EVALUATING WATERSHED OUTREACH INTERVENTIONS IN THE LOWER KASKASKIA RIVER WATERSHED

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Abstract

Effective programs (that meet programmatic goals) and efficient programs (which require reasonable effort) have a significant role in encouraging pro-environmental behavior and decreasing non-point source pollution. A missing component of many outreach programs and interventions is evaluating effectiveness and efficiency. This evaluation assessed outreach interventions associated with the Watershed Health Integrated Research project in the Lower Kaskaskia River Watershed in southwestern Illinois, USA. Outreach interventions included a community research team, a website, citizen and leader-focused workshops, and summary reports. Through developing the Model for Integrated Watershed Management Assessment, this evaluation examined the degree to which interventions fulfilled project objectives and the amount of effort required. Objectives-oriented evaluative criteria included taking a participatory approach, tailoring and appraising programs, and informing and empowering communities. Effort-oriented criteria included personnel numbers, hours, and costs. Data sources included correspondence with the project team, pre/post tests, and evaluative surveys. Results suggest that the citizen workshop was the most effective intervention in that it fulfilled all the project objectives, yet it was the least efficient because it required a high level of effort. None of the interventions were clearly more efficient. The community research team, summary reports, and the leader workshop fulfilled some objectives and required moderate effort, while the website fulfilled few goals and required a moderate effort. These findings can help practitioners with limited time and financial resources strategically choose outreach efforts based on efficiency and effort required. Additionally this evaluation further develops the limited field of watershed outreach evaluation.

Table of Contents

List of Tables

List of Figures

I. Introduction

One of the most important ongoing national water quality concerns is pollution contamination from nonpoint sources (Brown & Froemke, 2012). Nonpoint sources include runoff from urban, suburban, and agricultural landscapes and roadways, while point sources are centralized from one point of origin, such as an industrial discharge pipe. Because nonpoint sources are diffuse and largely unregulated, reducing pollution loads requires the involvement of land managers and landowners across an entire watershed. Individuals with a direct impact on the landscape are a critical component of reducing nonpoint source pollution and often a target of education and outreach (Shepard, 1999). This section introduces the topic of education and outreach, sets up the paradigm of integrated watershed management, establishes the evaluation subject and purpose, and presents the rationale of the evaluation. It concludes with a site description of the evaluation subject.

Education and Outreach

Education and outreach are an increasingly important aspect of protecting and managing natural resources (Bjorkland & Pringle, 2001). Outreach often aims to increase participant's awareness and understanding of complex problems and facilitate behavior change among diverse audiences. One way to understand outreach is that it extends research knowledge outside of academic areas. Outreach programs seek to enhance understanding, facilitate dialogue, and promote interpersonal connections among participants (Fien, Scott, & Tilbury, 2001). Education and outreach can happen in many different areas and at different scales. Within natural resources and environmental

outreach, natural resource managers may use outreach programs to educate stakeholders about best management practices, increase volunteerism, and increase public support for management programs (Van Den Berg, Riley, & Dann, 2011). An education or outreach effort can take the form of an intervention, which is a targeted effort toward changing a situation or behavior and maintaining, altering or creating new patterns of behavior for a specific audience (Ham & Krumpe, 1996). Abrahamse, Steg, Velk, and Rothengatter, (2005) explain that "interventions (e.g. information) are aimed at influencing underlying behavioral determinants (e.g. knowledge), which in turn are believed to influence behavior" (p. 275). Through a meta-analysis, Zeleny (1999) found that educational interventions could increase pro-environmental behavior. To increase pro-environmental behavior, researchers and natural resource managers are incorporating stakeholder involvement, education, and outreach interventions at the watershed scale within the context of integrated watershed management.

Integrated Watershed Management

Integrated watershed management is defined as "an integrative way of thinking about human activities on a given area of land (the watershed) that have effects on, or are affected by, water… [It] includes a set of tools or techniques—the physical, regulatory, or economic means for responding to problems or potential problems involving the relationship between water and land uses" (Brooks, Ffolliott, Gregersen, & DeBano, 2003) (p. 4).A watershed is the physical land area from which dissolved materials, sediment and water drain from an outlet into a water body (outlets can be natural or engineered drainage networks). Integrated watershed management offers a paradigm for managing water resources that reflects dynamics of the ecological system.

Ecological degradation and political inefficiencies were some of the primary forces that brought about a sea change in water resources management beginning in the 1980s (Mahler, Seago, Simmons, & Feadale, 2008; Mullen & Allison, 1999; Sabatier et al., 2005) and culminating in an increase of localized watershed planning initiatives in the 1990s (Lant, 2003; Lant, 1999).

Globally, the concept of regional catchment basins has existed since ancient times, however connecting ecological realities with resource management lagged behind (Borden, Cline, Hussey, Longsworth, & Mancinelli, 2007). Lant (1999) remarks, "the successes of the 20th century have left a list of complex, site-specific water resource problems that federally-funded engineering and federally-administered technological regulation is ill-designed to address" (p. 483). Even while the Clean Water Act of 1972 and the United States Environmental Protection Agency (EPA) recognized the value of regional watershed planning, actually enacting planning and policy-making according to hydrologic boundaries floundered due to obstacles such as political inertia, state's rights, and lack of institutional transformation (Borden et al., 2007; Lant, 2003).

Ecologic and hydrologic characteristics of traditional water resources management emphasized structural engineering for navigation and flood control, and centralized treatment of drinking and wastewater (Lant, 2003), as well as identifying and limiting point-source pollutants from entering the system (Mullen & Allison, 1999). The fallout of this focus is a long list of "profound problems" (p. 21) including chemical contamination, ecosystem simplification, erosion and sedimentation, excessive water withdrawals, exotic species introduction, and overfishing, to name a few (Lant, 2003). Characteristics of integrated watershed management include considering watershed-wide

pollutant sources, interactions and integrating those with land use and landscape patterns (Alder, 1995).

Political characteristics of traditional water resources management include federally funded, top-down hierarchal systems based on arbitrary political boundaries that ineffectively deal with boundary-crossing nature of water. Furthermore, traditional water resources management has been agency or expert driven and criticized for lacking democratic legitimacy, promoting competition for scarce freshwater resources, and failing to meet requirements for Total Maximum Daily Loads (Sabatier et al., 2005). In contrast, characteristics of integrated watershed management include being "decentralized, local, and stakeholder driven" (Borden et al., 2007, p. 92). Examining watershed management in Alabama, Mullen and Allison (1999) found that the more locally driven the approach, the greater degree of short and long-term success in preventing pollution, engaging the public, and delivering community-based environmental protection. Integrated watershed management has proved to be a vital component of protecting and providing surface drinking water to New York City through coordinating farmer's maintenance of working forests (Germain, Munsell, & Brazill, 2007).

Alder (1995) notes that while integrated watershed management "may be obvious to ecologists, there are significant legal, technical, and institutional barriers to ecosystem and watershed protection" (p. 975), it appears that prescriptions for integrated watershed management are more frequent than implementation due to conflicts such as watershed boundaries, decision-making arrangements, accountability (Blomquist & Schlager, 2005). However, integrated watershed management it is still the most comprehensive and

ecologically sound approach developed to date and attempts to address pervasive water quality and aquatic ecosystem degradation. It is also the basis for much of the current public engagement and outreach related to water resources. As researchers and natural resource managers consider which education and outreach interventions will best influence watershed knowledge and land use behavior in communities, incorporating objectives-oriented evaluation and effort-oriented evaluation can assist in determining the effectiveness and impact of education and outreach programs.

Evaluation Subject, Purpose, and Rationale

The purpose of this thesis is to evaluate the outreach interventions implemented as part of the Watershed Health Integrated Research project. Specifically, this evaluation seeks to use an objectives-oriented approach to determine which interventions met Watershed Health Integrated Research project goals and to use an effort-oriented approach to determine what level of effort the different interventions require (including costs, personnel, time) to reach diverse stakeholders. The Watershed Health Integrated Research project incorporated watershed scale outreach in southwestern Illinois' Lower Kaskaskia River Watershed (Appendix A). The Watershed Health Integrated Research project was conducted from 2007 – 2010 and used a multi-disciplinary team of hydrologists, social scientists and graduate assistants. The goal of the project was to analyze water resource impairment and assess community capacity for conservation and watershed planning in the Lower Kaskaskia River Watershed. Findings were presented to residents and community leaders through multiple outreach interventions, including a community research team (CRT), integrated website, interactive workshops for community leaders and citizens, and watershed-specific summary reports. These outreach

interventions are the subject of this evaluation. Two research questions drove this evaluation:

1. To what extent did interventions meet Watershed Health Integrated Research project goals, objectives, and criteria?
2. How much effort did each intervention require?

In order to answer to what extent did interventions meet Watershed Health Integrated Research project goals, objectives, and criteria, data were collected using pre/post tests and evaluative surveys which were analyzed using statistical and qualitative analysis as well as criteria assessment. In order to answer how much effort each intervention required, data were collected using personal communication with the Watershed Health Integrated Research project team and analyzed regarding personnel numbers, cost, and time. In this thesis, goals and objects exist on multiple areas, including Watershed Health Integrated Research project goals, outreach intervention goals and objectives, and evaluation goals and research objectives (Table 1).

Table 1. Hierarchy of Goals and Objectives.

Watershed Health Integrated Research Project Goal: • Analyze current water resource impairment and assess community capacity for watershed planning and conservation within seven subwatersheds of the Lower Kaskaskia River.
Watershed Health Integrated Research Outreach Intervention Goals: • Increase awareness and understanding of water quality impairments and potential pollutant sources in the watershed; • Enhance understanding of community capacity needs for sustainable watershed management; • Promote individual and collective action to protect, enhance, and conserve the watershed.
Watershed Health Integrated Research Outreach Intervention Objectives: • Employ a participatory approach to research from study design to outreach; • Develop outreach programs tailored to each subwatershed community's needs for conservation and capacity-building; • Administer outreach techniques that inform and empower diverse community stakeholders; • Appraise outreach programs in each community using pre/post-tests, evaluative surveys, and impact scores.
Thesis Research Outreach Intervention Evaluation Goal: • Systematically describe and judge the worth or merit of the interventions according to objectives achieved and effort extended.
Thesis Research Evaluation Objectives: • Determine to what extent outreach program goals were achieved or not achieved; • Describe and judge the individual interventions against applicable criteria; • Describe the input efforts required by each intervention.

Evaluation is necessary for outreach efforts to reach their transformative potential within watershed-scale management and beyond. However, observing across natural resource programs a lack of an evaluation culture exists, including environmental education, conservation management and water quality outreach programs (Conway, Godwin, Cloughesy, & Nierenberg, 2003; Knapp, 2007). Why this lack of evaluation? Various barriers to conducting evaluation exist, including the challenge of allocating staff time outside of project implementation, providing funding, and identifying well-

implemented evaluation efforts (Alexander, 1965). In addition, there can be a simple lack of concern for evaluation (Shepard, 2002). Without evaluation, programs can remain ineffective at meeting objectives and inefficient at using resources.

This thesis focuses on evaluation in order to improve the effectiveness and efficiency of outreach interventions and to encourage the use of evaluation. Because education and outreach will continue to have a significant role in encouraging pro-environmental behavior and decreasing non-point source pollution, effective and efficient programs (that meet programmatic goals and require reasonable effort) will continue to gain value and importance. This study significantly illuminates objective and effort-oriented evaluation approaches and can help practitioners with limited time and financial resources to choose interventions suitable for their objectives and realistic to their effort capabilities. Additionally, evaluation is an under-utilized component of outreach projects, including watershed outreach projects. Evaluating the Watershed Health Integrated Research project intended to promote evaluation and further develop the discipline of outreach evaluation.

Watershed Health Integrated Research Project Description

The Watershed Health Integrated Research project incorporated watershed scale outreach in southwestern Illinois' Lower Kaskaskia River Watershed, noted with the red dotted line (Figure 1). The Lower Kaskaskia River Watershed is a subwatershed of the Kaskaskia River Watershed, which drains approximately 3,676,928 acres (Illinois Department of Natural Resources, 1999) and includes an estimated 1,060,900 acres (Natural Resource Conservation Service, 2004). The Kaskaskia River Watershed is a tributary of the Mississippi River.

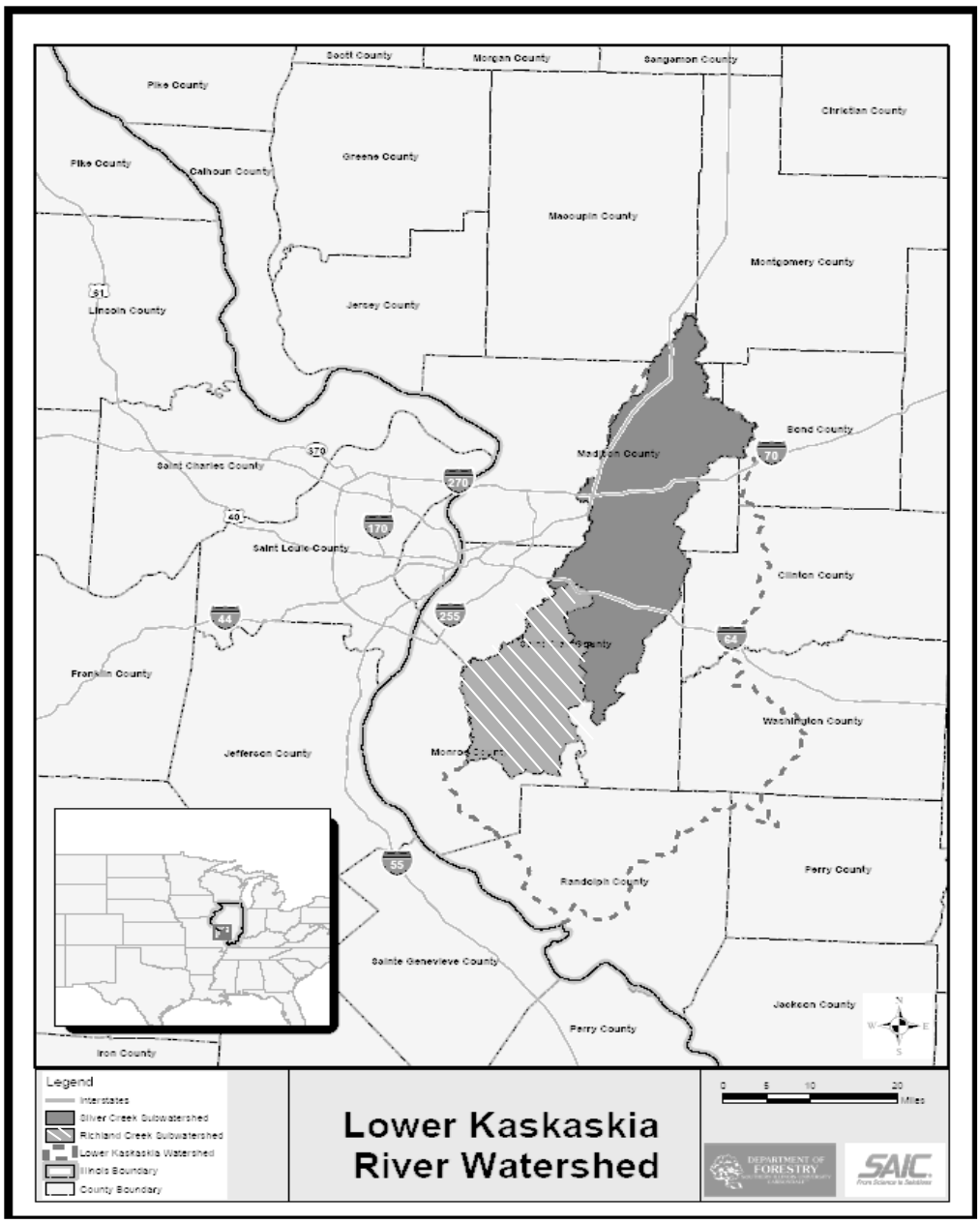

Figure 1. The Lower Kaskaskia River Watershed.

The Watershed Health Integrated Research project used a multi-disciplinary team of hydrologists, social scientists and graduate assistants to study water resource impairment and assess community capacity for conservation and watershed planning the Lower Kaskaskia River Watershed. The team included members from Southern Illinois University Carbondale, Illinois State University, and the University of Minnesota. The

United States Department of Agriculture's National Institute for Food and Agriculture (formerly the Cooperative State Research Education and Extension Service) provided funding through the National Integrated Water Quality Program. The Environmental Protection Agency, the Illinois Department of Natural Resources, and the Southwestern Illinois Resource Conservation and Development (SWIRC&D) Inc. provided further resources and funding. The project focused on two subwatersheds of the Lower Kaskaskia River Watershed: Richland Creek and Silver Creek watersheds. Investigators chose this study area based on local trends in population densities and percent urban land cover, two features that significantly affect water quality. Richland Creek and Silver Creek are comprised of many subwatersheds. Investigators sampled Water quality at 43 subwatersheds, and assessed community characteristics through interviews, focus groups, and a residential survey mailed to residents in six of those subwatersheds.

The goal of the Watershed Health Integrated Research project was to analyze water resource impairment and assess community capacity for conservation and watershed planning. Impairments to water quality raised concern among natural resource professionals, community leaders, and citizens across the region. Agriculture and urban development are likely leading water resource impairments in the watershed (Illinois Environmental Protection Agency, 2002). A prominent land use in the area is agriculture, including primarily soybeans and corn, with some wheat, hay, sorghum, cattle, and hogs (United States Department of Agriculture (USDA) National Agricultural Statistics Service (NASS), 2008). Agriculture can potentially impair streams as precipitation runoff can carry fertilizer, sediment, and other pollutants into streams.

The Watershed Health Integrated Research project categorized subwatersheds based on the percent of urban land cover. (Land cover is the dominant characteristic of the landscape, and differs from land use). The investigators classified 43 subwatersheds into urban, village, or agriculture categories based on the percentage of urban, forest or agricultural land cover (Table 2). In an urban subwatershed, 10-73% of the subwatershed had urban land cover, while a subwatershed classified as village included 2-7% urban land cover, and agriculture subwatersheds included no urban land cover 71-99% agricultural land cover (Friedmann, 2010; Schoonover, Willard, Hwang, & Friedmann, 2009).

Table 2. Subwatershed Classifications and Percentages of Land Cover.

Classification Type (Number of subwatersheds)	Urban Land Cover	Forest Land Cover	Agricultural Land Cover
Urban (10)	10.3-16.4%	0.0-30.4%	15.6-86.75%
Village (12)	2.1-7.3%	0.4-23.4%	71.1-93.9%
Agriculture (21)	0.0-0.2%	0.6-29.0%	70.7-99.6%

Increasing population densities is another important feature of the region. The Lower Kaskaskia River Watershed is represented by the counties of Madison, Monroe, and St. Clair, all of which have experienced recent population growth: 3.9 percent in Madison, 18.8 percent in Monroe, and 2.4 percent in St. Clair from 2000-2008. In addition, most of the watershed's major cities grew in population between 1990-2008, including more than 20 percent growth in O'Fallon, Troy, Shiloh, Mascoutah, Freeburg, Lebanon, and Smithton. Only East St. Louis and Belleville decreased in population, 29.7 percent and 4.0 percent respectively (United States Census Bureau, 2009). This trend seems to reflect people moving from dense urban areas to less dense rural areas. Increasing population densities can lead to more urban land use, which can in turn

influence water quality through increased impervious surfaces, storm water outlets and wastewater treatment systems. The Watershed Health Integrated Research project results suggested that the primary pollutants of concern in watersheds across all land covers were orthophosphate, fecal coliform, and *E. coli* (Hwang, 2010). The levels of fecal coliform and *E. coli* exceeded U.S. EPA and Illinois EPA review criteria. Agricultural and urban land uses were contributors to the water quality impairments (Friedmann, 2010).

Community capacity is defined by Chaskin (2001) as "the interaction of human capital, organizational resources, and social capital existing within a given community that can be leveraged to solve collective problems and improve or maintain the well-being of a given community" (p.293). The Watershed Health Integrated Research project investigator's assessed community capacity for watershed conservation and planning. Water quality and community capacity data informed the project's recommendations for enhancing, conserving, and protecting water resources and with building community capacity across land uses and communities.

An overarching goal of the Watershed Health Integrated Research project was integration of water quality data and social and community data to understand watershed health. As stated in the project proposal, the Watershed Health Integrated Research project had four primary objectives: employ a participatory approach to research from study design to outreach, develop outreach programs tailored to each subwatershed community's needs for conservation and capacity-building, administer outreach techniques that inform and empower diverse community stakeholders, appraise outreach programs in each community using pre/post-tests, evaluative surveys, and impact scores.

Figure 2 displays the timeline in which the investigation team presented findings to residents and community leaders through multiple outreach interventions between 2008 and 2010. The Southwestern Illinois Resource Conservation & Development Inc. assisted with various stages of the project, including as a partner for various interventions. Interventions included:

- Community research team;
- Integrated website;
- Interactive workshops for community leaders and citizens; and,
- Watershed-specific summary reports.

The Watershed Health Integrated Research outreach efforts also included a traveling display boards located at schools and libraries (more targeted at youth and community audiences); however, this intervention is not included in this evaluation.

Year	Watershed Health Integrated Research Project Activities	Watershed Health Integrated Research Project Outreach Interventions	Evaluation Activities
2008	•Project Begins •Water quality and hydrology data collection •Interviews and Focus Groups	•Community Research Team begins	
2009	•Water quality and hydrology data collection •Interviews, Focus Groups, & Residential Survey	•Community Research Team Pilot Tests Residential Survey	
2010		•June 3, Website Released •June 24, Community Leader Workshop •August 9-12, Citizen Workshop & Draft Summary Reports Distributed •September- Summary Reports Finalized	•December 26th, Website Analytic racking begins •June 24, Leader Workshop Pre/Post Survey •August 9-12, Citizen Workshop Evaluative Survey & Pre/post Survey
2011		•February 21-April 18, Summary Report Distributed	•February 9, Survey Added to Website •February 21-April 18, Summary Report Evaluative Surveys & Pre/post Survey
2012			•March 31st Website Analytic Tracking Ends

Figure 2. Watershed Health Integrated Research Project and Evaluation Timeline.

This section will describe interventions and intervention objectives, beginning with the community research team (CRT). Local stakeholders involved in the project, such as elected and non-elected government officials, organizational leaders, and citizens were recruited through a snowball sampling technique. The Watershed Health Integrated

Research investigation team invited each stakeholder to participate in the research project as a member of a CRT. Many were initially involved as interview participants or focus group members. The investigation team consulted the CRT members for planning and implementing the project, including having invited the CRT to participate and provide feedback on a residential survey and watershed-specific summary reports, and workshops. The objectives of the CRT were to instill a participatory approach to the research, to reach resource managers and community stakeholders interested in learning more information, and to create a forum for information exchange among investigators and stakeholders.

The integrated website (http://kaskaskia.illinoisstate.edu) presents information about the project. A homepage includes a project overview, and there are specific pages about the research, watershed maps, watershed profiles, stream data, contact information, and a community forum. Resources, including downloadable PDFs of summary reports, project presentations, and topics of interest (such as knowing your watershed) are included. The website was created to increase the dissemination of research activities and findings. The unique objectives of the integrated website were to reach a large population, create a resource depository for reference, and future use (e.g. storage of data, summary reports, and presentations), and provide a forum for information sharing among community members. An objective of the website functioning as a resource depository was to extend the intervention beyond the life of the project.

The interactive workshop for community leaders, hereafter known as the leader workshop, is described separately from the interactive workshop for citizens. For the leader workshop, the team recruited community leaders for the workshop, including

elected and non-elected governmental officials, and resource managers. Each identified leader was emailed "Evite" invitations and received a follow-up phone call about the meeting. The workshop was held the afternoon of June 24, 2010 in O'Fallon, and the agenda included presentation of water quality and social data findings, time for discussion, and the Northland Nonpoint Education for Municipal Officials (NEMO) watershed game. The watershed game simulates watershed decision-making across varying land-uses.

For the citizen-focused workshop, known hereafter as the citizen workshop, members of the CRT were the primary invitees. CRT members were individually invited by telephone to one of four workshops and requested to assist in promoting the workshop. The team sent press releases to local newspapers, although some newspapers did not advertise the event in a timely manner. Each workshop included a drawing for two free rain barrels and complimentary food. Workshops were held in a public location from 6:00-8:30pm during the week of Monday August 9th through Thursday August 12th2010.The team scheduled two workshops in Richland Creek watershed (Freeburg and Belleville), and scheduled two in Silver Creek watershed (O'Fallon and Troy). The agenda included presentation of water quality and social data findings, time for discussion, and the Northland NEMO watershed game. The objectives of the leader and citizen workshops were to disseminate research findings to stakeholders and build capacity, and to enhance information exchange between participants and investigators and to continue the research's participatory approach.

The team created watershed-specific summary reports for Richland Creek watershed and Silver Creek watershed. The 11-page summary reports included pictures

of study sites, a project overview with research methods, background information and terminology, social assessment data and water quality assessment data, a watershed map, and discussion and recommendations, as well as the project website. A draft report was distributed at the citizen workshops, and a final report was posted on the project website and mailed to CRT members. The objectives of the summary reports were to inform community leaders and resource managers and citizens who are interested in learning more in-depth information. In addition, as a reference document for decision-making, it extends the impact of the intervention beyond the life of the project.

The Watershed Health Integrated Research project focused on reaching audiences across the watershed in a variety of settings, including urban, rural, and agricultural and venues such as an urban office building, community centers, schools, libraries, and on the internet. The target audiences for the outreach interventions (Table 3) include individuals, governmental and non-governmental organizations at local, county, and regional scales.

Table 3. Target Audiences for Outreach Interventions.

Individuals
Business owners and operators
Conservation champions
Residents and landowners
Interest Group representatives
Organizations
Advocacy organizations (Kaskaskia Watershed Association, Kaskaskia/Silver Creek Ecosystem Partnership)
Chambers of commerce
County departments, boards, and committees
Engineering firms (Southwestern Illinois Resource Conservation & Development)
Farm bureaus
Government Agencies (Natural Resource Conservation Service, U.S. Army Corps of Engineering)
Land trusts
Neighborhood association
Public school districts and private schools

II. Literature Review

This section includes a definition for outreach and explores some of the foundational theories related to behavior change, along with the primary method for measuring impacts and improving outreach: program evaluation. An overview and definition of program evaluation, including characteristics, and a review of evaluation approaches used in empirical analysis follows. The literature review concludes with examining and synthesizing evaluations of watershed management outreach.

Outreach

Outreach happens when institutions exchange information with another entity. Outreach extends information beyond traditional boundaries, including academic environments, to serve diverse stakeholders and the broader public through increasing access and efficacy of information (Ottoson & Green, 2005; Ray, 1999). Stakeholders can include "any individual or organization interested in a particular policy issue" (Leach, Pelkey, & Sabatier, 2002) (p. 647).

Examples of integrated watershed management outreach are present, but not abundant in number. Similar to the Watershed Health Integrated Research project, a multi-disciplinary study took place in 2004 in conjunction with Rowan University in New Jersey (Jahan, Orlins, Hasse, Everett, & Miller, 2004). The hydrologic aspects of two watersheds were studied, modeled, and then data were shared through an outreach program targeted for citizens, developers, environmental specialists, and local government officials. The program included presentations and simple visual experiments by faculty and students as well as an interactive website and CD-ROM for target audiences. Outreach content involved watersheds, health and environmental impacts of

nonpoint source pollution, including prevention and cleanup of contaminated soil, surface water, and ground water (Jahan et al., 2004). Jahn et al.'s study is a typical example of outreach as defined as "meaningful and mutually beneficial collaboration with partners in education, business, public, and social science" (Ray, 1999, p. 1).

Outreach often originates from institutions whose motivations may stem from accountability to the community that created and endows such institutions (Hamilton, 2008). Beyond fiscal obligations, these institutions and projects generate knowledge necessary for addressing societal problems. Increasingly, public agencies connected with natural resources such as the National Science Foundation and the Natural Resource Conservation Service require investing in outreach activities to generate a broader impact and deliver public benefit (Andrews, Weaver, Hanley, Shamatha, & Melton, 2005; Newton, 2001). Public involvement is also crucial within the Environmental Protection Agency's Watershed Approach, which contains guidelines for local support and initiation of ideas, collaboration among the public, citizen groups, researchers, and agencies, and public meetings to inform and educate the citizens of the watershed (Rhoads, 1999). Larson et al. (2005) found that education is a viable alternative to regulation, which many landowners oppose. Besides university-driven obligations and granting requirements, Jacobson, McDuff and Monroe (2006) note that increasingly frequent conflicts over natural resources draw attention to the need for improved outreach and education. Similarly, natural resource management plans often depend on public compliance with policies and regulations, which implies that successes and failures of management efforts primarily rely on the public. Therefore, solutions must involve the public (Monroe, 2003).

An outreach effort can take the form of an intervention, which is a targeted effort toward changing a situation or behavior and maintaining, altering or creating new patterns of behavior for a specific audience (Ham & Krumpe, 1996). When searching the literature for outreach interventions, public health, nursing, social work, and health behavior dominate this area and occurrence of environmental outreach efforts are more limited. This may in part be because funding levels for environmental outreach are at a lower level than health outreach. Additionally, institutions do not always submit environmental outreach reports to academic journals. Government agencies, local government units, nonprofits, consultants, and universities may undertake outreach efforts that do not result in publications. Another reason for the lack of outreach interventions in the literature may be that outreach remains a vague concept and different disciplines call it by different names.

Within the environmental arena, outreach is also known as promoting conservation or pro-environmental behaviors, educational extension, science communication, and environmental education. Regardless of designation, promoting conservation behaviors is a crucial component of achieving environmental sustainability. Saunders (2003) explains, "any activities that support sustainability, either by reducing harmful behaviors or by adopting helpful ones, can be called conservation behaviors" (p. 141). These behaviors happen on individual, organizational, and societal levels, and can be direct (buying a energy-saving appliance) or indirect behaviors (changing a policy to make energy-saving appliances more affordable) (Monroe, 2003).Pro-environmental behaviors are related and defined as "behavior that harms the environment as little as possible, or even benefits the environment" (Steg & Vlek, 2009, p. 309). Typical

environmental interventions are activities such as school programs, presentations to civic groups, radio programs, exhibits, and demonstrations, tours, dramas, events (such as tree planting or litter pickup), and extension programs (Ham & Krumpe, 1996).

Environmental outreach has many parallels with environmental education, including many of the same program objectives, such as increasing awareness, knowledge, skills, participation, and changing attitudes. Environmental education can take place outside school systems (known as non-formal environmental education) and in school systems (known as formal environmental education) (Ham & Krumpe, 1996). Objectives in the seminal 1977 Tbilisi Intergovernmental Conference on Environmental Education included fostering awareness and concern, providing opportunities to acquire knowledge, values, attitudes, commitments, and skills to protect and improve the environment, and creating new patterns of behavior of individuals, groups, and society (UNESCO, 1978). These objectives could be considered a foundation for environmental outreach interventions, and are representative of the objectives of most natural resource management outreach efforts (Kudryavtsev, Krasny, & Walther, 2010; Morris, Jacobson, & Flamm, 2007; Newton, 2001).

The design of outreach interventions is often based on theories and models of individual behavioral and community change. These theories include the Health Belief Model (Rosenstock, Strecher, & Becker, 1988), Social Learning/Cognitive Theory (Bandura, 1977), Transtheoretical Model of Behavior (Prochaska & Velicer, 1997), Theory of the Diffusion of Innovations (Rogers, 1995), and social psychology theories such as Theory of Reasoned Action (Fishbein & Ajzen, 1975), and the Theory of Planned Behavior (Ajzen, 1985)(Heimlich, 2010; Ottoson & Green, 2005). According to these

theories and models, behavior is "a function of behavioral intentions which are affected by factors such as knowledge, attitudes, skills, and self-efficacy" (Heimlich, 2010, p.181). Behavioral intentions consequently lead to behaviors, which may need to be maintained, altered, or replaced in order to be considered environmentally sustainable. Affecting behaviors, however, is incredibly complex and pro-environmental or informational campaigns rarely result in behavior changes, except when it is convenient or not very costly to perform a pro-environmental behavior (Heimlich, 2010; Steg & Vlek, 2009). Even while information may not lead to behavior change, a lack of information can act as a barrier to pro-environmental behavior (Monroe, 2003).

Addressing one or more of the mediating factors affecting behavioral intention can lead to environmentally sustainable behavior. Examples of mediating factors include social norm, perceived self-efficacy, prior knowledge levels, attitudes, motivation, reproduction, and attention. Understanding and applying behavioral change theories can improve the effectiveness of outreach. Neglecting or disregarding behavioral change theories may lead to interventions based on tradition or common sense, but that actually do not lead to changes in behavior. Just because there is an outreach program does not mean it will lead to behavior change. Human beings are complex and by strategically applying these theories outreach can be more influential in changing behavior. Theory applied to a poorly executed outreach effort, however, desired results may not be achieved. In this case, a program evaluation that includes program theory can help.

Evaluation

Determining the worth or merit of something in a systematic way is a form of evaluation. Evaluation is an important tool for making decisions about programs. Policy-

makers and agencies increasingly call upon evaluation as a solution to lessen duplication and increase accountability with taxpayer funded programs (Shepard, 2002). Educators use evaluation to provide evidence that programs are effective (Zint, Dowd, & Covitt, 2011). Influential evaluator Michael Quinn Patton observed that evaluation researchers have traditionally understood evaluation as assessing the extent to which objectives and goals of programs are achieved (Patton, 1982). Program evaluation is considered an indispensable tool for achieving programmatic objectives, and standardized evaluation is crucial for determining the strong and weak points of a program in order to identify modifications and realize goals (Morris et al., 2007).

Dimensions that characterize a well-executed evaluation include rigor, strong design, valid measures, information tracking, and program theory. Rigor is "a characteristic of evaluation studies that refers to the strength of the design's underlying logic and the confidence with which conclusions can be drawn" (Braverman& Engle, 2009, methodological rigor defined section, para. 1). Evaluation can occur in ways that are more rigorous, which will include explicit goals and measurable objectives with plainly presented criteria. A rigorous evaluation allows an organization to apply evaluation findings to modify a program or accurately promote program accomplishments. Strong design, valid measures, and tracking information contribute to a robust evaluation (Andrews et al., 2005; Stokking, van Aert, Meijberg, & Kaskens, 1999).

Strong design assures that the evaluation approach and methods are well suited to the evaluation object. Valid measures means instruments accurately measure what the researcher thinks an instrument will measure, and in the case of an evaluation, a valid

measure is a survey instrument that will accurately answer the evaluation question. Tracking information can include many dynamics related to the program itself and to the program's evaluation. Tracked data can inform how leaders actually deliver the program, thus providing insights regarding accuracy and reliability of the findings. For example, even using a strong design and valid measures, the tracked information could reveal that the wrong population received the program services, thereby negating intended program outcomes. Program theory can aid framing and focusing an evaluation. Program theory, also known as a conceptual framework, a logic frame, or a logic model, is a tool to assist in narrowing evaluation scope, schedule, and stakeholders. Program theory is concerned with creating a feasible and logical model for how a program ought to work. It is considered a guide for defining how activities achieve goals (Bickman, 1987; Braverman & Engle, 2009; Christie & Alkin, 2003; Mickwitz, 2009). In the context of environmental education, program theory can help educators clarify program impacts by forcing "educators to explain how a trip to the zoo for third graders increases their willingness to embark on a conservation career" (Monroe, 2010, p. 195). Utilizing these evaluation planning characteristics and program theory can greatly improve the accuracy and reliability of an evaluation.

Evaluators generally choose approaches based on feasibility, constraints, and the needs of primary intended users. Within the realm of natural resources outreach evaluations, an evaluation object could be a project, program, intervention, or training. Different evaluation approaches use different data-gathering methods. If a qualitative approach for data collection were used, data would be primarily descriptive, narrative, and non-numerical. Methods include interviewing, focus groups, and thematic analysis

coding. While if a quantitative approach were used, data would primarily be numerical. Methods include surveys and statistical analysis is used to summarize data (Fitzpatrick, Sanders, & Worthen, 2004). A search of the literature revealed both qualitative and quantitative methods being employed in common approaches such as efficacy, effort, explanatory, impact, implementation, and objectives-oriented evaluation. Next, examples of each of these approaches related to a natural resources outreach interventions will be explored.

An efficacy evaluation, which looks at how effective the evaluation object is at achieving desired outcomes, was used by Morris et al. (2007) in evaluating the efficacy of a targeted boater outreach program for manatee protection. The study evaluated outcomes of the program, including measurable effects on boater behavior, attitudes, and knowledge related to manatees through a telephone survey of boat users who had interacted with the Manatee Watch program. The program involved a Manatee Watch program volunteer approaching a boater from the water or a dock, giving a 1-minute informational talk, and distributing kits which include floating key chains, maps, sunglasses, stickers with data, and boating recommendations. The survey results indicated that the intervention had little effect on behavior, attitudes, and knowledge of boaters, yet knowledge correlated positively with manatee-friendly boating behavior. This may be because the program did not target boater's underlying beliefs about manatees, or that kit materials were irrelevant or not useful. The study also made recommendations to improve program efficacy, such as considering the personal interests of audiences while tailoring messages. Sport fishing was the primary activity reported by boaters, therefore emphasizing the role of manatees in the ecosystem rather than only

focusing on manatee protection could make communication more effective. Other recommendations include higher frequency or longer interactions with the target population rather than short, one-time efforts.

Effort evaluation is a specific category of evaluation included in Patton's *Practical Evaluation* (1982). Effort evaluation examines the effort expended by the evaluation object. This approach emphasizes program inputs in terms of number of personnel and other descriptors, such as levels of activity, which provide information about the effort required by a program. Surprisingly, even with the scarcity of financial resources, this approach is quite uncommon. Greene (1987) analyzed the amount of effort required by stakeholder participation in evaluation design. More than eight in-depth steps were required to design an evaluation with meaningful stakeholder participation over the course of more than five months. Measurement tools included a survey of stakeholders' perceptions of their individual benefits and costs of their participation. Preliminary results found that in most cases, benefits were greater than the time-intensive costs in this type of evaluation. Shepard (1999) completed another evaluation involving effort where two extension agents compared number of days and percent time they worked on twelve different educational approaches in two different watersheds. The evaluation team compared these approaches with the rate of nutrient management adoption by farmers in the different watersheds. The evaluation found that certain interpersonal approaches led to a higher rate of adoption among farmers and were therefore a better use of extension agent effort. Specific results will be discussed more within the watershed outreach evaluation to date section.

Explanatory evaluation, which seeks to explain what the evaluation object is doing, was used when Shepard (2002) investigated the status of a federal agency's evaluation efforts of state water quality outreach programs. Eligible state water-quality coordinators received a survey via telephone, fax, and email methods. The evaluation findings included a widespread neglect of planning and collection of baseline data for tracking, which meant most evaluations were expected to be reactive and could include a biased coverage of positive accomplishments. This explanatory evaluation led to recommendations for creating an evaluation culture within organizations through professional development and increasing the capacity for leadership to conduct evaluations.

Impact evaluation seeks to assess the impact of an evaluation object. Van Den Berg and Dann (2008) conducted an impact evaluation in conjunction with an implementation evaluation, which was incorporated to determine if the evaluation object implemented correctly. The study examined the program implementation and impacts of the Michigan Conservation Stewards Program to create a new Master Naturalist initiative. Using pre- and post-program surveys, the impact of the program resulted in increased recipient's knowledge, attitudes, and skills related to ecological information.

An objectives-oriented evaluation approach was first utilized in an eight-year study of schools conducted in the 1930s by evaluator Ralph W. Tyler (1942). Tyler's conception of evaluation focused on determining the extent to which curriculum achieved stated purposes over time, including high school and college recidivism. This approach continues to be a common practice in evaluation. An objectives-oriented approach was highlighted in the World Conservation Union's Evaluating Environmental Education

manual and has been used in natural resource evaluations, such as Carr and Halverson (2001) and Lamy, Bolte, Santelmann and Smith (2002). Carr and Halvorsen (2001) evaluated three community-based approaches to citizen participation in forestry. These included community dinners, conversations with community groups, and a mail survey, each with community-oriented objectives. In evaluating each approach against the objectives, there were negatives and positives, as well as a need for more collaboration between communities and land managers to determine which approaches increase sustainable public forest management and community health. Lamy et al. (2002) used an objectives-oriented method in their assessment of restoration options that would fulfill restoration objectives, a watershed management plan that would fulfill community objectives, and landscaping methods that would fulfill landscape objectives. The interdisciplinary team used an objectives-oriented approach and decision-making tools, which allowed a more realistic assessment of strategies to meet watershed restoration objectives. Results pointed to multiple-objective methods as being a helpful instrument for assessing at watershed management plans. This sample of common approaches to natural resource outreach evaluation is not fully representative of the field, but it provides a context and foundation for further exploration specifically related to watershed outreach.

Watershed Outreach Evaluation

To date, watershed outreach evaluation has been limited. Included here are examples of four evaluations primarily using an efficacy approach to determine the degree to which the programs achieved goals. One evaluation also included an effort component. Some of the evaluations targeted youth in order to strategically develop

awareness of watersheds, and develop conservation behaviors related to water and forestry (Kirwan, Williams, & Kirwan, 2008; Thompson, Coe, Klaver, & Dickson, 2011). Another evaluation focused on adult learning with the watershed stewards program (Jemison, Wilson, & Graham, 2004). The final evaluation looked at efforts of extension educators in relation to nutrient management adoption (Jemison et al., 2004; Shepard, 1999). Each evaluation found the program positively influenced knowledge of program participants related to watersheds or that education influenced adopting conservation practices.

With a multi-disciplinary team of university faculty and classroom teachers, Thompson, Coe, Klaver and Dickson (2011) worked to create, implement, and evaluate an outreach program to address gaps in watershed knowledge for school-aged children in Texas. Using summative teacher evaluations and participant comments (children 5-10 years), along with rates of student commitments to water conservation pledges, the authors found that the program may positively influence both future and current water conservation behaviors (Thompson et al., 2011). Recommendations include conducting studies to determine if behavior changes actually took place.

Kirwan, Williams, and Kirwan (2005) presented and evaluated watershed restoration and education in the Chesapeake Bay's portion in Virginia. The project aimed to increase knowledge about watersheds, land uses, and seedling care, and to plant hardwood seedlings in targeted deforested areas. To achieve these goals the project created a website with resources and personally contacted 4-H Extension agents to participate in seedling distribution or suggest other volunteers. In total the project reached 20,932 students over three years in 17 counties (out of 19 eligible), and distributed

37,225 seedlings with an approximate 75% survival rate. Recommendations include incorporating hands-on activities that provide students with a personal stake in outcomes, especially with concepts like watersheds and land use planning, as knowledge gain was the greatest with hands-on learning. The authors also found it took approximately three years to develop the partnerships that made the program successful, and recommend taking time to make that investment.

The effectiveness of knowledge and level of community involvement of participants and non-participants in the Watershed Stewards Program through the University of Maine Cooperative Extension was evaluated by Jemison, Wilson and Graham (2004). They surveyed the newest class of program participants, along with a group of non-participants, and learned that participants had 23 percent more knowledge and were more involved in activities such as implementing stewardship efforts and lake governance (Jemison et al., 2004). The evaluation recommended that extension professionals consider replicating this study's example of assessing program impacts as well as comparing awareness, knowledge, and participation rates of watershed steward program participants with non-participants who also reside in the watershed.

Shepard (1999) evaluated two different extension agent's approaches to nonpoint source pollution education at a watershed scale by comparing farmer's rates of adopting nutrient management systems in two different watersheds in Wisconsin over five years. One extension agent used primarily a diffuse communication campaign method (citizen advisory committees, newsletters and publications, tours and field days), and the other agent used primarily a one-to-one approach (counseling, interviewing, conflict resolution, and conducting small group workshops). More frequently, landowners adopted nutrient

management systems in the watershed with the one-to-one outreach approach. The author recommends extension agents to not over-rely on diffuse information campaigns, and prioritize interpersonal contact with farmers.

Collectively, these evaluations show that watershed outreach and education programs are meeting program goals and producing water conservation awareness and behavior commitments. Watershed outreach and education projects are also influencing adopting nutrient management practices, increasing watershed knowledge, and community involvement. These examples have informed the Model for Integrated Watershed Management Assessment, as discussed below.

Watershed Outreach Evaluation Approach Synthesis

This literature review highlighted relevant theories and studies related to outreach and evaluation. The interdisciplinary nature of this subject brought many different disciplines together, including conservation biology, environmental education, environmental management, and water resources. Beginning with an overview of the growing field of watershed management, the section also included the importance of management at the watershed scale. Watershed science outreach is unique because it deals with a specific resource that is outside of any political boundary and is impacted at a variety of scales. Landowners, as well as cities, counties, and states, impact watersheds through actions such as land use and regulation. Watershed science outreach also involves people and their environmental and social behaviors. The literature review also highlighted the collaborative nature of outreach. In outreach, one entity takes a primary role in sharing information; both parties vest themselves in the process. The objectives of outreach are similar to environmental education objectives, such as changing attitudes

and increasing awareness, knowledge, skills, and participation. Often, the goal is maintaining, altering, or changing environmental behavior. Some of the foundational theories for changing behavior identify that communication strategies are more persuasive when they consider behavioral intention and social norm, and that motivation, reproduction, and attention are mediating factors for behavior change.

The related literature also established that incorporating evaluation into programs, interventions, or trainings could aid in decision-making, financial efficiency, accountability, and goal realization. Often, evaluations seek to assess the extent interventions achieve programmatic goals and objectives. There are many different approaches to evaluation, yet certain characteristics (rigor, strong design, valid measures, information tracking) and program theory should be the features of any evaluation.

The evaluation approaches presented here modify Tyler's (1942) objectives-oriented evaluation and Patton's (1978) effort evaluation. Although many of the watershed outreach evaluations in the literature review took an efficacy approach, an objectives-oriented approach and an effort-oriented approach incorporates efficacy while focusing on program outcomes related to program goals and objectives. This suited the Watershed Health Integrated Research project, where one of the goals of the project was to appraise interventions. This evaluation seeks to do that as well as provide the primary intended users with useful information for future outreach opportunities. The primary intended users for this study are project investigators, community leaders, and educators and evaluators engaging in outreach and evaluation. Based on discussions with project investigators, useful information included understanding which outreach interventions meet objectives, and what level of effort is required.

These approaches are feasible given limited funding and time constraints. Some of the approaches were not built into the study, such as involving a non-participant group (Jemison et al., 2004; Zint et al., 2011). As Alexander (1965) notes, relying on voluntary participants makes having a control group difficult. It was also beyond the scope of this evaluation to confirm conservation behaviors, such as Thompson et al. (2011) recommends and Shepard (1999) implemented. However, the Model for Integrated Watershed Management Assessment considers hands-on learning as recommended by Kirwan et al. (2008). The constraints of these approaches include the risk of focusing on objectives and losing sight of what the program actually accomplishes. Other constraints can include historical organizational failures (i.e. weak partnerships, misguided projects), limited financial and personnel resources, time constraints, social acceptability concerns, and data gaps (Fitzpatrick et al., 2004). In this evaluation, data gaps are one of the most significant concerns. Limitations include inaccurate data.

Additional evaluation considerations include internal versus external evaluators and formative versus summative evaluations. This evaluation is internal because the evaluator, (henceforth referred to as "I"), was involved in implementing certain intervention activities, including the CRT, the workshops, and the summary report. An advantage of an internal evaluation is the depth of insight and familiarity with the evaluation object. Yet a drawback is the possible bias due to closeness and subjectivity of employed individuals (Fitzpatrick et al., 2004). Additionally, Monroe (2010) notes internal evaluators may lack the ability to see gaps in program theory because of their level of familiarity with the work. Therefore, this evaluation approach includes an awareness of the threat of subjectivity and missing gaps in program theory in order to try

to prevent these occurrences. This evaluation is summative because the program is complete and the focus is assessing accomplishments, as opposed to a formative approach attempting to modify an ongoing program. An advantage of a summative evaluation is that it can completely assess a fully implemented program, yet the disadvantage is that findings can only be used to benefit future programs and mid-stream corrections cannot be made unlike with formative evaluations (Fitzpatrick et al., 2004).

The Model for Integrated Watershed Management Assessment is designed to promote the use of evaluation and to increase the utility of doing such an evaluation, and contribute to future water resource-based outreach evaluation efforts. Because there has been a limited amount of watershed outreach program evaluation, this work further develops the field and offers an example of an effort that has not yet been endeavored in this area. The dynamics of multi-scale natural resources and complex human behavior create a challenge for evaluation. Incorporating the best practices of outreach and evaluation outlined above is the goal of the Model for Integrated Watershed Management Assessment.

Integrated Assessment Model and Program Theory

Model for Integrated Watershed Management Assessment (Figure 3) graphically brings together the components used in the evaluation, including evaluation, outreach, and the Watershed Health Integrated Research project. Visually, there is a sphere of evaluation. This sphere includes concepts such as evaluation theories and program theory. Another sphere is outreach and education. This includes the psychological behavior change theories. The Watershed Health Integrated Research project provides the scientific and social context of the Model for Integrated Watershed Management

Assessment. The model is the foundation for the objectives-oriented and effort-oriented approaches of this evaluation.

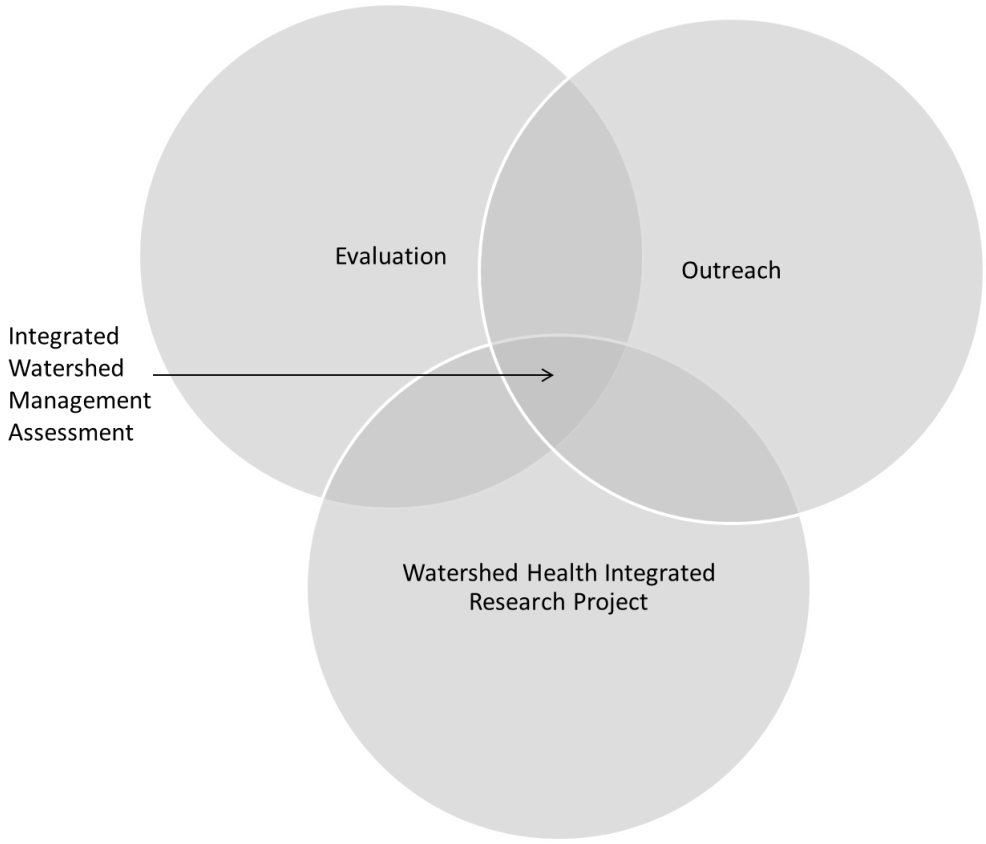

Figure 3. Model for Integrated Watershed Management Assessment.

Understanding how a project intends to achieve its goals is important for conducting evaluations. Program theory is considered a guide for defining how activities achieve goals (Bickman, 1987; Braverman & Engle, 2009; Christie & Alkin, 2003; Mickwitz, 2009). For the Watershed Health Integrated Research project, the project proposal illustrated that the implementation of outreach, planning, and management were to lead to outcomes surrounding watershed and community health (Figure 4).

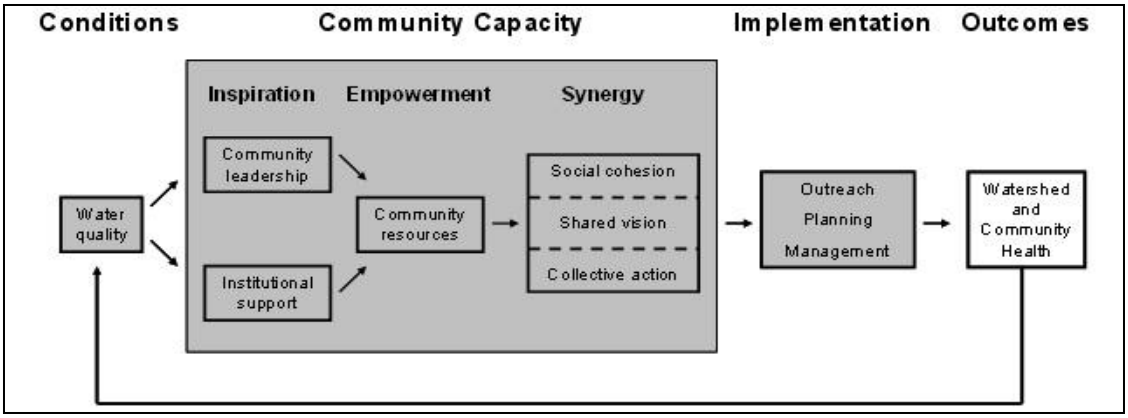

Figure 4. Watershed Health Integrated Research Project Program Theory.

Conditions such as poor water quality affect community capacity, including the inspiration of community leadership, institutional support, and empowerment of community resources. Additionally the synergy of factors such as social cohesion, vision, and collective action positively or negatively affects community capacity. The status of community capacity leads to an action like implementation of outreach, planning or management, which ideally creates outcomes like watershed and community health. Ultimately, these programs were designed to build capacity for watershed planning and conservation, and to promote watershed and community health.

In order to develop a program theory model for the Watershed Health Integrated Research project outreach interventions, I utilized the Watershed Health Integrated Research project program theory and the program theory framework developed by Fien, Scott, and Tilbury (2001). In the program theory, inputs result in outputs. As shown in the program theory framework in Table 4, resources are necessary to create activities and outputs, which in turn lead to short-term and long-term outcomes.

Table 4. Watershed Health Integrated Research Project Outreach Intervention Program Theory.

Resources	Activities/Outputs	Short-term Outcomes	Long-term Impacts
Project grant	Community research team (CRT)	Knowledge gained	Change behavior
Investigators	Website	Awareness gained	Build community capacity
Community leaders	Workshops	Individual and collective action	Enhance watershed health
Concerned citizens	Summary reports	Networking	Enhance community health
SWIRC&D		Empowerment	

In the case of the Watershed Health Integrated Research outreach interventions, resources include the financial capital and personnel capital. A grant from the USDA National Institute of Food and Agriculture supported the project. Personnel capital includes the investigators (e.g. hydrologists, social scientists, and graduate students), the community leaders and citizens engaged in the work through assisting with or participating in interventions. Southwestern Illinois Resource Conservation & Development Inc. assisted and participated in many parts of the project. Each intervention is an output. Short-term outcomes are the knowledge, attitudes, and behaviors of individuals and community groups. The long-term impacts include changing behaviors, building community capacity, and enhancing watershed and community health. This evaluation will only evaluate the short-term outcomes according to the objectives-oriented evaluation.

III. Methods

This section describes the project site and outreach interventions, the evaluation audiences, the data collection, data analysis, evaluation assessment, as well as the study limitations. The evaluation consisted of three phases: data gathering, data analysis, and evaluation. First, I gathered quantitative and qualitative data on each of the interventions. Then, I analyzed the data through descriptive and inferential statistics. Finally, I evaluated the interventions following an objectives-oriented approach and the effort-oriented approach based on the data gathered.

Evaluation Setting and Audience

The evaluation setting varied, with the objectives-oriented evaluation including assessments that took place in southwestern Illinois in person (workshops in Belleville, Freeburg, O'Fallon, and Troy, IL), through the mail (pre/post test for summary reports), and through the internet (website survey). Because participants included volunteers recruited through snowball sampling and word of mouth, and based on leadership roles and involvement in the community research team, they are non-random and not considered representative of the general population. The effort evaluation used personal communication with the Watershed Health Integrated Research investigation team about input costs, personnel, and time.

The primary intended audience of this evaluation includes members of the Watershed Health Integrated Research investigation team, researchers, educators, extension agents, and others interested in watershed outreach, and evaluators, educators, extension agents, and others interested in outreach evaluation. I intend to share evaluation findings with the target audiences of the evaluation by emailing the investigation team.

Additionally, I will share findings with researchers and evaluators through submitting the results from this study to a journal and presenting findings at relevant conferences.

Objectives-Oriented Data Collection

For the objectives-oriented evaluation, I collected data through intervention rates of participation, participant pre/post tests (referred to as pre/post tests), and participant evaluation surveys (referred to as evaluative surveys) (Table 5). Project records and personal communication with the investigators were also data sources for all interventions. Additionally, demographic information was documented at the Belleville citizen's workshop using an audience response program, which electronically records audience responses sent through personal hand held devices.

Table 5. Data, Descriptions and Sources (Modified from Fitzpatrick et al. (2004)).

Intervention	Data Description (Source of Data)
Citizen Research Team	Membership (Project records) Number invited and accepted (Project records)
Website	Visitors (Hits counted through Google Analytics) Website feedback (Homepage survey)
Citizen Workshops	Participation rates through attendance (Sign-in sheet) Evaluative survey (Workshop evaluation survey) Knowledge, attitude, behavior (Pre/post test)
Leader Workshop	Participation rates through attendance (Sign-in sheet) Evaluative survey (Workshop evaluation survey) Knowledge, attitude, behavior (Pre/post test)
Summary Reports	Participation rates through distribution data (Workshops, CRT) Evaluative survey (Summary report survey) Knowledge, attitude, behavior (Pre/post test)

Recording participation rates is another common data collection source for evaluating environmental outreach (Herringshaw et al., 2010). Participation data are easily collected and attendance can indicate that participants are interested in the

outreach. Data sources for participation rates with each intervention varied, including project records, self-reported rates, and the Google Analytics hit counter.

Participation rates for the CRT were based on project records (Microsoft Access membership database), including individuals who were asked and accepted or declined membership. Participation rates for the website were based on data from the hit counter and self-report rates from the summary report. The website went live June 3, 2010 and there was no hit-counter installed at the time of release. The project team chose Google Analytics as the method for collecting data about website visitors, including monthly rates of site visits, unique visitors, percentage of new visits, number of page views, and average duration of site visit. Google Analytics began tracking the website on December 26, 2010, more than six months after the website launched. Participation rates collected for the workshop include workshop attendance records and self-reported summary report numbers. Participation rates for the summary report were based on distribution rates at the citizen workshop and to CRT members. Pre/post tests and evaluative surveys were administered at the workshops and self-administered by CRT members regarding the summary reports.

Many natural resources outreach studies use a pre/post test to demonstrate a change in knowledge before and after an intervention (Herringshaw, Thompson, & Stewart, 2010; Knight, Johnson, & Finley; Larese-Casanova, 2011; Prokopy, Molloy, Thompson, & Emmert, 2010). Pre/post tests administer the same questions before and after an intervention, and the change in response between tests is calculated. I conducted pre/post tests and evaluative surveys for the citizen's workshop (Appendix B), pre/post

tests for the leader workshop (Appendix C), and pre/post tests and evaluative surveys for the summary reports evaluation (Appendix D).

The Southern Illinois University Carbondale Institutional Review Board approved the instruments developed for the workshop and mailings (Appendix E). For the leader workshop, the team administered pre/post tests as part of the workshop program, and provided participants a folder of information, including a welcome letter that doubled as a consent form (Appendix F), the pre/post tests, and other informational materials. At the citizen workshop, the investigation team administered pre/post tests as part of the workshop program, and gave participants a folder of information, including a welcome letter that doubled as a consent form (Appendix G), the pre/post tests, a workshop evaluative survey, a copy of a summary report, and other informational materials. All members received a summary report applicable to their subwatershed in the mail along with instructions and the pre/post tests. Following an adapted Dillman (2000) protocol, participants received a pre-notification postcard (Appendix H), then a survey solicitation letter that doubled as a consent form (Appendix I), along with the summary report and evaluative survey. Next, participants were mailed a reminder letter (Appendix J), and if they had not returned their first copy they were sent a replacement solicitation letter, evaluative survey, and summary report (Appendix K).

Evaluative surveys were used as part of the package for the citizen workshop, the summary report, and as the only component for the online evaluative survey for the website (Appendix L). Evaluative surveys included Likert-type scale questions, and wording for questions indicated the specific intervention but were otherwise identical. The format for website evaluative survey involved placing a link to a Survey Monkey

survey on the homepage. The team added the Survey Monkey™ survey o the website February 9, 2011; approximately eight months after the website went live.

Objectives-Oriented Data Analysis

I analyzed the objectives-oriented evaluation data through descriptive statistics (e.g. revealing patterns) and inferential statistics (e.g. drawing conclusions and making predictions), including statistical analysis of pre/post tests and analysis of evaluative surveys, and grounded-theory analysis of open-ended questions. For pre/post test response data, I entered data into PASW Statistics 17.0 (SPSS 17) and performed descriptive and frequency analysis. For the pre/post Likert-type scale responses, I used a Wilcoxon signed-ranks test ($p < .05$). Van Den Berg and Dann (2008) used the Wilcoxon signed-ranks test to analyze pre- and post- program questionnaires for the Michigan Conservation Stewards Program. The Wilcoxon signed-ranks test is a non-parametric statistical hypothesis test that can be used when the population is not considered normally distributed, and with small sample sizes to determine if there were statistically significant changes in repeated measurements on a single sample. It assesses whether the mean ranks in a population differ, and in the case of this evaluation, if respondent's awareness, knowledge, opinions, and behavior significantly changes between pre/post tests.

Specific questions for the objectives-oriented data analysis include if there was a cumulative impact of the workshops and summary reports on participants' attitudes, knowledge and behavior, and if individual interventions had a significant effect on participants' knowledge, attitudes, and behavior. I also analyzed the evaluative survey responses for open-ended questions using thematic coding. Thematic coding is a common tool for analyzing participant knowledge gain and perceptions (Herringshaw et al., 2010).

Grounded-theory technique is a coding approach that does not use a lens or category to group data, instead categories and themes come from the data (Strauss & Corbin, 1990). After transcribing responses from evaluative surveys, I grouped similar responses into themes. The open-ended questions provide another way for identifying participant knowledge gain and perceptions (Herringshaw et al., 2010).

Objectives-Oriented Evaluation

Next, I integrated data analysis results with other descriptive factors to assess the extent to which different interventions fulfilled Watershed Health Integrated Research goals, objectives, and criteria. The project description and grant proposal were the basis of the Watershed Health Integrated Research goals, objectives, and criteria. Each goal included one to four objectives and each objective included one to three criteria. In order to assess the extent to which different interventions achieved project goals, I created tables for each goal with columns for objectives and criteria and assessment in the results section (Tables 14-17). I judged the degree of goal and objective fulfillment based on the number of criteria fulfilled. If the intervention fulfilled a criterion, I assigned one point (1), and when an intervention failed to fulfill a criterion, I assigned a zero (0). In certain cases, I assigned one-half point (0.5) for a partially fulfilled criterion. In other cases, due to lack of data, the rating was unknown (U). In some cases, an intervention structurally fulfilled a criterion (such as offering an evaluation yet no participants filled out an evaluation). In such cases, I noted that an intervention existed, but assigned zero points. If an intervention fulfilled at least half of the criteria, I rated it as fulfilling the objective.

Effort-Oriented Data Collection

For the effort-oriented evaluation, I collected data through personal communication with the Watershed Health Integrated Research investigation team regarding costs, personnel numbers, and time. In Table 6, input and output is compared. Resources are not only financial, but include time and personnel; therefore, effort components included cost, personnel numbers and time required. Details included input costs (intervention cost, the cost of personnel for planning and implementation, and travel), input personnel (the number of people needed for planning and implementation) and input time (the number of hours to plan, implement, and travel). I counted the personnel numbers, time, and cost inputs separately. The full description of effort (Appendix M) includes a detailed description of the roles of personnel, the hours spent planning, implementing, and traveling; and the cost for the intervention, personnel, and travel. All of the effort calculations were based on the best data available provided through personal communication with Watershed Health Integrated Research investigation team members. Estimating numbers occurred in some cases. The intent was not to create an accurate budget template, but to provide approximate numbers for informed decision-making.

Table 6. Effort Input and Output.

Effort	Criteria	Interventions
Input	Personnel (#)	Number of personnel for planning and implementation
	Time (hrs)	Number of hours to plan and implement Personnel travel time
	Cost ($)	Intervention costs Cost of personnel for planning, implementation and travel
Output	Participation Rates	Described
	Pre/post Test Results	Described
	Participant Satisfaction	Described
	Partnerships Formed or Strengthened	Described
	Products generated	Described

Effort-Oriented Data Analysis

For the personnel input, I differentiated individuals by their title, such as investigator, graduate student, contractor, and information technology professional. For most interventions, investigators and graduate students were involved. There were five investigator personnel in total from three different institutions, including three from Southern Illinois University Carbondale, one from the Illinois State University (ISU), and one from the University of Minnesota (UMN). Two graduate students were from Southern Illinois University Carbondale, one from Illinois State University, and one was from the University of Minnesota. Personnel totals for each intervention were broken down into planning and implementation components and totaled. If a person played a role in planning and implementing, I counted them for each phase of the project. If an individual played two different roles in one phase (e.g., mailing and coordinating), I only counted them once.

The time input used hours as the unit of analyses. Based on the estimates of personnel numbers, hours were estimated for each individual and then added together to get total hours for the intervention component. For example, if five investigators were involved in CRT planning, and investigators estimated they spent two hours planning the CRT each, I estimated that investigators spent ten total hours in CRT planning. For travel hours, roundtrip hours were estimated (i.e. eight hours meant that one individual's trip was eight hours roundtrip). Planning, implementing, and travel hours were added together to get total estimated hours.

For the cost input, I used dollars as the unit of analysis. For the intervention supplies, I estimated costs based on food, mailing, flight, and gasoline costs from the summer of 2010. I based personnel costs (both planning and implementing) on estimates of personnel numbers and time. I calculated cost using an estimated hourly rate. The rate used for investigators was $65/hr, the rate used for graduate students was $18/hr, the rate used for the contractor was $50/hr, and the rate used for the information technology professional was $35/hr. This rate was multiplied by the number of hours of effort that particular person expended (i.e., 5 investigators multiplied by 10 hours multiplied by $65/hour equals $3,250). For travel, I estimated car mileage at 15 miles per gallon, and multiplied that by relevant mileage at a rate of $2.75 per gallon of gas (the price during the summer of 2010). I added supplies, planning, implanting, and travel together for the total cost of each intervention.

Effort-Oriented Evaluation

To conclude the effort evaluation, I compared effort input with intervention outputs. By contrasting input effort and measurable output data, I could highlight the

strengths and weaknesses of each intervention based on involvement, partnerships, products generated, and participant assessment. The output involvement includes participation rates, and the output partnerships include the partnerships formed or strengthened. Output data includes information and products generated. Output valuation includes participant assessment of the value of interventions.

Cumulative Evaluation

The different evaluation approaches provide insight into specific interventions, yet a higher-level appraisal can provide useful information for decision-making. Therefore, another aspect of this evaluation is a cumulative rating of interventions regarding objective fulfillment and effort required. A visual spectrum in the results section (Figure 5) combines objective fulfillment and required effort scales. Each intervention was ranked on the x-axis regarding effort expended (low, moderate, and high), and on the y-axis the number of objectives fulfilled (few, some, all). When low effort was expended, the intervention was considered more efficient, and when more objectives were met, the intervention was considered more effective.

For the number of objectives fulfilled on the y-axis, ratings were calculated out of four objectives. If an intervention fulfilled 0-1 objectives it was ranked as "few," if it fulfilled 2-3 it was ranked as "some," and if it fulfilled 4 it was ranked as "all." For effort expended on the x-axis, rankings ranged from low, moderate, and high. There were three criteria, and if an intervention was ranked as fulfilling "low," "moderate," or "high," in two or more criteria it received that ranking overall. (For example if an intervention was rated as "low" for personnel, "moderate" for time, and "moderate" for cost, it was rated as requiring moderate effort overall. Regarding criteria rankings with personnel numbers,

"low personnel effort" involved less than 5 personnel, "moderate personnel effort" ranged from 6-10 personnel, and "high personnel effort" required greater than 10 personnel. For the time criteria, "low time effort" required less than 75 hours, "moderate time effort" required 76-150 hours, and "high time effort" required greater than 150 hours. Finally, for the cost criteria, "low cost effort" cost up to $4,000, "moderate cost effort" cost ranged from $4,000-$8,000, and "high cost effort" was $8,000 or more.

Limitations

The limitations of this evaluation include lack of a control group, potential bias, self-reporting surveys, small sample sizes, limited data, and the presence of an internal evaluator. Limitations of conducting outreach interventions include the absence of a control group to compare between populations that receive and do not receive a control group. Without a control group, it is difficult to know what would have happened if the outreach intervention did not occur. Another concern is bias, including selection bias, and aspects of selection bias including non-respondent bias, and volunteer/referral bias. Selection bias which occurs when subjects are unrepresentative of the population of interest (Hartman, Forsen, Wallace, & Neely, 2002). In this evaluation, selection bias may have occurred in that volunteers and snowball sampling recruitment led to participation of certain types of people, and not others, such as overly representing retired-age people and under-representing working young people. The population of interest was Lower Kaskaskia River Watershed residents, particularly landowners.

Prokopy (2010) noted that web surveys are convenience surveys with unknown response rates because it was unknown how many people saw the survey and chose not to

take it. Furthermore, the study found distinct differences between convenience and random samples as mean awareness levels tended to be higher for convenience survey respondents. Prokopy's findings suggested that convenience surveys might over-estimate the level of awareness for the general population. In the case of Watershed Health Integrated Research project interventions, volunteer or referral bias is a potential concern, due to the use of snowball sampling for CRT recruitment. Another type of selection bias is non-respondent bias, when individuals who do not respond to the survey differ in important ways from those who responded, such as the individuals who respond or participate may be more concerned or actively engaged residents of the watershed. Another inherent limitation is survey questions are self-reporting and rely on the honesty of the respondents, who may be tempted to respond in a way preferential to the survey author or the socially acceptable way (Margai, 1997). This may be especially true in workshop settings, where participants meet investigators face-to-face and may be too kind and not honestly comment on effectiveness (Syme & Sadler, 1994).

Additionally, small sample sizes were a challenge in this study the samples are not considered representative of the general population in the Lower Kaskaskia River Watershed. Small sample sizes also increase the margin of error. Furthermore, comparing participant sample sizes between the different outreach interventions was also a limitation. These unlike variables were measured in different ways based on the context of the intervention (such as a one day workshop and an enduring website), yet measurements complement each other and support evaluation findings. There is also a lack of data available in some cases. This includes the six-month period of time where web analytics was not collecting information even while the website was receiving

traffic, and other outreach interventions were occurring. There also is the seven-month analytics record gap where data were not provided to me. Another potential limitation of this evaluation is that an internal evaluator is completing it, where familiarity can pose a threat (Monroe, 2010). As an evaluator I am aware of the potential subjectivity, and despite these limitations, the methods will allow the evaluation to answer the research questions for this thesis: (1) to what extent each intervention meet Watershed Health Integrated Research project goals, and (2) what level of effort did interventions require.

IV. Results

This section includes the intervention participation rates, pre/post test results, evaluative surveys, as well as goal and effort assessments. The objectives-oriented evaluation results include quantitative analysis, qualitative analysis, and an assessment of the extent interventions fulfilled to which goals, objectives, and criteria. The effort-oriented evaluation includes results from the effort input and output analysis. Results indicated that the citizen workshop was the most effective, as it fulfilled all the Watershed Health Integrated Research project goals. No intervention clearly required the least effort, yet the cumulative spectrum of intervention groups the leader workshop, the summary report, and the CRT as requiring a moderate amount of effort and achieved some goals. The website fulfilled few goals and required a moderate amount of effort.

Intervention Participation and Survey Results

This section presents results of project record participation rates, self-reported participation rates, demographic information, and the evaluative survey response rates for the citizen workshops, the leader workshop, and the summary reports (Table 7), followed by a presentation of survey results for pre/post tests.

Table 7. Participation Numbers and Rates.

	CRT	Website	Leader Workshop	Citizen Workshops	Summary Reports
Project Records Participation Numbers	61 Members	≥ 61 Visitors	17 Attendees	31 Attendees	92 Distributed
Participation Rates	78% (N=78 Invited)	Unknown	18% (N=91 Invited)	50% (N=61 Invited)	Unknown
Evaluative Survey Response Rates	N/A	(n=0)	76% (n=13)	72% (n=21)	42% (n=26)
Pre/Post Survey Response Rates	N/A	(n=0)	76% (n=13)	72% (n=21)	42% (n=26)
Summary Report Self-Reported Participation Numbers	24 Responded	9 Visited	9 Attendees	9 Attendees	24 Responded
Summary Report Self-Reported Participation Rates	100% (N=24)	37% (N=24)	37% (N=24)	37% (N=24)	100% (N=24)

Participation rates included 61 individuals engaged as CRT members. There were 61 unique visitors to the Watershed Health Integrated Research project website tracked by Google Analytics during the period where data is available (between 12/26/2010-1/31/2011 and 9/2/2011-3/31/2012) (Appendix N). However, 61 visitors is a conservative figure, because of a gap between when the website went live and when the analytics started tracking, as well as the gaps when the analytic data were not available. Additionally, the summary report evaluative survey included nine respondents who reported visiting the website who may or may not have been captured in the unique visitor count. There were 48 individuals who participated in the workshops, with 17

attendees at the leader workshop and 31 attendees at the citizen workshop: 20 in Belleville, 9 in Troy, 2 in Freeburg, and 0 in O'Fallon (although a reporter came and interviewed the investigation team and an article was published in a local newspaper later in the week). Additionally, the summary report evaluative survey included eight respondents who reported attending a workshop. The workshops and CRT were the channels for distributing 92 summary reports to individuals.

Another indicator of participation rates was the self-reported participation (n=24) from a question on the summary report evaluation sent to CRT members (39% response rate). There were eight options participants could chose for how they were involved in the Watershed Health Integrated Research project, and participants could choose as many options as applicable (Appendix D). Reviewing residential survey questions and a progress report were two activities offered exclusively to the CRT, while the other activities were open to the broader community. Reviewing a progress report had the highest level of involvement out of respondents, while viewing a traveling display had the lowest. Over 70% of respondents reviewed a progress report (n=17), 66% reviewed residential survey questions (n=16), 58% shared in a focus group (n=14), and 50% participated in an interview (n=12). Only 36% of respondents reported participating in a workshop (n=9) and visiting the website (n=9). Just 8% of respondents reported seeing a traveling display or selected "other" and wrote in "measured rainfall" with the project funded rain gauges (n=2).

Pre/post intervention surveys and evaluative survey response rates had the same response rate within interventions, but varied among interventions. The workshop survey response was 76% (n=13) for the leader's workshop, 72% (n=21) for the citizen's

workshop, with (85% (n=17) at Belleville, 55% (n=5) at Troy, and zero at Freeburg and O'Fallon. The summary report survey response rate was 42% (n=26), although each respondent did not answer all of the questions, and sometimes entire sections were incomplete. Additionally, three respondents returned two surveys (it is likely they filled out the initial and the replacement survey). Only the first of the returned surveys were included in analysis.

Demographic results from the workshop in Belleville, IL included gender, age, and city of residence. Out of 16 participants, 50% were male and 50% were female. The age ranges were split between three main demographics, with the median age range of 46-60 (31%), the younger age range 18-30 (31%), and 61 and older (31%). The majority of people were from Belleville (66%), while others (26%) were from another city or village. Results indicated that the majority of or participants thought high water quality was important to quality of life and that they had some concern about water quality problems in their watershed.

Pre/post tests investigated knowledge and attitudes related to water quality and watersheds and behavioral intentions. Overall, pre/post tests documented significant changes in knowledge and attitudes for the citizen workshops, leader workshop, and the summary reports (Table 8). Analysis revealed that the citizens workshops had a significant impact on participants' ratings of the importance of water quality to quality of life in their community (p=0.041), their knowledge about water quality issues (p=0.004), and their familiarity with watershed boundaries and characteristics (p=0.004). Additionally, workshops had a significant impact on participants' familiarity with best management practices to improve water quality (p<0.001), and their familiarity with

strategies to build community capacity for watershed management ($p<0.001$). In all cases, a documented increase in importance, knowledge, and familiarity occurred following the workshop.

The leader workshop produced significant differences between the pre/post workshop survey responses were revealed in participants' rating their knowledge about water quality issues ($p=0.030$), their familiarity with best management practices to improve water quality ($p=0.005$), and their familiarity with strategies to build community capacity for watershed management ($p=0.005$). In all cases, a documented significant increase in knowledge and familiarity occurred following the leader workshop.

Analysis revealed that the summary report had a significant impact on participants' ratings of their knowledge about water quality issues ($p<0.001$), their familiarity with best management practices to improve water quality ($p<0.001$), and their familiarity with strategies to build community capacity for watershed management ($p=0.020$). In all cases, a significant increase in knowledge and familiarity were documented following the workshop.

Table 8. Participant Knowledge and Attitudes Pre/Post Intervention.

Question	Survey	N Pre (post)	Mean Pre (post)	Standard Deviation Pre (post)	P-Value
How important are high quality water resources to quality of life in your community?	CW	24 (19)	4.79 (5.37)	1.47 (0.90)	**0.041***
	LW	13 (13)	5.23 (5.46)	0.73 (0.66)	0.317
	SR	27 (27)	4.96 (5.15)	1.13(0.82)	0.190
	Total	64 (59)	4.95 (5.29)	1.20 (0.81)	**0.009***
How concerned are you about water quality problems in your community?	CW	24 (20)	5.04 (5.35)	1.33 (1.14)	0.100
	LW	13 (13)	5.46 (5.46)	0.78 (0.66)	1.000
	SR	27 (26)	4.89 (5.12)	1.21 (0.77)	0.271
	Total	64(59)	5.06 (5.27)	1.19 (0.89)	0.083
How knowledgeable are you about water quality issues in your community?	CW	24 (20)	3.79 (4.65)	1.62 (0.99)	**0.004***
	LW	13 (13)	4.62 (5.31)	1.04 (0.63)	**0.030***
	SR	27 (26)	3.96 (4.54)	1.09 (0.99)	**0.001***
	Total	64 (59)	4.03 (4.75)	1.32 (0.96)	**0.000***
How familiar are you with your watershed including its boundaries and characteristics?	CW	24 (20)	3.58 (4.60)	2.04 (1.23)	**0.004***
	LW	13 (13)	5.00 (5.15)	0.82 (0.90)	0.480
	SR	27 (26)	3.96 (4.73)	1.34 (0.96)	0.127
	Total	64 (59)	4.03 (4.78)	1.63 (1.05)	**0.000***
How familiar are you with strategies to protect or improve water quality in streams?	CW	24 (20)	3.92 (5.05)	1.50 (.999)	**0.000***
	LW	13 (13)	4.62 (5.23)	0.96 (0.73)	**0.005***
	SR	27 (26)	3.33 (4.23)	1.52 (1.31)	**0.000***
	Total	64 (59)	3.81 (4.73)	1.48 (1.17)	**0.000***
How familiar are you with strategies to build your community's capacity for watershed management?	CW	24 (20)	3.25 (4.45)	1.68 (1.40)	**0.001***
	LW	13 (13)	4.00 (4.77)	1.00 (0.44)	**0.008***
	SR	27 (26)	3.26 (3.77)	1.40 (1.30)	**0.020***
	Total	64 (59)	3.41 (4.22)	1.46 (1.25)	**0.000***

Note: CW: Citizen Workshop. LW: Leader Workshop. SR: Summary Reports.
*Significant at $p<.05$.
Response scale: 0 (not at all) to 6 (extremely).

In general, behavioral intention of responses produced fewer significant differences between the pre/post tests than responses related to attitudes and knowledge (Table 9). Analysis revealed that the leader workshop had a significant impact on participants' ratings of their likelihood of working with other communities to protect or improve water quality in the future (p=0.035). The summary report had a significant impact on participants' ratings of their likelihood of taking personal action to protect or improve water quality on their property in the future (p=0.022). In these cases, a

significant increase in intention to work with other communities and take personal action on participants' property was documented following interventions.

Table 9. Participant Behavioral Intentions Pre/Post Intervention.

Question	Survey	N Pre (post)	Mean Pre (post)	Standard Deviation Pre (post)	**P-Value**
How likely is it that you will take personal action to protect or improve water quality on your property in the future?	CW	24 (18)	5.04 (5.44)	1.37 (0.79)	0.132
	LW	13 (13)	4.62 (4.77)	0.96 (1.01)	0.414
	SR	27 (26)	4.44 (4.88)	1.12 (1.11)	**0.022***
	Total	64 (57)	4.70 (5.04)	1.20 (1.02)	**0.005***
How likely is it that you will work with others in your community to protect or improve water quality in the future?	CW	24 (20)	5.00 (5.20)	1.18 (0.83)	0.260
	LW	13 (13)	5.00 (5.31)	0.82 (0.63)	0.157
	SR	27 (26)	4.26 (4.38)	1.29 (1.30)	0.317
	Total	64 (59)	4.69 (4.86)	1.21 (1.10)	0.054
How likely is it that you will work with other communities to protect or improve water quality in the future?	CW	24 (20)	4.83 (5.10)	1.13 (0.79)	0.516
	LW	13 (13)	4.77 (5.13)	1.24 (0.75)	**0.035***
	SR	26 (24)	3.81 (4.04)	1.42 (1.34)	0.149
	Total	63 (59)	4.40 (4.68)	1.35 (1.20)	**0.019***

Note: CW: Citizen Workshop. LW: Leader Workshop. SR: Summary Reports.
*Significant at $p<.05$.
Response scale: 0 (not at all) to 6 (extremely).

Overall ratings of the citizen workshops evaluative survey and the summary reports evaluative survey demonstrated strong (5) or extreme (6) agreement with evaluation questions. Responses from the participant evaluation of the citizen workshop (Table 10) were on a Likert-type scale (0 not at all to 6 extremely) and over 50% of respondents rated that that the workshop facilitators were extremely responsive (6) to the audience's questions and that the leaders talked about concepts extremely important to participants. Over 50% of respondents thought attending the workshop was a good use of participant's time. Overall, more than 40% agreed the workshop met participant needs extremely well. The most varied responses were regarding if playing the watershed game was valuable, yet over 40% rated it as extremely valuable.

Table 10. Participant Evaluation of Citizen Workshops.

	Mean*	Standard Deviation	0**	1	2	3	4	5	6
The leaders were responsive to the audience's questions	5.33	0.90	0%	0%	0%	7%	7%	33%	53%
The leaders talked about concepts that were important to me	5.29	0.91	0%	0%	0%	7%	7%	36%	50%
This workshop was a good use of my time	5.20	1.02	0%	0%	0%	7%	20%	20%	53%
Today's program met my needs	5.00	1.11	0%	0%	0%	14%	14%	29%	43%
The watershed game was valuable	4.36	1.78	0%	7%	14%	7%	21%	7%	43%

Note: Source: Citizen workshops evaluation from Belleville and Troy.
*Responses based on a 7 point scale of agreement from not at all (0) to extremely (6).
**Responses rounded valid percent based on agreement from not at all (0) to extremely (6).

Generally, participant evaluation ratings agreed less strongly for the summary workshop compared to the citizen workshop. Responses for the participant evaluation of the summary reports (Table 11) included over 30% of respondents who rated that the summary reports talked about concepts extremely important to them, and over 29% rated that reading the summary reports was an extremely good use of participant's time. Overall, the summary reports included concepts the respondents found extremely valuable (29%), and agreed that the summary reports met respondents needs extremely well (21%). Regarding whether the summary reports had all the information respondents were looking for, there was slightly less agreement (17%).

Table 11. Participant Evaluation of Summary Report.

Question	Mean*	Standard Deviation	0**	1	2	3	4	5	6
The summary report talked about concepts that were important to me	4.79	1.10	0%	0%	0%	17%	21%	29%	33%
Reading this summary report was a good use of my time.	4.67	1.05	0%	0%	0%	13%	38%	21%	29%
The summary report included concepts that were valuable	4.63	1.17	0%	0%	4%	13%	29%	25%	29%
The summary report met my needs	4.25	1.30	0%	0%	8%	25%	20%	25%	21%
The summary report had all the information I was looking for	3.96	1.52	4%	0%	8%	29%	17%	25%	17%

Note: Source: Summary Report evaluation.
*Responses based on a 7 point scale of agreement from not at all (0) to extremely (6).
**Responses based on rounded valid percent of agreement from not at all (0) to extremely (6).

Responses from the qualitative data analysis include open-ended questions in the pre/post tests, which requested respondents to write about two concepts or ideas learned at the interventions (Table 12). The question "can you name two concepts or ideas that you learned…" (Appendix O) referred to participants' experiences at the workshops or reading the summary reports, and rates of respondents who completed one or more responses included the citizen workshop (40%), the leader workshop (76%), and the summary reports (70%). The summary of the qualitative analysis of themes regarding two concepts or ideas learned through interventions includes "actions" to take and "community and watershed needs." "Interconnectedness" was a common theme shared by the leader workshop and the summary reports, and "definitions and concepts" was a theme shared by the citizen workshop and the summary reports. Other unique themes were "resources available" at the citizen workshop, "awareness" and "citizen views" at

the leader workshop, and "community and watershed problems" with the summary reports.

Table 12. Summary of Themes from Two Concepts or Ideas Learned.

Theme	Citizen Workshops	Leader Workshop	Summary Reports
Actions	X	X	X
Awareness		X	
Citizen's Views		X	
Community and Watershed Needs	X	X	X
Community and Watershed Problems			X
Definitions and Concepts	X		X
Interconnectedness		X	X
Resources Available	X		

The question, "what has the workshop or summary reports inspired you to do" was posed to participants (Table 13) taking the pre/post test for the workshops and the summary reports (Appendix P). Rates of respondents who added a comment in questionnaires varied between the citizen workshop (40%), the leader workshop (92%), and the summary reports (62%). The summary of the themes of inspiration (Table 13) involved common themes between the citizen workshop, the leader workshop, and summary reports including "sharing with others." Responses from the workshops included a theme of "seeking more information" and "working with others." The theme of "changing personal land use practices" at the citizen workshop was similar to the themes of "applying in job," "increased interest," and desire to "initiate something" at the leader workshop, and desire for "personal action" from the summary reports. In other cases, themes were unique, such as a citizen workshop a participant writing "no inspiration" and a summary reports reader writing "increased awareness."

Table 13. Summary of Themes of Inspiration.

Theme	Citizen Workshops	Leader Workshop	Summary Reports
Apply in Job		X	
Change in Personal Land Use Practices	X		
Increased Awareness			X
Increased Interest		X	
Initiate Something		X	
No Inspiration	X		
Personal Action			X
Seek More Information	X	X	
Share with Others	X	X	X
Work with Others	X	X	

Objectives-Oriented Results

The objectives-oriented evaluation results incorporated data from the pre/post tests and evaluative surveys. The first goal of the Watershed Health Integrated Research project was for interventions to "employ a participatory approach" (Table 14). The objectives were for stakeholders to be engaged in planning, implementing, and evaluating the interventions, and for partnerships with local groups to be developed. Criteria for the first objective was for stakeholders to plan, implement (i.e. participate), and evaluate the intervention. Criteria for the second objective were for local groups to provide funding, volunteers, or promotion of interventions.

The citizen workshop fulfilled the most criteria (5 of 6) and the website fulfilled the fewest criteria (1 of 6). Across the board, interventions did not meet the criteria of involving stakeholders in planning. Stakeholders were involved as participants in evaluations, except for the leader workshop and summary reports. The website offered a Survey Monkey™ evaluation on the homepage, but there was no participation.

Partnerships developed with local groups with the CRT and workshops, but not through the website and summary reports. In total, three of the five interventions fulfilled the first Watershed Health Integrated Research project goal to employ a participatory approach.

Table 14. Goal Achievement of Employing a Participatory Approach to Research.

Objectives	Criteria	Assessment
Stakeholders engaged in planning, implementing, and evaluating interventions	Stakeholders planned the intervention	**CRT:** (0) Stakeholders did not plan (1) Stakeholders participated (n=61) (0) Stakeholders did not evaluate*
		Web: (0)Stakeholders did not plan (1) Stakeholders participated (n=48) (0) Stakeholders did not evaluate**
	Stakeholders participated in the intervention	**CW:** (1) Stakeholders did not plan (1) Citizens participated (n=32) (1) Stakeholders evaluated CW
	Stakeholders evaluated the intervention	**LW:** (0) Stakeholders did not plan (1) Leaders participated (n=17) (0) Stakeholders did not evaluate*
		SR: (0) Stakeholders did not plan (1) Citizens received summary reports (1) Stakeholders evaluated SR
Partnerships with local groups developed	Local groups provide funding	**CRT:** (0) No local group funding (1) SWIRC&D staff volunteered (1) SWIRC&D promoted
		Web: (0) No local group funding (0) No local group volunteered (0) No local group promoted
	Local groups provide volunteers	**CW:** (0) No local group funding (1) SWIRC&D staff volunteered (1) SWIRC&D and members of local groups (i.e. Sierra Club) promoted
	Local groups promote interventions	**LW:** (0) No local group funding (1) SWIRC&D volunteered (1) SWIRC&D staff promoted
		SR: (0) No local group funding (0) No local group volunteered (0) No local group promoted
TOTAL: CRT: 3/6	Web: 1/6	CW: 5/6 LW: 3/6 SR: 2/6

Note: CRT: Community Research Team. Web: Website. CW: Citizen Workshop. LW: Leader Workshop. SR: Summary Reports. U: Unknown. *No evaluation offered. **Evaluation offered, but no participation. ***0 scoring meant that the criterion was not fulfilled, while 1 scoring meant the criterion was fulfilled.

The second goal of the Watershed Health Integrated Research project was for interventions to "develop outreach programs tailored to each subwatershed community's needs for conservation and capacity-building," (Table 15). The objectives were to tailor

interventions to subwatersheds and for content to integrate ecological and social findings. Criteria for the first objective were for the intervention to include Richland Creek or Silver Creek specific content. Criteria for the second objective were for presenting integrated ecological and social findings to stakeholders. The website, the citizen workshop, and the summary reports fulfilled the most criteria (2 of 2), and the leader workshop fulfilled the least criteria (0 of 2). Parts of the CRT and the website, as well as the whole citizen workshop and the summary reports included tailored content. Yet other content from the CRT and the leader workshop was not tailored to subwatersheds. In summary, all of the Watershed Health Integrated Research project interventions fulfilled the objectives and criteria of integrating ecological and social content and the second goal to develop outreach programs tailored to each subwatershed community's needs.

Table 15. Goal Achievement of Developing Tailored Outreach Programs.

Objectives	Criteria	Assessment
Interventions tailored to subwatershed	Intervention included Richland Creek or Silver Creek specific content	**CRT:** (0.5) Content not tailored for survey draft or progress report, content tailored for summary reports
		Web: (1) Content available for both
		CW: (1) Content tailored
		LW: (0) Content not tailored
		SR: (1) Content tailored
Content integrated ecological and social findings	Integrated ecological and social findings presented to stakeholders	**CRT:** (1) Integrated content
		Web: (1) Integrated content
		CW: (1) Integrated content
		LW: (1) Integrated content
		SR: (1) Integrated content
TOTAL: CRT: 1.5/2	Web: 2/2 CW: 2/2	LW: 1/2 SR: 2/2

Note: CRT: Community Research Team. Web: Website. CW: Citizen Workshop. LW: Leader Workshop. SR: Summary Reports.

The third goal of the Watershed Health Integrated Research project was for interventions to "administer outreach techniques that inform and empower diverse community stakeholders," (Table 16). The objectives were to influence knowledge gain, awareness gain, intent for pro-environmental behavior change, and for stakeholders to be

interested in sharing information. Criteria included influencing a statistically significant positive change between pre/post knowledge, awareness of watershed boundaries and characteristics, and to influence stakeholder's intention for pro-environmental behavior change, and influence stakeholder's intention to share information with others. The citizen workshop fulfilled the most criteria (4 of 4) and the summary reports fulfilled the fewest criteria (3 of 4), while the CRT and the website could not be evaluated. The influence of interventions is unknown with the CRT and the website, which did not use a pre/post test or receive written feedback to analyze for qualitative themes. Overall, three of the five interventions fulfilled the third Watershed Health Integrated Research project goal to administer outreach techniques that inform and empower diverse community stakeholders.

Table 16. Goal Achievement of Interventions that Inform and Empower.

Objectives	Criteria	Assessment
Influence knowledge gain	Statistically significant change between pre/post knowledge*	**CRT:** (U) Unknown
		Web: (U) Unknown
		CW: (1) Statistically significant increase
		LW: (1) Statistically significant increase
		SR: (1) Statistically significant increase
Influence awareness gain	Statistically significant change between pre/post awareness of watershed boundaries and characteristics**	**CRT:** (U) Unknown
		Web: (U)Unknown
		CW: (1) Statistically significant increase
		LW: (1) Statistically significant increase
		SR: (0) Not statistically significant increase
Influence intent for pro-environmental behavior change	Stakeholders intent pro-environmental behavior change***	**CRT:** (U) Unknown
		Web: (U)Unknown, presumed 0 (No visitors)
		CW: (1) Commitment for change of personal land use practices from some respondents
		LW: (0.5) No intention for changing land use, but some intent for applying knowledge in job and initiating something in organization
		SR: (1) Commitment from some to take personal action
Stakeholders interested in sharing information	Stakeholders intent to share information with others***	**CRT:** (U) Unknown
		Web: (U)Unknown, presumed 0 (No visitors)
		CW: (1) Intent from some to share with others
		LW: (1) Intent from some to share with others
		SR: (1) Share from some to share with others
TOTAL: CRT: U/U (4U) Web: U/U (4U) CW: 4/4 LW: 3.5/4 SR: ¾		

Note: CRT: Community Research Team. Web: Website. CW: Citizen Workshop. LW: Leader Workshop. SR: Summary Reports.
*Change in knowledgeable about water quality issues in your community pre/post test question.
**Change in familiarity with your watershed, including its boundaries and characteristics pre/post test question.
***Change from qualitative themes.

The fourth goal of the Watershed Health Integrated Research project was for interventions to "appraise outreach programs in each community using pre/post-tests, evaluative surveys, and impact scores" (Table 17), and the objectives were identical to these goals. Criteria included appraising interventions through pre/post tests, evaluative surveys, and impact scores. The citizen workshop and the summary reports fulfilled the most criteria (3 of 3), and the CRT and the website fulfilled the fewest criteria (1 of 3). All of the interventions were appraised through the impact scores of this evaluation. The workshops and summary reports were appraised through pre/post tests, and the citizen

workshop and summary reports were appraised through an evaluative survey, while the CRT and the website were not appraised through pre/post tests or the evaluative survey. As mentioned earlier, the intent was to appraise the website through a Survey Monkey™ survey, yet no website visitors took the survey. Overall, the citizen workshop, leader workshop, and summary reports fulfilled the fourth goal of appraising outreach programs in each community.

Table 17. Goal Achievement of Appraising Outreach Interventions.

Objectives	Criteria	Assessment
Interventions appraised in appropriate ways, including pre/post-tests, surveys, and impact scores	Intervention appraised through pre/post test	**CRT:** (0) Not appraised through pre/post test*
		Web: (0) Not appraised through pre/post test*
		CW: (1) Appraised through pre/post test (n=21)
		LW: (1) Appraised through pre/post test (n=13)
		SR: (1) Appraised through pre/post test (n=26)
	Intervention appraised through survey	**CRT:** (0) Not appraised through survey*
		Web: (0) Not appraised through survey**
		CW: (1) Appraised through survey (n=21)
		LW: (0) Not appraised through survey*
		SR: (1) Appraised through survey (n=26)
	Intervention appraised through impact-scores	**CRT:** (1) Appraised through impact scores
		Web: (1) Appraised through impact scores
		CW: (1) Appraised through impact scores
		LW: (1) Appraised through impact scores
		SR: (1) Appraised through impact scores
TOTAL: CRT: 1/3	Web: 1/3 CW: 3/3	LW: 2/3 SR: 3/3

Note: CRT: Community Research Team. Web: Website. CW: Citizen Workshop. LW: Leader Workshop. SR: Summary Reports.
*No test or evaluation offered.
**Evaluation offered, but no participation.

Cumulative results from the objectives-oriented assessment of the interventions suggest that the citizen workshop fulfilled the most Watershed Health Integrated Research project goals (Table 18). The summary reports fulfilled three goals, and the leader workshop, and the CRT fulfilled two goals. The website fulfilled one goal.

Table 18. Objectives Accomplishment Totals.

Goals	CRT	Website	Citizen Workshop	Leader Workshop	Summary Reports
1) Employ a participatory approach to research	3/6 **Yes**	1/6 **No**	5/6 **Yes**	3/6 **Yes**	2/6 **No**
2) Develop outreach programs tailored to each subwatershed community's needs for conservation and capacity-building	1.5/2 **Yes**	2/2 **Yes**	2/2 **Yes**	1/2 **No**	2/2 **Yes**
3) Administer outreach techniques that inform and empower diverse community stakeholders	U/U (4U) **No**	U/U (4U) **No**	4/4 **Yes**	3.5/4 **Yes**	3/4 **Yes**
4) Appraise outreach programs in each community using pre/post-tests, surveys, and impact scores	1/3 **No**	1/3 **No**	3/3 **Yes**	2/3 **Yes**	3/3 **Yes**
Total Objectives Fulfilled	5/15, or 5/11 (4U) **Two fulfilled**	4/15, or 4/11 (4U) **One Fulfilled**	14/15 **Four Fulfilled**	9.5/15 **Three Fulfilled**	10/15 **Three Fulfilled**

Note: U: Unknown. Yes: More than half criteria fulfilled. No: Fewer than half criteria fulfilled.

Effort-Oriented Results

Overall, the effort-oriented results suggest that the CRT required the least amount of effort. Effort inputs, including costs, personnel, and time expended by each intervention, are detailed in Table 19. For all interventions, seven to eight personnel were involved, including the five WHR program investigators, 1-2 graduate students, and additional personnel. Time required varied, ranging from 43 hours (CRT) to the 228 hours (citizen workshops). The CRT required the fewest hours, comparable to one forty-hour workweek. The summary report required two forty-hour workweeks, while the leader workshop required three forty-hour workweeks. The website required four forty-hour workweeks, while the citizen workshop required the greatest number of hours totaling in just under six forty-hour workweeks. Cost also varied, ranging from a minimum of $3,845 for the summary report to a maximum of $11,814 for the citizen

workshop. Interventions were rated as low, moderate, and high cost. Interventions that cost less than $3,999 included the summary reports (rated as low cost), and interventions that cost $4,000-$7,999 included the CRT and the leader workshop (rated as moderate cost). The website and the citizen workshop cost more than $8,000 (rated as high cost).

Table 19. Effort Input With Ratings.

Criteria	CRT	Website	Leader Workshop	Citizen Workshops	Summary Reports
Personnel (#) Low= <6 Mod=6-10 High= >10	7 Personnel (5I, 2G) *Moderate*	8 Personnel (5I, 1G, 1C, 1T) *Moderate*	8 Personnel (5 R, 3G) *Moderate*	7 Personnel (5I, 2G) *Moderate*	7 Personnel (5I, 2G) *Moderate*
Time (Hrs) Low= <75 hr Mod=76-150 hr High= >150 hr	43 hrs *Low*	165 hrs *Moderate*	116 hrs *Moderate*	228 hrs *High*	95 hrs *Moderate*
Cost ($) Low=$0-$3,999k Mod=$4k-$7,999k High= >$8k	$5,525 *Moderate*	$10,985 *High*	$6,052 *Moderate*	$11,814 *High*	$3,845 *Low*

Note: I: Investigator. G: Graduate Student. T: Information Technology Professional. C: Contractor for Website. For Cost $k: Thousand-Dollar Increment.

Cumulative Evaluation Results

The comparison between the cumulative input and output (introduced in Table 6) is completed in Table 20. The input includes the costs, personnel and time expended by each intervention. The outputs produced include engaging participants, forming or strengthening partnerships, generating products, and in some cases, potentially influencing attitudes, knowledge and behavioral, and satisfying participants.

For the CRT, seven personnel contributed roughly 43 hours at a cost of $6,620 to involve 61 participants, with an unknown impact. Although partnerships were developed with Southwestern Illinois Research Conservation and Development Inc., and stakeholders, no products were generated. The creation of the website involved eight

personnel, approximately 165 hours, and $8,660 to reach at least 61 visitors. The website continues to exist today, with an unknown impact. No visitors evaluated the website and no measurable partnerships were formed or strengthened through the website. For the leader workshop, eight personnel supplied around 228 hours, at a cost of $9,594 to hold a workshop for 17 people (an assortment of elected officials, government agency representatives, and city and county employees from the Lower Kaskaskia River Watershed) that may have influenced knowledge and behavior. Additionally, the leader workshop built partnerships with the Southwestern Illinois Research Conservation and Development Inc., and stakeholders and provided workshop materials for future reference. The citizen workshop involved seven personnel, took roughly 116 hours, and cost $14,826 to hold four workshops to engage 31 attendees that may have influenced knowledge and attitudes, developed partnerships with the Southwestern Illinois Research Conservation and Development Inc., and stakeholders, and provided workshop materials for ongoing reference. Overall the workshop was rated favorably by participants: 71.4% respondents rated the evaluation as extremely positive (mean=4.36). The summary reports required seven personnel to contribute roughly 95 hours at a cost of $4,445 to design and produce two watershed-specific reports, approximately 92 of which were distributed and may have influenced reader's knowledge, attitudes, and behavior. No partnerships were engaged through the summary reports. Overall the summary reports were rated favorably by readers: 58.4% respondents rated the evaluation as extremely positive (mean=3.96).

Table 20. Completed Comparison of Input and Output Effort.

	Criteria	CRT	Website	Leader Workshop	Citizen Workshops	Summary Reports
Input	Personnel (#)	7 Personnel (5I, 2G)	8 Personnel (5I, 1G, 1C, 1T)	8 Personnel (5 R, 3G)	7 Personnel (5I, 2G)	7 Personnel (5I, 2G)
	Time (Hrs)	43 hrs	165 hrs	116hrs	228hrs	95 hrs
	Cost ($)	$5,525	$10,985	$6,052	$11,814	$3,845
Output	Participation Rates	61 Participants (61/78 Invited & accepted)	At least 61 visitors	17 Attendees	31 Attendees	92 distributed (61 CRT, 31 workshops)
	Pre/post Test Results	Unknown Impact	Unknown Impact	Influenced knowledge, behavior	Influenced knowledge, attitudes	Influenced knowledge, attitudes, behavior
	Participant Satisfaction	N/A	N/A	N/A	Extremely Positive evaluation*	Extremely Positive evaluation**
	Partnerships Formed or Strengthened	Partnership with SWIRC&D, stakeholders	None	Partnership with SWIRC&D, stakeholders	Partnership with SWIRC&D, stakeholders	None
	Products generated	None	Website	Workshop & materials	Workshop & materials	Reports

Note: I: Investigator. G: Graduate Student. T: Information Technology Professional. C: Contractor for Website.
*71.4% of respondents (Table 11) evaluated workshop as positive (>4).
** 58.4% of respondents (Table 12) evaluated workshop as positive (>4).

The results of the objectives-oriented and effort-oriented evaluation were visually combined and each intervention was ranked on the x-axis of amount of effort expended (low, moderate, and high), and the y-axis of number of objectives fulfilled (few, some, all) (Figure 5). When low effort was expended, the intervention was considered more efficient, and when more objectives were met, the intervention was considered more effective. Compared to other interventions, the citizen workshop fulfilled all the goals, and therefore was the most effective, yet it required a high amount of effort. The leader workshop, the summary report, and the CRT fulfilled some of the goals while requiring

moderate effort. The website fulfilled few goals and required a moderate amount of effort.

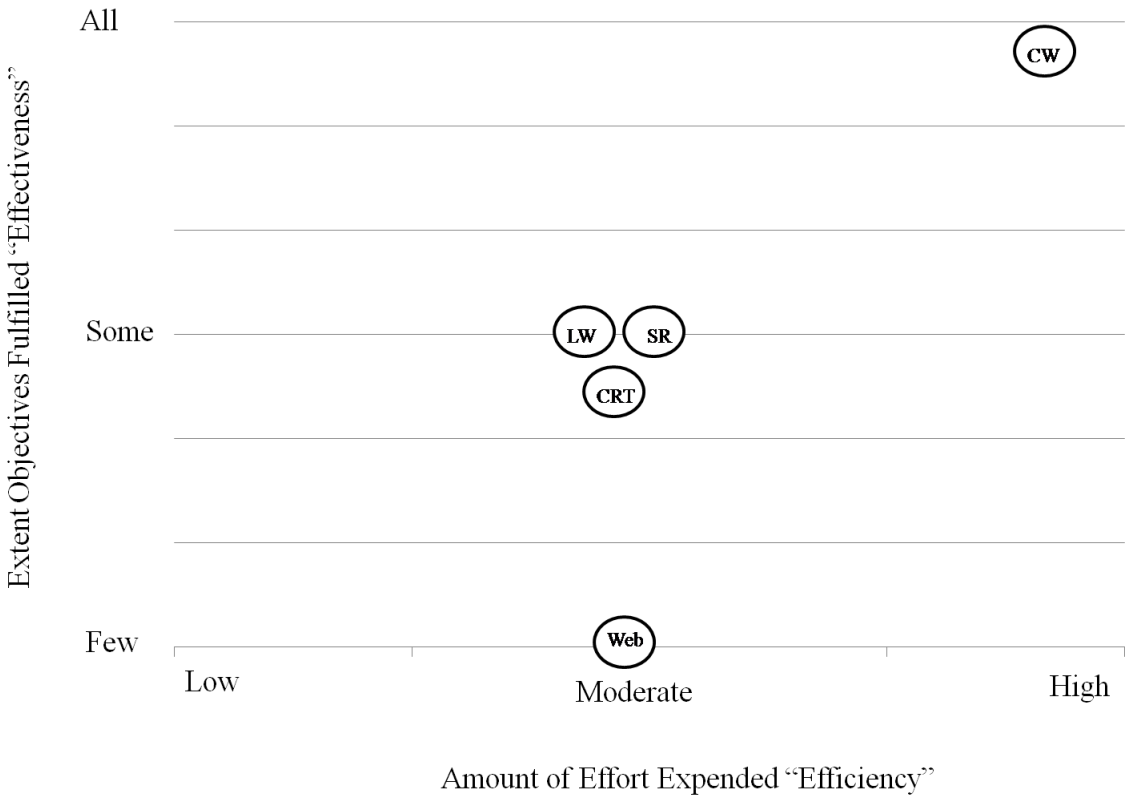

Figure 5. Spectrum of Interventions Evaluation.

V. Discussion

The purpose of evaluating the Watershed Health Integrated Research project outreach interventions was to determine the degree to which interventions fulfilled programmatic goals (effectiveness) and to quantify the effort required (efficiency). Since the rise of interest in integrated watershed management, only a limited number of evaluations of watershed outreach programs have been implemented, and many non-point source pollution reduction goals remain unreached. The objectives-oriented approach assessed the extent interventions fulfilled Watershed Health Integrated Research project goals, and results suggest that the citizen workshop fulfilled project goals to the greatest extent and were the most effective intervention. Identifying interventions as more or less effective provides understanding for future intervention planning and evaluation to increase effectiveness (Zint et al., 2011). This evaluation also reveals outreach and evaluator shortcomings, such as inconsistent data collection and evaluation (especially for the CRT and the website interventions), which can provide a valuable lesson for future evaluators. This section presents a discussion of the objectives-oriented approach, followed by the effort-oriented approach, and follows with recommendations for interventions and evaluations.

Objectives-Oriented Approach

This section explores the results from the objectives-oriented assessment of each intervention. There is evidence to suggest interventions influenced attitudes, knowledge, and behavior in varying ways. The workshops increased knowledge about water quality issues, familiarity with strategies to protect or improve water quality in streams, and familiarity with strategies to build community capacity for watershed management within

respondent's communities. The workshops may also have influenced the intent to share information with others, as indicated by qualitative theme to "share with others." Additionally, the workshops shared the theme to "seek more information" and "work with others," which was not apparent in the summary reports.

The citizen and leader workshops also generated unique impacts. Qualitative analysis revealed that the citizen workshops influenced knowledge of potential conservation "actions", "definitions and concepts", and "community and watershed needs." This demonstrates that if practitioners desire to influence knowledge or familiarity, a citizen-focused workshop may be an attractive option. The citizen workshops alone may have influenced the attitude regarding the importance of high quality water resources to the quality of life in respondent's communities as well as respondents' familiarity with watershed boundaries and characteristics. For some respondents, the citizen workshops seemed to influence a behavioral intent for "change in personal land use practices" or "personal action," yet the leader workshop did not seem produce this type of commitment.

However, the leader workshop may have influenced intent to "apply in job" and "initiate something" in their organization. In addition, leader workshop participants learned about "interconnectedness," which refers to an understanding that personal choices by landowners influence water quality in the watershed, that downstream efforts require partnership with upstream users, and that watershed health is connected to community health. The leader workshop also influenced how likely it is respondents will work with other communities to protect or improve water quality in the future. A leader-

focused workshop may be an advantageous option if similar outcomes influencing behavioral intentions, knowledge, and understanding are sought.

The summary report increased knowledge about water quality issues, "definitions and concepts, "familiarity with strategies to protect or improve water quality in streams, and familiarity with strategies to build community capacity for watershed management. Additionally, summary reports increased knowledge of potential personal "actions" and "community and watershed needs." The summary reports may be an ideal intervention option if practitioners aim to influence participants' knowledge or familiarity. Another component of knowledge, and potentially attitudes, affected by the summary report is the concept of "interconnectedness." Results from pre/post tests as well as qualitative analysis reveal that for some respondents, the summary reports influenced the likelihood they will take personal action to protect or improve water quality on property in the future. The summary reports also influenced how likely it is that respondents would share information with others.

A few thoughts on these differences emerge. One possibility is that interventions were uniquely suited vehicles for conveying specialized forms of information. For example, the citizen workshop being well-suited to highlight the importance of water quality while the summary reports was more suited to highlight concern for water quality problems. The content of the workshops focused on introducing and increasing awareness about water quality issues, whereas the summary reports focused on sharing personal action steps and in-depth information regarding water quality and community capacity. Additionally, format is an important consideration. Workshops naturally are an interactive intervention and may stimulate ideas and facilitate working with others more

than individually reading a report, as evidence by the workshops shared theme to "seek more information" and "work with others," which was not apparent in the summary reports. Another possibility is that certain participants were already knowledgeable or concerned in these areas; significant gains in knowledge were not likely to be influenced by the intervention. There would have been stronger design, more valid measures with more participants, and an increase in information tracking.

Additional considerations include question design. I designed some questions for a particular target audience, such as targeting leaders when asking "the likelihood of working with other communities to protect or improve water quality," an action that is more likely at a community level as opposed to an individual level. One limitation is that a pre/post test was not available for the CRT or the website, and these interventions may have influenced participants' knowledge, attitudes, and behavior. Another limitation is that all behaviors discussed were measured as behavioral intentions, and there was no way of verifying if actual behavior was performed. In various studies examined by Abrahamse et al. (2005), actual follow-up to behavioral intention measures reveal participants do not always institute behaviors, such as adopting energy-saving measures like turning down the thermostat. In the case of the interventions it is unknown.

Findings for the two evaluative surveys (for the citizen workshop and the summary reports) were generally positive, although limitations include small sample sizes. Additionally, comparing surveys across all of the interventions would have been a useful comparison tool in future outreaches assessments. Overall, the objectives-oriented evaluation revealed that the citizen workshop fulfilled the programmatic goals and objectives to a greater extent than other interventions. Why does this matter? This

information can inform and improve intervention planning. Identifying implementing key objectives, such as tailoring or evaluating content, can improve the quality of interventions and the ability for interventions to meet objectives. Additionally, interventions which may appear good on paper but truly do not meet the objectives of an outreach program should be altered or exchanged for something that does. In the case of the Watershed Health Integrated Research project, the website only fulfilled one goal, which was tailored information. While the website included a citizen forum, it was not utilized by citizens. The website also did not meet goals of applying a participatory approach and appraising the outreach programs, which implies the intervention needs to be modified or it will continue to be ineffective. Applying a participatory approach and involving the community in planning the website is a potential intervention modification that could increase the effectiveness of a website. Additionally, while it is challenging to get a non-captive audience such as a website visitor to appraise the website, holding community focus groups or meeting with CRT members personally to appraise the website are additional methods for appraising outreach programs.

Effort-Oriented Approach

This section explores the effort required by different interventions, along with the assets and limitations of the input and output approach, and effort efficiency considerations. Effort-oriented approach assessed the amount of effort required by each intervention regarding personnel, time and cost. Regarding criteria rankings with personnel numbers, “low personnel effort” involved less than 5 personnel, “moderate personnel effort” ranged from 6-10 personnel, and “high personnel effort” required greater than 10 personnel. For the time criteria, “low time effort” required less than 75

hours, “moderate time effort” required 76-150 hours, and “high time effort” required greater than 150 hours. Finally, for the cost criteria, “low cost effort” cost up to $4,000, “moderate cost effort” cost ranged from $4,000-$8,000, and “high cost effort” was $8,000 or more. Using these criteria, results were accumulated and if an intervention was ranked as fulfilling “low,” “moderate,” or “high,” in two or more criteria it received that ranking overall.

Effort oriented evaluation results suggest that the summary reports required the lowest level of effort to reach the greatest number of diverse stakeholders. Identifying interventions as having low or high levels of efficiency can allows practitioners to make strategic and informed decisions (Kirwan et al., 2008; Thompson et al., 2011). Depending on programmatic objectives and resources, the spectrum of intervention evaluation results can provide insight for choosing interventions.

The effort-oriented results revealed that the leader workshop, the CRT, the summary reports and the website required a moderate amount of effort to reach the largest diverse group of stakeholders. The leader workshop required a moderate amount of effort to reach at least 12 community leaders, while the website demanded a moderate amount of effort to reach at least 60 people, and the summary report to reach at least 92 people. The citizen workshop required a high amount of effort to reach a group of at least 61 citizens. Regarding effort calculations, totals of personnel involved was less of a decisive factor in determining effort because personnel numbers ranged from seven to eight largely because the entire Watershed Health Integrated Research project investigation team was involved in intervention planning. A more determinant factor was the amount of hours an investigator spent on the project because their hourly billing rate

was the highest. For example, the website involved the same amount of personnel as the citizen workshop, but required more hours at a lower cost. This is because the citizen workshop involved all investigators, whereas the website only involved one investigator to implement.

The effort ratings illuminate input effort required by the interventions. Another dimension of the effort analysis was the relationship between inputs and outputs. There is not necessarily a linear correlation between inputs and outputs, as through inputs of personnel, time, and money automatically result in outputs of behavior change. However pairing input effort with outputs delivered provides a context, such as the input and output results (Table 20). It appears that the citizen workshop required the most inputs yet delivered the most outputs. The citizen workshop involved the most hours at the highest expense yet influenced a change in pre/post test regarding attitudes and knowledge, garnered a positive evaluation mean, developed local partnerships, and generated products.

Correspondingly, the CRT required fewer inputs to deliver fewer outputs; however there were unknown components (e.g. confirmed changes in attitude, knowledge, and behavioral intention). The summary reports deviates from this understanding, however, as it required fewer inputs, yet included 93 participants and may have influenced knowledge, attitudes and behavior, resulted in positive mean evaluation scores and generated products. As important as outputs are to consider, they do not tell the whole story. For example, not all of the benefits of the CRT can be quantified in the output chart. The CRT also functioned within the context of the Watershed Health Integrated Research project research, including interviews and focus groups, which were

not in themselves interventions, yet potentially could have influenced the individuals' knowledge, attitudes, behavior and interventions. Members of the CRT received unique opportunities to relate to the investigation team and learn about their watershed both hydrologically and socially. Likewise, investigators were informed by CRT member's reviews of initial residential survey drafts and benefited from the CRT's function as community gatekeepers (Rogers, 1995). Specifically, the Watershed Health Integrated Research project benefited from the community gatekeeper's ability to influence their peers and recruit volunteers. Furthermore, interventions do not exist within a vacuum, but within a timeframe and a physical and relational community. Van der Ploeg (2011) further developed input/output thinking when their team assessed the effectiveness of different outreach techniques on crocodile conservation in the Philippines. Outreaches were evaluated based on cost effectiveness (cost per person per day) and the ranking given by respondents. Findings suggest that mass diffusion campaigns (such as billboards), as well as interactive interventions can provide the highest participant satisfaction, which may help justify the high cost (van der Ploeg, Cauilan-Cureg, van Weerd, & De Groot, 2011). Not all of the interventions evaluated participant satisfaction, but it is an important component of output and should be included in future outreach assessment endeavors.

There were some special considerations for the Watershed Health Integrated Research project interventions regarding effort efficiency. In some cases, work could have required fewer investigators yet in most cases all of the investigators were involved because the project was by nature collaborative and sought to bring together hydrologic knowledge with social science expertise into each intervention. Another consideration is

that personnel were involved from three different institutions. There are many benefits to collaborating outside of an individual's institution, yet drawbacks may include more complex planning (such as conference calls) and higher associated cost due to travel time and costs. This was the case with the Watershed Health Integrated Research project and the total expenditures reflect inflated travel costs. Travel was a consideration because one of the investigators accepted a new position at the University of Minnesota, which required one investigator and one graduate student to travel from Minneapolis-St. Paul to contribute to interventions in southwestern Illinois. Travel also generated increased cost for interventions (such as workshops). The workshops could have potentially required less effort if long-distance travel were not required.

Recommendations for Future Interventions

In this section, recommendations refer to interventions that may be well-suited for use in certain contexts, as well as recommendations for intervention improvement. Each intervention has different strengths and weaknesses. Depending on a program's objectives and resources, different interventions will be more or less suitable. If a goal is to employ a participatory approach, choosing interventions that involves stakeholders and partners with local groups, such as the CRT or a workshop, would be effective options. Key elements of such an intervention include involving stakeholders in planning, participating in, and evaluating the intervention. If a goal is informing and empowering diverse stakeholders, the workshops and the summary reports would be effective options. Other goals, such as tailoring interventions and appraising outreach programs, were not more or less suitable for any intervention. If resources are constrained, multi-day interventions, such as the citizen workshop, required greater effort than one-time

interventions, such as the leader workshop. In addition, involving the entire research team in planning and implementing interventions significantly increases costs. If financial resources are limited, utilizing graduate student talent for certain tasks will reduce personnel cost, as well as utilizing contractors. However, involving the whole planning team may also create better interventions and outcomes.

Integrating follow-up into interventions is another way to improve interventions and characterize intervention impact. Future interventions should explore the extent to which long-term impacts came to fruition. Fien et al. (2001) and Abrahamse et al. (2005) note that little is known about long-term effects of interventions. In southwestern Illinois, this could involve a future study measuring if behavioral change, community capacity, watershed and community health were influenced by the Watershed Health Integrated Research project. This would involve hydrologic sampling and sending a follow-up survey similar to the initial residential and analyzing data for differences.

This evaluation also revealed recommendations for improving interventions, including engaging participants through the CRT, gaining website visitors, reducing workshops cost, and summary report reader's motivation. The CRT could have potentially done more to engage participants. Although there were 61 CRT members, not all were active. Approximately 39% (n=24) responded to the summary report evaluative survey, perhaps indicating a more active contingent. This variation in level of involvement may be related to a variety of factors, such as the time availability, interest in responding to surveys, interest in the project, or failed recruitment strategy. There may be further implications for targeting individuals who act as the primary gatekeepers and diffusers of innovation; by involving those individuals and maintaining that connection

an intervention could potentially increase response rates. There are limited recommendations for the CRT because insights from an evaluation and a pre/post test were not available, so another recommendation is to incorporate these evaluator tools into future interventions.

Regarding the website, total visitor rates are unknown. Installation of the website visit counter occurred approximately six months after launching the website. Since installing the website visit counter there have been72 visits and 61 unique visitors as of March 2012. The website visit counter was not tracking during the leader and citizen workshops, so it did not capture traffic that may have increased from those events. There is a strong potential that visitors are missing from our records from that time. Additionally, the website hit counter monthly visit records are incomplete. Information provided to this evaluator included 12/26/2010-1/31/2011 and 9/2/2011-3/31/2012, and approximately seven months were missing from the beginning of the record. The website visit counter also did not account for when project team members, including this evaluator, may have visited the site. Various team members occasionally accessed the site to check on information. Despite these circumstances, low website visit rates are not uncommon.

When employing an online pre-test, Kirwan, Williams, and Kirwan (2005) received zero responses, even though the pre-test was posted on a variety of natural resources based websites (e.g. a local Soil and Water Conservation District). Because of this non-response, investigators adapted the evaluation and sent evaluators into classrooms to administer a shortened three-question test and some gave schools a write-in test. Additionally, Mahler, Seago, Simmons, and Fedale (2008) found that website use

was dependent upon the involvement of program partners who consider the website a resource and refer to it over time.

The Watershed Health Integrated Research project intended the website to be a resource repository, but perhaps needed more partnership development or a deeper understanding of what the partners and stakeholders needed in a website. The mentality of "build it, they will come" is not effective in this age of abundant information. Recommendations for the website include taking a participatory approach involving stakeholders in planning the website. This could help determine if there is a genuine need for such a website, or what features would meet stakeholder needs. Furthermore, confirming that organizational partners are supportive and willing to promote the website is another important dimension of a website intervention. An interactive website, such as Abrahamse et al. (2007) developed, is another option. This website provided participants with tailored feedback regarding energy conservation, and something customized in such a way could be more attractive to stakeholders. The website would have fulfilled more of the Watershed Health Integrated Research project goals if appraisal efforts had been more successful. It is also challenging attracting website visitors to fill out an evaluative survey when there are no benefits or reward for them. Perhaps offering a reward or other incentive (e.g. name entered into a rain barrel drawing or cash), could increase survey response. Alternatively, adopting more deliberate strategies, such as collaborating with organizational partners to recruit website appraisal participants, or including website appraisal as a focus group topic, could increase website appraisal rates.

The workshops were the two most effort-intensive interventions. Personnel travel was one component that raised workshop costs. Another consideration for the workshop

is the difference in data analysis results between the leaders and citizen workshops (Tables 8 and 9). The difference may reveal variable levels of prior knowledge and intention to apply that behavior. While differences in pre/post test regarding knowledge, attitudes, and behavior intent were significant, it is unknown whether any actual changes in behavior occurred. Abrahamse et al. (2007) reported that an energy conservation workshop conducted by Geller (1981) influenced higher conservation knowledge, but did not influence changes in behavior. This evaluation attempted to make a clear distinction between knowledge gain and the reality that it may not correlate with behavior change. It is important to understand potential results of interventions; thus further research is needed to determine realistic expectation for workshop outputs.

Considerations with the summary reports include participant's motivation. Van der Ploeg et al. (2011) found that the effectiveness of newsletters was highly dependent on participants' motivation to read them (and hindered by low literacy rates). An implication for the Watershed Health Integrated Research project is that perhaps only the highly motivated individuals are willing to read summary reports intervention. Data were not collected from participants who did not read the summary reports, but gathering information from non-respondents may shed light on the usefulness of summary reports.

Recommendations for Future Evaluations

Recommendations for future evaluations include consistent and organized planning, as well as determining appropriateness for watershed scale interventions. Objectives-oriented evaluations should consider strategically planning consistent pre/post tests and evaluations whenever possible, and make a priority of using participant satisfaction results. Such as incorporated by van der Ploeg (2011). Effort-oriented

evaluations should consider creating data collection matrices before the intervention, so that collecting accurate data is part of the process and estimations are not needed after the interventions are complete. Another consideration is that effort-related hourly costs and rates may not be immediately useful, as often grant applications do not require investigators to list hourly wage, rather a bulk rate (i.e., one investigator at ½ time for three months).

Through evaluating the Watershed Health Integrated Research project interventions, it is evident that some of the interventions have qualities that make them more or less appropriate for watershed scale outreach. Because integrated watershed management is still a relatively emerging field (Sabatier et al., 2005) and few watershed scale outreach evaluations have been conducted (Kirwan, Williams, &Kirwan, 2008; Jemison, Wilson, & Graham, 2004; Shepard, 1999; Thompson, Coe, Klaver, & Dickson, 2011), there is an opportunity for development of appropriateness criterion. As far as this author knows, no other evaluation has attempted to rate the degree to which an intervention is appropriate for watershed outreach. The unique characteristics of integrated watershed management could potentially provide criteria to evaluate the extent to which outreach interventions are appropriate. The criteria could include: bottom up/grass roots (versus top-down) (Mullen & Allison, 1999), community-based, cooperative, democratically legitimate, fair, and stakeholder-driven approaches (Borden et al., 2007; Germain et al., 2007; Sabatier et al., 2005). Additionally, locally-driven (versus federally-driven) (Borden et al., 2007; Lant, 1999), decentralized treatment and less-engineered solutions (Borden et al., 2007; Lant, 2003), integrated with land use (Alder, 1995), watershed boundaries (versus political boundaries) (Alder, 1995), and

watershed-wide pollutant sources (versus point sources) (Alder, 1995) could be included criteria to evaluate the extent to which outreach interventions are appropriate. The appropriateness criteria provide other lenses for evaluating watershed scale outreach interventions that could further develop the field.

VI. Conclusions

This evaluation used the Model for Integrated Watershed Management Assessment to create a spectrum regarding effectiveness and efficiency of interventions. Through data collection and analysis, the evaluation determined that the citizen workshop fulfilled goals to the greatest extent, and thereby was the most effective. Regarding efficiency, no intervention was clearly the most efficient, as the CRT, the leader workshop, the website and summary report required a moderate amount of effort. Each intervention uniquely blended efficiency and effectiveness, which provides insight for practitioners in choosing intervention options.

When impact related to knowledge, attitudes and behavior was tested (for the workshops and the summary report) results showed that the interventions had significant impact on participants. In all cases, a significant increase in knowledge and familiarity followed participating in the workshops and reading the summary report. Because watershed outreach is an emerging area with untapped potential for decreasing non-point source pollution, these findings can aid in decision-making related to interventions. Furthermore, evaluating the Watershed Health Integrated Research project outreach interventions further develops the discipline of outreach evaluation and offers an example of an integrated model along with recommendations in order to encourage the use of evaluation and improve program effectiveness and efficiency.

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Appendices

Appendix A: Acronyms and Definitions.

Community Capacity: Community capacity is defined by Chaskin (2001) as "the interaction of human capital, organizational resources, and social capital existing within a given community that can be leveraged to solve collective problems and improve or maintain the well-being of a given community," (p.293).

Integrated Watershed Management: Integrated watershed management is defined as "an integrative way of thinking about human activities on a given area of land (the watershed) that have effects on, or are affected by, water," (Brooks, Ffolliott, Gregersen, &DeBano, 2003) (p. 4).

Lower Kaskaskia River Watershed (LKRW): The Lower Kaskaskia River Watershed is a subwatershed of the Kaskaskia River Watershed in southwestern Illinois, and a tributary of the Mississippi River.

Outreach: Outreach extends research knowledge outside of academic areas. Outreach programs often seek to enhance understanding, facilitate dialogue, and promote interpersonal connections among participants (Fien, Scott, & Tilbury, 2001).

Southwestern Illinois Resource Conservation & Development (SWIRC&D) Inc.: A nonprofit council authorized as a Resource Conservation & Development Council that conserves open space and fosters livable and sustainable communities (http://www.swircd.org/index.html).

Watershed: A watershed is the physical land area from which dissolved materials, sediment and water drain from an outlet into a water body (outlets can be natural or engineered drainage networks).

Watershed Health Integrated Research Project (WHIR): A National Institute of Food and Agriculture funded project from 2008-2010 which incorporated a multi-disciplinary team of researchers to assess water quality and community capacity in the Lower Kaskaskia River Watershed.

Appendix B: Citizen Workshop Survey Instrument.

Pre-Workshop Citizen Survey [CITY] Folder Number____
Please complete this short survey BEFORE the workshop begins. When finished, turn the survey in when it is collected or at the welcome/check-in desk.
Circle the number that best represents your response to each question. Please answer questions for the COMMUNITY in which you WORK or LIVE in.

	Not at all						Extremely
How important are high quality water resources to quality of life in your community?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How concerned are you about water quality problems in your community?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How knowledgeable are you about water quality issues in the community?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How familiar are you with your watershed including its boundaries and characteristics?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How concerned are members of your community about water quality problems?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How capable is your community to respond effectively to water quality problems?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How capable are other communities in the Lower Kaskaskia River Watershed to respond effectively to water quality problems?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How familiar are you with strategies to protect or improve water quality in streams?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How familiar are you with strategies to build your community's capacity for watershed management?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How likely is it that you will take personal action to protect or improve water quality on your property in the future?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How likely is it that you will work with others in your community to protect or improve water quality in the future?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How likely is it that you will work with other communities to protect or improve water quality in the future?	**0**	**1**	**2**	**3**	**4**	**5**	**6**

Post-Workshop Citizen Survey [CITY] Folder Number____
Please complete this short survey AFTER the workshop is completed. When finished, turn in the survey when it is collected or at the registration desk.
Circle the number that best represents your response to each question. Answer questions for the community in which you WORK or LIVE in.

	Not at all						**Extremely**
How important are high quality water resources to quality of life in your community?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How concerned are you about water quality problems in your community?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How knowledgeable are you about water quality issues in your community?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How familiar are you with your watershed including its boundaries and characteristics?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How concerned are members of your community about water quality problems?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How capable is your community to respond effectively to water quality problems?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How capable are other communities in the Lower Kaskaskia Watershed to respond effectively to water quality problems?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How familiar are you with strategies to protect or improve water quality in streams?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How familiar are you with strategies to build your community's capacity for watershed management?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How likely is it that you will take personal action to protect or improve water quality on your property in the future?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How likely is it that you will work with others in your community to protect or improve water quality in the future?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How likely is it that you will work with other communities to protect or improve water quality in the future?	**0**	**1**	**2**	**3**	**4**	**5**	**6**

Continued on back

What do you believe are the three biggest needs related to water resource management in the Lower Kaskaskia River Watershed? (Circle three numbers)

1. Funding for infrastructure improvements (e.g., storm water and wastewater management)
2. Funding for programs that provide financial incentives for landowner conservation stewardship
3. More regulations on current land uses and new development
4. Better enforcement of existing regulations on current land uses and new development
5. Septic system maintenance education programs
6. Residential landscaping education programs for lawn/garden care and water management
7. Agricultural conservation practice education programs
8. Streamside protection for water quality
9. Better coordination and planning across local units of government
10. Enhancement of stream scenic integrity and recreation access to streams.

Can you name two concepts or ideas that you learned as a result of participating in this workshop?

1._____

2._____

What has this workshop inspired you to do? Give an example of how you will apply information you learned tonight in your community:

_____

_____

Appendix C: Leader Workshop Survey Instrument.

Pre-Workshop Survey Folder Number____

Please complete this short survey BEFORE the workshop begins. When finished, turn the survey in when it is collected or at the welcome/check-in desk.

Circle the number that best represents your response to each question. Please answer questions for the COMMUNITY in which you WORK as a LEADER or MANAGER.

	Not at all						**Extremely**
How important are high quality water resources to quality of life in your community?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How concerned are you about water quality problems in your community?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How knowledgeable are you about water quality issues in the community?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How familiar are you with your watershed including its boundaries and characteristics?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How concerned are members of your community about water quality problems?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How capable is your community to respond effectively to water quality problems?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How capable are other communities in the Lower Kaskaskia River Watershed to respond effectively to water quality problems?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How familiar are you with strategies to protect or improve water quality in streams?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How familiar are you with strategies to build your community's capacity for watershed management?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How likely is it that you will take personal action to protect or improve water quality on your property in the future?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How likely is it that you will work with others in your community to protect or improve water quality in the future?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How likely is it that you will work with other communities to protect or improve water quality in the future?	**0**	**1**	**2**	**3**	**4**	**5**	**6**

Post-Workshop Survey Folder Number____

Please complete this short survey AFTER the workshop is completed. When finished, turn in the survey when it is collected or at the registration desk.

Circle the number that best represents your response to each question. Answer questions for the community in which you WORK as a LEADER or MANAGER.

	Not at all						**Extremely**
How important are high quality water resources to quality of life in your community?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How concerned are you about water quality problems in your community?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How knowledgeable are you about water quality issues in your community?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How familiar are you with your watershed including its boundaries and characteristics?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How concerned are members of your community about water quality problems?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How capable is your community to respond effectively to water quality problems?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How capable are other communities in the Lower Kaskaskia Watershed to respond effectively to water quality problems?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How familiar are you with strategies to protect or improve water quality in streams?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How familiar are you with strategies to build our community's capacity for watershed management?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How likely is it that you will take personal action to protect or improve water quality on your property in the future?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How likely is it that you will work with others in your community to protect or improve water quality in the future?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How likely is it that you will work with other communities to protect or improve water quality in the future?	**0**	**1**	**2**	**3**	**4**	**5**	**6**

Continued on back

What do you believe are the three biggest needs related to water resource management in the Lower Kaskaskia River Watershed? (Circle three numbers)

1. Funding for infrastructure improvements (e.g., storm water and wastewater management)
2. Funding for programs that provide financial incentives for landowner conservation stewardship
3. More regulations on current land uses and new development
4. Better enforcement of existing regulations on current land uses and new development
5. Septic system maintenance education programs
6. Residential landscaping education programs for lawn/garden care and water management
7. Agricultural conservation practice education programs
8. Streamside protection for water quality
9. Better coordination and planning across local units of government
10. Enhancement of stream scenic integrity and recreation access to streams.

Can you name two concepts or ideas that you learned as a result of participating in this workshop?

1._____

2._____

What has this workshop inspired you to do? Give an example of how you will apply information you learned tonight in your community:

_____
_____
_____
_____

Appendix D: Pre and Post Summary Reports Survey Instrument.

ID Number____ Pre-Survey

Please complete this short survey BEFORE you read the summary report. When finished, set aside and read the summary report.
Circle the number that best represents your response to each question. Please answer questions for the COMMUNITY in which you WORK or LIVE.

	Not at all						**Extremely**
How important are high quality water resources to quality of life in your community?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How concerned are you about water quality problems in your community?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How knowledgeable are you about water quality issues in the community?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How familiar are you with your watershed including its boundaries and characteristics?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How concerned are members of your community about water quality problems?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How capable is your community to respond effectively to water quality problems?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How capable are other communities in the Lower Kaskaskia River Watershed to respond effectively to water quality problems?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How familiar are you with strategies to protect or improve water quality in streams?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How familiar are you with strategies to build your community's capacity for watershed management?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How likely is it that you will take personal action to protect or improve water quality on your property in the future?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How likely is it that you will work with others in your community to protect or improve water quality in the future?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How likely is it that you will work with other communities to protect or improve water quality in the future?	**0**	**1**	**2**	**3**	**4**	**5**	**6**

Post-Survey

Please complete this short survey **AFTER** you read the summary report. **Please do not refer back to your Pre-Survey responses.** When finished, place survey in the self-addressed stamped envelope provided.

Circle the number that best represents your response to each question. Answer questions for the community in which you WORK or LIVE.

	Not at all						**Extremely**
How important are high quality water resources to quality of life in your community?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How concerned are you about water quality problems in your community?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How knowledgeable are you about water quality issues in your community?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How familiar are you with your watershed including its boundaries and characteristics?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How concerned are members of your community about water quality problems?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How capable is your community to respond effectively to water quality problems?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How capable are other communities in the Lower Kaskaskia Watershed to respond effectively to water quality problems?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How familiar are you with strategies to protect or improve water quality in streams?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How familiar are you with strategies to build your community's capacity for watershed management?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How likely is it that you will take personal action to protect or improve water quality on your property in the future?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How likely is it that you will work with others in your community to protect or improve water quality in the future?	**0**	**1**	**2**	**3**	**4**	**5**	**6**
How likely is it that you will work with other communities to protect or improve water quality in the future?	**0**	**1**	**2**	**3**	**4**	**5**	**6**

What do you believe are the three biggest needs related to water resource management in your watershed? (Circle three numbers)

1. Funding for infrastructure improvements (e.g., storm water and wastewater management)
2. Funding for programs that provide financial incentives for landowner conservation stewardship
3. More regulations on current land uses and new development
4. Better enforcement of existing regulations on current land uses and new development
5. Septic system maintenance education programs
6. Residential landscaping education programs for lawn/garden care and water management
7. Agricultural conservation practice education programs
8. Streamside protection for water quality
9. Better coordination and planning across local units of government
10. Enhancement of stream scenic integrity and recreation access to streams.

Can you name two concepts or ideas that you learned from reading the summary report?

1. _____
2. _____

What has this summary report inspired you to do? Give an example of how you will apply information you learned in your community (e.g., build a rain garden):

_____

_____

_____

Summary Report Evaluation

	Not at all						**Extremely**
Reading this summary report was a good use of my time.	**0**	**1**	**2**	**3**	**4**	**5**	**6**
The summary report talked about concepts that were important to me.	**0**	**1**	**2**	**3**	**4**	**5**	**6**
The summary report included concepts that were valuable.	**0**	**1**	**2**	**3**	**4**	**5**	**6**
The summary report had all the information I was looking for.	**0**	**1**	**2**	**3**	**4**	**5**	**6**
The summary report met my needs.	**0**	**1**	**2**	**3**	**4**	**5**	**6**

How have you participated in the Watershed Health Integrated Research Project thus far? Please check all that apply:

☐ Reviewed resident survey questionnaire ☐ Read research progress reports

☐ Participated in a focus group ☐ Participated in an interview

☐ Viewed a traveling display ☐ Attended a workshop

☐ Visited the website: *http://kaskaskia.illinoisstate.edu/* ☐ Other:_____

Thank you for taking this survey! When finished, place survey in the self-addressed stamped envelope provided. Thank you for your help!

Southern Illinois University Carbondale

Research Development and Administration
Human Subjects Committee
www.siu.edu/orda/human
www.siuc.edu

To: Erin Seekamp

From: Jane L. Swanson, Ph.D.
Chair, Human Subjects Committee

Date: February 3, 2011

Subject: *Evaluating Watershed Health Risks through Integrated Water Quality Analyses, Community Capacity Assessments, and Outreach Appraisals*

The revisions to the referenced study have been reviewed and approved by the SIUC Human Subjects Committee.

This approval expires on 1/30/2012, one (1) year from the review date. Regulations make no provision for any grace period extending beyond the above expiration date. Investigators must plan ahead if they anticipate the need to continue their research past this period. The application should be submitted 30 days prior to expiration with sufficient protocol summary and status report details, including number of accrued subjects and whether any withdrew due to complaint or injury. If you should continue your research without an approved extension, you would be in non-compliance of federal regulations. You would risk having your research halted and the loss of any data collected while HSC approval has lapsed. Extensions will not be required to continue work on an approved project when all the data has been collected, there will be no more interaction or intervention with human subjects and **subject identifiers have been removed** (e.g. during the data analysis or report writing stages).

Also note that any future modifications to your protocol must be submitted to the Committee for review and approval prior to their implementation.

Your Form A approval is enclosed. Best wishes for a successful study.

This institution has an Assurance on file with the USDHHS Office of Human Research Protection. The Assurance number is 00005334.

JS:kr

Woody Hall, C-Wing - Mail Code 4709 ▪ Southern Illinois University Carbondale
900 South Normal Avenue ▪ Carbondale, Illinois 62901 ▪ 618 | 453.4533 ▪ Fax: 618 | 453.8038

Appendix F: Leader Workshop Consent.

June 24, 2010

Dear Workshop Participant,

The Watershed Health Integrated Research (WHIR) Project team would like to **thank you** for attending this workshop. We would like to invite you to take part in a brief survey aimed at better understanding your perceptions of your community, its water resources, and watershed management.

This project will inform community leaders, resource managers, and residents about the status of water quality in the Lower Kaskaskia River Watershed (LKRW), residents' needs and concerns, as well as local communities' ability to address potential problems. In turn, decision makers and residents can work together to protect, enhance and conserve the LKRW and quality of life in the area. The survey is part of the Watershed Health Integrated Research (WHIR) project conducted by Southern Illinois University Carbondale. The project is being funded by the National Institute on Food and Agriculture of the U.S. Department of Agriculture. You have been asked to participate because you live and/or work in the LKRB. Participation should take approximately 15 mintues. Your participation in the surveys is voluntary and you are free to withdraw at any time. Your responses are completely confidential and will be released only as summaries in which no individual's answer can be identified and your name will not be associated with your answers.

Any inquiries about the workshop or the survey specifically should be directed to: Erin Seekamp, Southern Illinois University Carbondale at (618) 453-7463 or eseekamp@siu.edu.

You can help us very much by taking a few minutes to share your opinions about your community and watershed.

Thank you,

WHIR Research Team

This project has been reviewed and approved by the SIUC Human Subjects Committee. Questions concerning your rights as a participant in this research may be addressed to the Committee Chairperson, Office of Research development and Administration, Southern Illinois University, Carbondale, IL62901-4709. Phone (618) 453-4533. E-mail siuhsc@siu.edu.

Appendix G: Citizen Workshop Consent.

August 2010

Dear Workshop Participant,

The Watershed Health Integrated Research (WHIR) Project team would like to **thank you** for attending this workshop. We would like to invite you to take part in a brief survey aimed at better understanding your perceptions of your community, its water resources, and watershed management.

This project will inform community leaders, resource managers, and residents about the status of water quality in the Lower Kaskaskia River Watershed (LKRW), residents' needs and concerns, as well as local communities' ability to address potential problems. In turn, decision makers and residents can work together to protect, enhance and conserve the LKRW and quality of life in the area. The survey is part of the Watershed Health Integrated Research (WHIR) project conducted by Southern Illinois University Carbondale. The project is being funded by the National Institute on Food and Agriculture of the U.S. Department of Agriculture. You have been asked to participate because you live and/or work in the LKRB. Participation should take approximately 15 mintues. Your participation in the surveys is voluntary and you are free to withdraw at any time. Your responses are completely confidential and will be released only as summaries in which no individual's answer can be identified and your name will not be associated with your answers.

Any inquiries about the workshop or the survey specifically should be directed to: Erin Seekamp, Southern Illinois University Carbondale at (618) 453-7463 or eseekamp@siu.edu.

You can help us very much by taking a few minutes to share your opinions about your community and watershed.

Thank you,

WHIR Research Team

This project has been reviewed and approved by the SIUC Human Subjects Committee. Questions concerning your rights as a participant in this research may be addressed to the Committee Chairperson, Office of Research development and Administration, Southern Illinois University, Carbondale, IL62901-4709. Phone (618) 453-4533. E-mail siuhsc@siu.edu.

Appendix H: Summary Reports Pre-notification Postcard.

The Watershed Health Integrated Research (WHIR) Project team would like to **thank you** for your participation in the Community Research Team (CRT). Your contribution has been *invaluable!* This postcard is being sent to notify you that we will soon be mailing a Final Summary Report and a brief survey for the Silver Creek or Richland Creek Watershed.

We need your help.

When you receive the report, please complete the pre-survey before you read the report and the post-survey after you read the report. The survey will inquire about your reactions to the report. Participation should take approximately 20 minutes.
You should receive your summary report and surveys in the mail shortly. If you have questions please contact Erin Seekamp at 618-453-7463.

Thank you,
WHIR Research Team

Appendix I: Summary Reports Letter & Survey Solicitation.

[Month, Day], 2011
[Name]
[Address]
[City, State, Zip]

Dear [name],

The Watershed Health Integrated Research (WHIR) Project team would like to **thank you** for your participation in the Community Research Team (CRT). Your contribution has been *invaluable!* As a culmination of our efforts, we have enclosed the Final Summary Report for the Silver Creek or Richland Creek Watershed.

The Summary Report **aims** to inform community leaders, resource managers, and residents about the status of water quality, residents' needs and concerns, as well as local communities' ability to address potential problems in the Lower Kaskaskia River Basin (LKRB). In turn, decision makers and residents can work together to protect, enhance and conserve the LKRB and quality of life in the area.

We need your help.

We would like you to read the report, and let us know what you think!*We have included a brief survey to complete before and after you read the report.*

First, *b*efore reading the report, please complete the short "pre-survey." It should take about 5 minutes.
Second, read the report.
Third, comlete the short "post-survey." It should take about 7 minutes.
Fourth, place both surveys in the self-addressed stamped envelope, and place in the mail.

Participation should take approximately 20 minutes. Return of the mailed survey indicates your voluntary consent to participate. Your participation is voluntary and you are free to withdraw at any time. We will take all reasonable steps to ensure your confidentiality, and responses will be released only as summaries in which no individual's response can be identified and your name will not be associated with your responses. To ensure confidentially, a code has been assigned to your name for administrative purposes, but a list linking the codes with names will be kept in a secure location and will only be accessible to the primary researcher. Any inquiries about the summary report or the survey specifically should be directed to: Erin Seekamp, Southern Illinois University Carbondale at (618) 453-7463 or eseekamp@siu.edu.

Please help us by taking a few minutes to share your opinions about the summary report of YOUR community and watershed.

Thank you,
Erin Seekamp
Asssistant Professor
WHIR Research Team

This study is part of the Watershed Health Integrated Research (WHIR) project conducted by Southern IllinoisUniversityCarbondale. The project is being funded by the National Institute of Food and Agriculture of the U.S. Department of Agriculture. This project has been reviewed and approved by the SIUC Human Subjects Committee. Questions concerning your rights as a participant in this research may be addressed to the Committee Chairperson, Office of Research development and Administration, Southern Illinois University, Carbondale, IL62901-4709. Phone (618) 453-4533. E-mail siuhsc@siu.edu.

Appendix J: Summary Report Reminder Letter.

The Watershed Health Integrated Research (WHIR) Project team would like to *once again* **thank you** for your participation in the Community Research Team (CRT). This postcard was sent to **remind you** that we sent a Final Summary Report and survey for the Silver Creek or Richland Creek Watershed. Thank you very much if you have already returned the survey in the self-addressed stamped envelope.

If you have not completed the survey, we still need your help.

P*lease complete the short pre- and post- surveys about your reactions to the report.*

Participation should take approximately 20 minutes.

Thank you,
WHIR Research Team

Appendix K: Summary Report Replacement Letter & Survey Solicitation.

[Month, Day], 2011
[Name]
[Address]
[City, State, Zip]

Dear [name],

Hello again,

The Watershed Health Integrated Research (WHIR) Project team would like to **thank you** for your participation in the Community Research Team (CRT). Enclosed is a replacement pre- and post-survey for the Silver Creek or Richland Creek Watershed Summary Report Survey. Thank you very much if you have already returned the survey in the self-addressed stamped envelope.

If you have not completed the survey, we still need your help. We have asked a small sample of local stakeholders to review the report so your feedback is extremely important to us.

If you have not read the report yet, *please take a short survey about your knowldege and reactions to the report.*

First, *b*efore reading the report, please complete the short "pre-survey." It should take about 5 minutes.

Second, read the report.

Third, complete the short "post-survey." It should take about 7 minutes.

Fourth, place both surveys in the self-addressed stamped envelope, and place in the mail.

Participation should take approximately 20 minutes. Return of the mailed survey indicates your voluntary consent to participate. Your participation is voluntary and you are free to withdraw at any time. We will take all reasonable steps to ensure your confidentiality, and responses will be released only as summaries in which no individual's answer can be identified and your name will not be associated with your responses. To ensure confidentially, a code has been assigned to your name for administrative purposes, but a list linking the codes with names will be kept in a secure location and will only be accessible to the primary researcher. Any inquiries about the research project or the survey specifically should be directed to: Erin Seekamp, Southern Illinois University Carbondale at (618) 453-7463 or eseekamp@siu.edu.

Thank you,
Erin Seekamp
Assistant Professor
WHIR Research Team

This study is part of the Watershed Health Integrated Research (WHIR) project conducted by Southern Illinois University Carbondale. The project is being funded by the National Institute of Food and Agriculture of the U.S. Department of Agriculture. This project has been reviewed and approved by the SIUC Human Subjects Committee. Questions concerning your rights as a participant in this research may be addressed to the Committee Chairperson, Office of Research development and Administration, Southern Illinois University, Carbondale, IL62901-4709. Phone (618) 453-4533. E-mail siuhsc@siu.edu.

Appendix L: Online Survey Solicitation and Survey Instrument for Website.

We need your help!
Let us know what you think of this website by taking a short survey! (It should take 5 mintues).
Your participation is voluntary and you are free to withdraw at any time. Completion of this survey indicates your voluntary consent to participate. Your answers are anonymous and will be released only as summaries in which no individual's answer can be identified and your name will not be associated with your answers. Any inquiries about the workshop or the survey specifically should be directed to: Erin Seekamp, Southern Illinois University Carbondale at (618) 453-7463 or eseekamp@siu.edu.
Thanks for taking a few minutes to share your opinions!

Sincerely,
WHIR Research Team
This study is part of the Watershed Health Integrated Research (WHIR) project conducted by Southern Illinois University Carbondale. The project is being funded by the National Institute on Food and Agriculture of the U.S. Department of Agriculture. This project has been reviewed and approved by the SIUC Human Subjects Committee. Questions concerning your rights as a participant in this research may be addressed to the Committee Chairperson, Office of Research development and Administration, Southern Illinois University, Carbondale, IL62901-4709. Phone (618) 453-4533. E-mail siuhsc@siu.edu.

First, we have a few quick questions about your attitudes and knowledge and then we'd like to know what you think of our website.

It's easy. Just check the circle that best represents your response to each question. Complete each question and hit "Next" button. If you need to change an answer, hit the "Prev" button. When you finish, click the "Done" button.

Answer questions for the community in which you WORK or LIVE.

1) My attitudes and knowledge…	Not at all Extremely
How important are high quality water resources to quality of life in your community?	**0 1 2 3 4 5 6**
How familiar are you with strategies to protect or improve water quality in streams?	**0 1 2 3 4 5 6**
How familiar are you with strategies to build your community's capacity for watershed management?	**0 1 2 3 4 5 6**
How likely is it that you will take personal action to protect or improve water quality on your property in the future?	**0 1 2 3 4 5 6**
How likely is it that you will work with others in your community to protect or improve water quality in the future?	**0 1 2 3 4 5 6**

2) My evaluation of the website…	Not at all						Extremely
Visiting this website was a good use of my time.	0	1	2	3	4	5	6
The website featured concepts that were important to me.	0	1	2	3	4	5	6
The website was valuable.	0	1	2	3	4	5	6
The website had all the information I was looking for.	0	1	2	3	4	5	6
The website met my needs.	0	1	2	3	4	5	6

3) How have you participated in the Watershed Health Integrated Research Project thus far? Please check all that apply:

☐ Reviewed resident survey questionnaire
☐ Read research progress report
☐ Participated in a focus group
☐ Participated in an interview
☐ Viewed a traveling display
☐ Attended a workshop
☐ Visited the website: *http://kaskaskia.illinoisstate.edu/*
☐ Other_____

Thank you for taking this survey! If you have any additional comments, please add them here. When you finish, click the "Done" button.

Appendix M. Effort Details.

Estimated Effort Input	**Citizen Research Team (CRT)**	**Website**	**Leader Workshop**	**Citizen Workshops**	**Summary Reports**
(I= WHIR Investigator; G=Graduate Student; C=Contractor; IT=Info. Tech. Professional**)**					
Input Personnel Numbers **Number of personnel for planning**	5 Investigators = **5I**	5 Investigators=**5I**	1 Investigator and 1 Graduate student = **1I, 1G**	1 Investigator and 1 Graduate student = **1I, 1G**	1 Investigator and 1 Graduate student = **1I, 1G**
Number of personnel for implementation	2 Investigators (mailings survey draft, progress report, summary report), 2 Investigators (collaborated with SWIRC&D), 1 Graduate student (invited workshops), 1 Graduate student (mailed rain gauges and coordinated ISCO sampler) = **4I, 2G**	1 Investigator (coordinated), 1 GS (coordinated), 1 Contractor (built), 1 IT Professional = **1I, 1G, 1C, 1IT**	5 Investigator and 3 Graduate students = **5I, 3G**	5 Investigator, 2 Graduate students = **5I, 2G**	4 Investigator, 1 Graduate student (contributed and reviewed), 1 Investigator, 1 Graduate student (designed)= **5I, 2G**
Total	**7 Personnel (5 Investigators, 2 Graduate students)**	**8 Personnel (5 Investigators, 1 Graduate student, 1 Contractor, 1 IT personnel)**	**8 Personnel (5 Investigators, 3 Graduate students)**	**7 Personnel (5 Investigators, 2 Graduate students)**	**7 Personnel (5 Investigators, 2 Graduate students)**

Estimated Effort Input	**Citizen Research Team (CRT)**	**Website**	**Leader Workshop**	**Citizen Workshops**	**Summary Reports**
Input Time **Number of hours to plan**	5 Investigators (2 hrs) = **10 hrs**	5 Investigators (5 hrs) = **25hrs**	4 Investigators (5 hrs), 1 Graduate student (5 hrs), 1 Investigator (15 hrs), 1 Graduate student (15 hrs) = **55 hrs**	4 Investigators (5 hrs), 1 Graduate student (5 hrs), 1 Investigator (15 hrs), 1 Graduate student (15 hrs) = **55 hrs**	1 Investigator (10 hrs), 1 Graduate student (10 hrs) = **20 hrs**
Number of hours to implement	1 investigators (mailed report) (2 hrs), 1 investigator (mail two reports) (4 hrs), 1 investigator (report comments) (5hrs), 2 Investigators (collaborated with SWIRC&D) (6 hrs), 1 Graduate student (rain gauges, ISCO sampler) (10 hrs) = **33 hrs**	1 Investigator (coordinated) (20 hrs), 1 Graduate student (coordinated) (20 hrs), 1 Contractor (built) (80 hrs), 1 IT Professional (coordinated) (20 hrs) = **140hrs**	5 Investigators (4 hrs), 3 Graduate students one afternoon (4 hrs) =**32 hrs**	5 Investigators (4 hrs), 2 Graduate students four nights (4 hrs) = **112 hrs**	4 Investigators (5 hrs), 1 Graduate student (contributed and reviewed) (5 hrs), 1 Investigator (designed) (10hrs), 1 Graduate student (designed) (40 hrs) = **75 hrs**
Personnel travel time	None	None	5 driving from Carbondale (2 hrs), 1 driving from ISU (3 hrs), 2 flying from UMN (8 hrs) = **29 hrs (Roundtrip)**	5 driving from Carbondale (2 hrs), 1 from ISU (3 hrs), 2 from UMN (8 hrs), 8 commute from hotel to site (4hrs) = **61 hrs (Roundtrip**	None
Total	**43 hrs**	**165 hrs**	**116 hrs**	**228 hrs**	**95 hrs**

Estimated Effort Input	**Citizen Research Team (CRT)**	**Website**	**Leader Workshop**	**Citizen Workshops**	**Summary Reports**
Input Costs **Cost of supplies**	Printing & Mailing progress report: $100 Printing & Mailing survey draft w/return postage: $200 Printing & Mailing summary report w/ return postage: $200= **$600**	Build website = **$3,000**	Snacks/drinks, printing posters, nametags, handouts = **$50**	Snacks/drinks, printing posters, nametags, handouts: $25 per night (shared) = **$100**	Printing for workshop (11 pg, 50 copies @ 10c page): $55, Printing & Mailing w/ return postage: $200 = **$255**
Cost of personnel for planning	5 Investigators @ $65 (10 hrs) = **$3,250**	5 Investigators @ $65 (5 hrs) = **$1,625**	4 Investigators @ $65 (5 hrs), 1 Graduate student @ $18 (5hrs), 1 Investigator @ $65 (15 hrs), 1 Graduate student @ $18 (15 hrs) = **$2,635**	4 Investigators @ $65 (5hrs), 1 Graduate student @ $18 (5 hrs), 1 Investigator @ $65 (15 hrs), 1 Graduate student @ $18 (15 hrs) =**$2.635**	1 Investigator @ $65 (10 hrs), 1 Graduate student @ $18 (10 hrs) = **$830**
Cost of personnel implementation	1 Investigators @ $65 (2 hrs), 1 Investigator @ $65 (4 hrs), 1 Investigator @ $65 (5 hrs), 2 Investigators @ $65 (6 hrs), 1 Graduate student @ $18 (10 hrs) = **$1,675**	1 Investigators @ $65 (20 hrs), 1 Graduate student @ $18 (20 hrs), 1 Contractor @ $50 (80 hrs), 1 IT Professional (20 hrs) @ $35 = **$6,360**	5 Investigators @ $65 (4 hrs), 3 Graduate students @ $18 (4 hrs) = **$1,516**	5 Investigators @ $65 (16 hrs), 2 Graduate students @ $18 (16 hrs) = **$5,776**	4 Investigators @ $65 (5 hrs), 1 Graduate student @ $18 (5 hrs), 1 Investigator @ $65 (10 hrs), 1 Graduate student (40 hrs) = **$2,760**
Cost of personnel travel	None	None	3 Investigators @ $65 driving (2 hrs), 1 Investigator @ $65 driving (3hrs), 1 Investigator @ $65	3 Investigators @$65 (2 hrs), 1 Investigator @ $65 driving (3hrs), 1 Investigator @ $65	None

			flying (8 hrs), 2 Graduate students @18 driving (2hr), 1 Graduate Student @18 (8 hrs)=**$1,321** 2 cars from Carbondale @ 87 miles for $2.75 gallon and 15 mpg=$64 dollars, 1 car from ISU 194 miles for $2.75 gallon and 15 mpg=$74 dollars, 2 Flights from UMN ($200 per flight) =**$530**	flying, 1 Graduate student @18 (2hrs), 1 Graduate Student @18 (8 hrs), 5 Investigator commuting (4 hrs), 2 Graduate students commuting (4hrs) =**$2,713** 2 cars from Carbondale @ 87 miles for $2.75 gallon and 15 mpg=$64 dollars), 1 car from ISU @ 194 miles for $2.75 gallon and 15 mpg=$74 dollars, 2 cars commute to site (8x) 20 miles for $2.75 gallon and 15mpg= $60 dollars, 2 Flights from UMN ($200 per flight= $400) = **$590**	
Total	**$5,525**	**$10,985**	**$6,052**	**$11,814**	**$3,845**

Appendix N. Themes of Two Concepts or Ideas Learned.

"Name two concepts or ideas that you learned as a result of participating in this workshop?" Citizen Workshop (n=25, Two concepts= 7 of 24, One concept= 3 of 24, No Comment= 15 of 24).	
Actions	• Adopt best management practices • If we focus on health maybe we can get people involved • Working together
Community and watershed needs	• Community plan • Groups need to work together • Long range planning is needed • More education • More media • Public activism
Definitions and concepts learned	• E. coli is in our streams • One water quality parameter can be good while the others can be poor in the same stream or watershed • Possible to improve watershed • Relationship between community/public opinions and water quality • Total maximum daily load • Water quality is a social problem, people have a very low regard for political leaders • Watershed
Resources available	• Website resources available
"Name two concepts or ideas that you learned as a result of participating in this workshop?" Leader Workshop (n=13, Two concepts= 10 of 13, One concept= 1 of 13, No Comment= 2 of 13).	
Actions	• Cost sharing can be more productive than each small community or area working on their own • Drains can be spray painted with messages • Forestry management • It's good to plan • Some interest in stronger regulation • Working together throughout the entire watershed is important • Working with other groups get better results
Awareness	• More community leaders are aware and concerned than previously thought
Citizen's views	• Community views on what is being done • Reality vs. perception of water quality-not necessarily the same
Community and watershed needs	• General public needs more/better education (3) • Need for education at community level thought planners were educated • Need for encouraging public involvement in solutions (2),

	everyone wants to be involved until there is work • Need to work across watershed(s) to be successful in improving water quality • Types of quality issues within the community
Interconnectedness	• Downstream efforts must be supported by upstream efforts to succeed
"Name two concepts or ideas that you learned from reading the summary report?" Summary Report (n=27, Two concepts= 17 of 27, One concept= 0 of 27, No Comment= 10/27).	
Actions	• Conservation practices in residential and farms (2), fertilizers • Formation of watershed groups • Importance of cooperation of communities within the watershed • My personal property-using storm water to service my gardens • Practicing these things for 48 years and will continue to
Community and watershed needs	• Need for education and education of residents (2) • Need for enforcement- local zoning has little experience with enforcing issues related to water channels • No money from federal government or state and little local money exists • Scale of projects too big for local dollars • This report doesn't tell us any solutions we didn't already know
Community and watershed problems	• Development has an impact on water quality (2) • Farmers/landowners need to reduce chemical use • Impact of farming on watershed (2) • Land clearing and development have been giant contributors • Loss of agricultural lands 88% • Our biggest problem is city people moving to the country • Pet waste has an impact • Problem caused by rural and urban alike • Roads and parking lots and rooftops are problems • Streams are more polluted in Kaskaskia area than I thought
Definitions and concepts learned	• Concern for water quality greater than expected • How to use some of the results from the study to help my community better understand the need for preservation of our water resources • Survey response greater than expected • Urbanization • Water quality, Individuals can actually make a difference and together make a big difference/positive impact (2) • Watershed
Interconnectedness	• Everyday choices can impact watershed • Little acknowledgement by local landowners of impact beyond their property • People do realize clean water=good community

Appendix O. Themes of Inspiration.

"What has this workshop inspired you to do? Give an example of how you will apply information you learned tonight in your community." Citizen's Workshop (n=25, One comment= 10 of 25, No comment= 15 of 25).	
Change personal land use practices	• Improve septic management • Plant more tree (native) on river bluffs
Seek more information	• Broaden my acquaintance with surface and groundwater conditions in my regions, investigate how condition came to be what they are, and what could change them
Share with others (formal, informal)	• Educate more people about how human activities affect our natural environment • I will take to my friends and families ideas of things they can do to help, rain barrel and less impervious land • Include more information about watersheds/water quality in the classes I teach • Take part in policy making • Talk to others- try to inspire look at lawn care practice on own land
Work with others	• Work with members of environmental groups, newspapers, television stations
Nothing	• No idea, I work on issues every day, try not to be pessimistic
"What has this workshop inspired you to do? Give an example of how you will apply information you learned tonight in your community." Leader Workshop (n=13, One comment= 12 of 13, No comment= 1 of 13).	
Apply knowledge in job	• Be more aware of how the different components of the watershed work together • Cities have a greater chance to make a change • Continue to participate/support watershed organizations • Support state CREP[Conservation Reserve Enhancement Program] for Kaskaskia • Use watershed game • We will work to apply the data acquired in this research into all of our projects in the region where appropriate • Work with the community more to work on preserving the watershed
Increased interest	• More interest in protecting out watershed
Initiate something	• Start education efforts in the city
Seek more information	• More research on septic tank use in watershed
Share with others	• Pass on information and make people more aware of those problems • Share the technical information in this study to others

Work with other groups	• Consider Homeowners Associations and pick a pilot project to build local awareness of watershed issues- hope to find volunteers for future programs
"What has the summary report inspired you to do? Give an example of how you will apply information you learned tonight in your community (e.g. build a rain garden)." Summary report (n=27, One comment= 17 of 27, No comment= 9 of 27).	
Share with neighbors	• Encourage neighbors to use more grass waterways, riparian buffers and maintain their sewage systems • Talk to neighbors about concerns and no I have the correct information about our area • Use the map to educate citizens about stream pollution in our county • This summary report has inspired me to spread the word, not only in my community but surrounding areas as well • I will continue to advocate environment issue as an essential aspect of existence
Share with leaders	• Speak with local elected officials • Take to community improvement board in our community • I have tried to get our local school to build a rain garden on a perfect location in their adjacent park. There has been NO interest in this idea by the Supt., School Board Pres. or Science teacher!!!
Personal action	• Build a rock drainage to filter water into a stream next to my house • I plan to use [my rainwater collecting cistern] for watering garden and lawn this summer • I will expand and continue to provide a clean watershed...keep picking up the trash! We do not use chemicals, no runoff of any into our water areas • I will use a rain barrel • Incorporate old cistern into gutter system to hold rainwater • Install the rain barrel I bought at Sam's last month and get another • Minimize law fertilization • Remove pet waste and yard clippings, etc. more effectively • Try to do a better job of soil conservation- use of cover crop for winter cover and less tillage • Use no toxic chemicals on law
Increased awareness	• It will make me more conscious of the water quality issues in my community • Learn about rain barrel/rain gardens and maybe apply it to my property

Appendix P. Website Visit Details.

Date Range	Website Visits	Website Unique Visits	Average Time (Minutes)	Percentage New Visits	Number of Page Views
12/26-12/31/2010	0	Unknown	Unknown	Unknown	Unknown
1/1-1/31/2011	3	Unknown	Unknown	Unknown	Unknown
9/1-9/30/2011	13	12	3.00	92%	37
10/1-10/31/2011	6	4	0.14 seconds	67%	8
11/1-11/30/2011	6	6	1:42	100%	21
12/1-12/31/2011	8	6	4:55	63%	52
1/1-1/31/2012	10	8	2:56	80%	22
2/1-2/28/2012	13	12	1:52	100%	50
3/1-3/31/2012	13	13	1:15	85%	24
	72 Total	61 Total	0.52 seconds Average	84% Average	214 total