e 87}
Stepenuck (2002) (U.S. EPA)	USA: WI	• Water quality • Nonpoint source pollution	• Neighborhood organizations • Service clubs • Env./ conservation NGOs	N/I	• Extension agents • Government agency (DNR) professionals	Education • activities -storm-drain stenciling -river clean-ups -river & stream monitoring	Program evaluation R: WEAK [16] A2, B3, C2, D4, E2, F3	N/I	• To evaluate effectiveness of educational activities	N/I	N/I	Government agency report	AGRICOLA {I38}
Stride, Seed, & Thompson (1995)	Canada: ON	• Water quality	• Gov't agency professionals • Business and Industry Water Users • Citizens (partnerships)	N/A	Ontario Ministry of Environment and Energy	Capacity building	Only the abstract was available N/I	N/A	N/A	N/A		Conference proceedings	ASFA3 {I140}

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Talsma (2001)	USA: MI	• Water quality	• Teachers (K-12)	• Action research/ community problem solving	• Teachers	Education • hands-on, real-world classroom applications • problem-solving skills • data interpretation & analysis skills • use of an interdisciplinary approach to a topic	Interviews, focus group, & mail survey to census of teachers who had participated in the Rouge Education Project Program (REP) (Note: 26 of 85 teachers participated in the evaluation) R: MODERATE [14.5] A2, B2, C2.5, D4, E2, F2	N/A	• To determine if the program was meeting its goals and objectives • To determine program affect on participating teachers and students • To formulate recommendations about how the program might be strengthened and expanded	• Teacher objectives • Teacher experiences • Teachers perceptions	• More than half of the teachers used the full 10 days of curriculum; water quality testing was the most widely used component, community surveys were the least used component • 84% of schools logged into computer conference but some only logged data • 77% of teachers reported behavior changes in their work including modifying curriculum exchanging text books for real world activities, and initiating small group collaboration • Half of the teachers did not report the student action component • 71% of teachers noted that the program effectively increases student knowledge base about the watershed • Students and teachers have successfully enacted small- and large-scale environmental change across the Rouge River basin • Students and teachers have become more actively involved in other activities sponsored by Friends of the Rouge. • Teachers and students benefit from professional development that provides teachers with awareness, knowledge, and skills to overcome perceived program barriers • Explosion of WWW has facilitated program conferencing among teachers and eliminated many of the logistical challenges of classroom computer use.	Environmental Education	Elaine
Trede & Miller (2000)	USA: IA	N/A	• Farmers	• Development Theory • Principles of Adult Education	N/A	N/A	Self-administered mail survey of a purposive sample R: WEAK [15.5] A1, B3, C3.5, D4, E2, F2	N/A	• To establish baseline information on learning styles of Iowa farmers • To determine their preferred learning modes for selected agricultural topics • To determine the perceived effectiveness of selected learning activities and the impact of learning styles on the learning activities	• Kolb Learning Style Inventory (LSI)	• When tested for learning style preferences, survey Iowa farmers preferred: -'Active Experimentation' for learning about physical farming resources, e.g., land, crops, livestock, machinery, and buildings -'Abstract Conceptualization' or 'Reflective Observation' for leaning about topics requiring more critical thinking, e.g., markets and prices, whole farm planning, and financial management. • About half of responding farmers were identified as having the "assimilator" learning style. The assimilator focuses on abstract conceptualization and reflective observation when learning • Education providers need further understanding of farmers' learning styles and their preference for use when learning about different agricultural topics.	Conference proceedings	Elaine
Tsuji & Nieboer (2001)	USA: NC	• Lead exposure (contamination)	• Households -Families -Preschool children	• Principles of youth education • Principles of adult education	• Researchers -researchers educated parents -parents education children	Education • Workshop • Parent workbook • Home information leaflet • "Lead Commander" cartoon book with exercises	Research Critique of study by Marlowe & Trathen (1996)	What Marlowe & Trathen (1996) could have done vs. what they did	• To critique prior research by Marlowe & Trathen (1996)	N/A	Critique of study reported by Marlowe and Trathen (1996) • Overstated lead poisoning in children • Used hair lead levels rather than more reliable blood lead biomarker • Did not control for use of multiple labs for toxicological analyses • Could have used better measures for assessing behavior • Sample size was too small	Environmental Education	TOC browse of last 10 years of The Journal of Environmental Education (November 2002)

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Tucker & Napier (2001)	USA: Midwest (OH, IA, MN)	• Perception of risk associated with agricultural chemicals	• Farmers	• Social learning • Risk perception • Farm structure	N/A	N/A	Structured-questionnaire survey of systematic random samples of farmers in three Midwest states R: STRONG [9.5] A1, B1, C3.5, D2, E1, F1	(Population A to B to C)	• To analyze audiences (Audience analysis)	• Perceived risks of using agricultural chemicals	Farmers: • Perceived low to moderate risk associated with agro-chemical use. Farm applicator and human health had highest level of perceived risk • View soil and water conservation information as moderately important to management decision-making • Judged other farmer's use of chemicals as posing a significantly greater risk than their own use of chemicals • Perceived little or no risk to watersheds for the 5 hazards assessed • Assess ag-chemical risks in the context of localized situations. • Farmers who viewed soil and water information as an important management tool were more likely to perceive higher levels of risk from ag chemicals • Farmers probably viewed their own use of chemicals as "voluntary, familiar and controllable" whereas non-farm consumers would view it as partially familiar, involuntary and uncontrollable	Rural Studies	AGRICOLA {i13}
U.S. EPA (2002)	USA	• Water quality • Nonpoint source pollution	Multiple • Ranchers • Decision Makers, Local • Homeowners • Landowners with on-site sewage treatment systems • Students, K-12 • Adults • Teachers • Soil and water conservation districts • Colorado residents • Zoo guests	for individual program reports, see listed authors with “U.S. EPA (2002)” after their names	for individual program reports, see listed authors with “U.S. EPA (2002)” after their names	for individual program reports, see listed authors with “U.S. EPA (2002)” after their names	for individual program reports, see listed authors with “U.S. EPA (2002)” after their names	for individual program reports, see listed authors with “U.S. EPA (2002)” after their names	for individual program reports, see listed authors with “U.S. EPA (2002)” after their names	for individual program reports, see listed authors with “U.S. EPA (2002)” after their names	for individual program reports, see listed authors with “U.S. EPA (2002)” after their names	Government agency report	AGRICOLA {I38}

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Varlamoff, Florkowski, Jorday, Latimer, & Braman (2001)	USA: GA	• Water quality	• Homeowners	• Education planning	Extension education material	Education • Best management practices (BMP) manual	RDD telephone survey R: MODERATE [13.5] A1, B1, C3.5, D4, E2, F2	N/A	• To learn about homeowners': -use of fertilizer and pesticide in maintaining their landscapes -expectations regarding the appearance of their lawns -current gardening practices	• Fertilizer & pesticide application • Gardening practices	• The proposed best management practices (BMP) manual, intended for training gardeners in Georgia, must address the currently observed behavior regarding the use of garden chemicals. These include a high percentage of self-applying practices in a year-round growing season. Since fertilizer and pesticide application practices are complex due to changing weather effects, homeowner training needs to include differences in warm and cold season plant varieties, for example. • Homeowners were found to be receptive to the dissemination of practices reducing the threat of environmental pollution, lowering the maintenance cost and reducing their workload, while conforming to neighborhood norms.	Horticulture	AGRICOLA {f62}
Voege & Wagner (1997)	USA: CA	• Watersheds • Forest lands	• Landowners • Forestry professionals • Gov't agency professionals • Soil & water conservation districts	• Principles of Adult Education	N/A	N/A	Audience analysis • Interviews • Focus groups R: WEAK [17.5] A2, B3, C3.5, D4, E2, F3	N/A	• To determine how and why landowners learn	• Landowner: -demographics -self assessments -information needs & preferences -understanding of the term 'watershed'	• Workshop participants indicated that landowners often feel misunderstood, distrusted, and not respected. An education process based on mutual understanding, trust, and respect that leads landowners to choose to comply because they see it in their best interest would be more effective than regulatory controls. • Agency goals — landowners did not understand the goals of agencies that regulate landowners; goals from one agency appeared to conflict with goals of another; goals did not seem in the best interest of landowners • Agency terminology — landowners are unsure of how terms such as conservation, stewardship, watershed and management affect their land use, In particular, the term "watershed" is not seen as a place and is not seen as a place which relates to a location on their property. • Resources Conservations Districts have characteristics that are effective with landowners. The RCD has a board, has a written annual plan, reports regularly to stakeholders. • Landowners cared about preservation, restoration, mitigations and management • Landowners are motivated to learn when: they can increase their sense of control, are given choices, and see a practical benefit demonstrated • Landowners are looking for how to manage specific site conditions, economic incentives, basic technical information, private property rights • Landowners prefer to get their information from an agency representative, demonstrations and field trips, bulletins and fact sheets, newspapers and magazines	Department report	Word of mouth

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Wagenet, Pfeffer, Sutphin, & Stycos (1999)	USA: NY	• Water quality	• Households	• Principles of adult education (Bloom's taxonomy)	• Researchers	Information • materials made available to audience -fact sheet series -concluding videotape	Post-intervention survey & analysis with two controls R: STRONG [7.5] A1, B1, C2.5, D1, E1, F1	(Intervention Population to Control) differences in knowledge, application, and evaluation of groundwater by experimental group vs. control groups	• To determine the effectiveness of a watershed educational program in stimulating subject learning and understanding of distributed educational material	• Knowledge of local watershed (recall of watershed facts) • Application of knowledge (how they link different watershed components to watershed protection) • Evaluation (judgment of their relationship to the common watershed resource) (Where knowledge, application, & analysis are levels in Bloom's taxonomy)	Self-directed education materials were sent to people in pilot towns participating in whole community planning • Respondents who received the materials were more likely to be highly active and informed compared to those who did not receive the materials • Individuals who fully used the education materials were more knowledgeable about specific fact-related watershed issues presented in material than those who partially used them or did not receive them. • Recipients who did not fully use the materials were less likely to display favorable attitudes toward broad-scale watershed concepts • Knowledge level was positively and significantly related to individual application of knowledge	Water resources	WRA {B11}
Watson, Murphy, Kilfoyle, & Moore (1999)	Australia	• Water conservation	• Households • Parents • Teachers (K-12) • Students, K-12	• Noneconomic social sciences	Water utility sponsored education programs & material	Information • large-scale TV add campaigns Education • materials • curriculum support for schools	Matrix study (three cross-sectional studies conducted on repeated stratified random samples over seven years) R: STRONG [7] A1, B1, C1, D2, E1, F1	Behavior-change factors A and B to C Information & education programs to price structuring as management strategies for reduction of domestic water consumption	• To see whether or not water conservation is affected by changed management strategies	• Knowledge • Attitudes • Behavior intentions • Reported Behavior	• Survey instrument stability was established and could be used to measure the effects of future water management strategy changes • The studied factors did not account for much of the variation in reported behavior. There were no or weak correlations between attitudes, knowledge and behavior. There were weak correlations between attitudes and behavior intentions and between behavior intentions and reported behaviors. • The first phase measurement which occurred after an education and media campaign had a stronger effect on water conservation gain than the 2ond 3 years or the last year. • TV was cited as a major influence during the education and media campaign, but remained important even after the campaign was over • The "user pays pricing structure" of the 2ond 3 years maintained the gains of the first 3 years, but may not have built sustainable support. Cost was cited as a major influence. • Youth knowledge scores increased over time, but youth groups did poorly in "reported behavior" in all aspects of the study. • While the study contributed to understanding change in domestic water use, the amount of unexplained variation in behavior indicates the need for further study of other variables.	Population & environment	CC {I287}

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Wolf (1995)	USA: WI	• Water quality	• Landowners	N/A	N/A	N/A	Reports on 11 watershed studies that assess: • Changes in water quality • Program participation • Institutional effectiveness R: WEAK [16.5] A3, B3, C3.5, D4, E1, F2	$$ expenditures to changes in water quality	• Program evaluation	• Change in water quality (pollution load reduction) • Level of landowner participation (participating landowners relative to total eligible) • Institutional effectiveness	• "Education" is mentioned as part of "program "participation" criteria but was not tested or evaluated separately • Evaluations of individual priority watersheds make clear the lack of any substantive improvement in water quality; Micros studies showed local improvement, but there was no watershed level improvement • Participation levels, ranged from 0 - 100% depending on the watershed; 75% participation is needed to show a difference. In some areas there were noncompliance issues with "participants" thus reducing potential impact • The low level of participation in the voluntary nonpoint source program is the weak link in the administrative chain between program implementation and better water quality. • By all accounts, the Wisconsin NPS program is a well-designed and far-reaching, cutting edge program that seems to exemplify the limited affect a voluntary program can have on water quality.	Water resources	Agris {c80}
Wood (2001)	USA: Chesapeake Bay area	• Watershed ecology	• Teachers	• Principles of adult education	N/I	Education • Chesapeake Watershed Ecology course (highly concentrated — 6 hours/day for two weeks)	Pretest & posttest with control using census of course participants R: MODERATE [11.5] A(2), B2, C1.5, D1, E2, F3	(post-intervention to before) Skill performance after intervention compared to performance before	• To evaluate an environmental professional development course using Stake's Countenance Model as the organizational framework	• Teacher background • Appropriate curriculum • Resource availability • Program component participation • Course choreography • Behavioral interactions • Performance improvements • Teacher attitudes • Teacher intent to use course components • Unexpected outcomes	• Course -Successfully applied an evaluation method which looked at "antecedents" and "transactions" as well as outcomes. These were measured against intents, observations, standards, and judgments. This allows identification of reasons and consequences for observed effects. -Summative: Nine out of ten course measures exceeded their preset criteria standards. Only 'Unexpected Outcomes' fell below the criterion level for the course as a whole. Based on results of the summative assessment, the researchers concluded that the Chesapeake Watershed Ecology course was effective and worthy of continued implementation. -Formative: • Make sure necessary instructional resources are appropriate and functioning. Inappropriate or ill-functioning instructional resources can alter the intended instructional experience and affect audience opinions. • Adapt the curriculum to accommodate the various abilities and interests of the audience. • Significant gains in learning influence teacher intention to use the knowledge and materials in future endeavors. Specifically, new science skills and pedagogical knowledge gave teachers the professional confidence to expand their curriculum. • Curriculum activities must be feasible for the intended setting and context (for example, teachers could not conduct deep water studies with their students because of lack of access to deep water)	Environmental Education	TOC browse of last 10 years of The Journal of Environmental Education (November 2002)

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Zint, Kraemer, Northway, & Lim (2002)	USA: Chesapeake Bay area	• Chesapeake Bay ecology	• Students, K-12	• Environmental Behavior change	• Teachers	Education • 1- & 3-day field trips • 2-week summer field trips • catch-of-the-bay model curriculum for ages 11-18 • 2-day teacher workshops • In-school shad restoration program for ages 11-14 • 5-day field, in-services for primary and secondary teachers	pre-, post-, & retention tests for youth and teachers with control (1998 prgrm) Activity log maintained by teachers (1998 prgrm) Mail survey of participants in programs prior to 1998 Random samples & convenience samples R: STRONG [7.5] A1, B1 & B3, C1.5, D2, E1, F1	Program A to B to C . . . Results of Chesapeake Bay Foundation's 1&3-day field trips to 2-week summer field trips to catch-of-the-bay curriculum to	• To evaluate Chesapeake Bay Foundation conservation education programs	• Knowledge change • Change in environmentally responsible behavior • Teachers' assessments of effects	Pre and post surveys evaluating the impact of youth and teacher education initiatives in the Chesapeake Bay area. Youth initiatives included a 2-week field trip, a 3-day field trip, a 1-day field trip, a shad restoration project, and classroom use of a curriculum. Teacher programs included a 5-day summer field course and a 2-day school year curriculum training. • Findings seem to confirm that education programs need to be focused, provide multiple experiences over extended periods of time, and be coordinated with other interventions to reach their full potential in promoting Environmentally Responsible Behaviors (ERB). • Each of the nine ERB characteristics (knowledge of issues, skill in actions, knowledge of ecology and actions, group locus of control, intention to act, environmental sensitivity, personal responsibility, individual locus of control) was affected by at least one of the five programs, with all groups increasing in knowledge of issues. • Curriculum groups scored higher than comparison groups on only knowledge of issues. This result may be explained in part by the fact that teachers used only about one third of the recommended activities and few implemented the recommended service-learning project. • Programs that showed an impact with a large number of ERB characteristics should have also led to an increased intention to act, but not all did. This suggests that further research is needed to test the Hungerford and Volk model (1990). • Personal responsibility and locus of control improved only among field trip participants. This suggests that programs are not providing youth with enough opportunities to develop self-confidence in their abilities. • It is likely that some youths' ERB increased as a result of participation in outdoor programs, but the results are less clear for the curriculum and restoration project youth. • Teachers who participated in the 5-day field inservice improved in all ERB characteristics. Teachers who participated in the 2-day curriculum inservice improved in all ERB characteristics except environmental sensitivity, not surprising given the indoor setting of the workshops.	Conservation Biology	Elaine

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Zipper & Rockett (1997)	USA: Virginia (SW)	• Water quality	• Business and Industry Water Users • Households • Students, K-12 • Gov't agency professionals • Teachers (K-12)	Education	• VA CES	Education & Outreach • technical workshops Information • publications • field tours	Program evaluation R: WEAK [17] A3, B3, C2, D4, E2, F3	N/I	• To ID factors for Power River Project success	• Financial support for project • Local participation • Demand for educational services	• Powell River Project successfully: -identified problems of local concern -developed and implemented technologies that improved industry ability to protect the environment while achieving cost-effective compliance -generated information of use to clientele for dealing with the problems -built knowledge and support for changes in regulation that paralleled technology changes (such as permission to use coal ask as a soil amendment) • The strong link between Extension and the watershed-specific research of several disciplines is an essential component of Extension education and information programs • The active liaison maintained by the project Extension agent with other Extension personnel and local organizations enables the agent to provide informed input to the research development process.	Extension	AGRICOLA {i21}

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