

# The Beargrass Story: Utilizing Social Science to Evaluate and Learn from the “Watershed Approach”

\*Sarah P. Church<sup>1</sup>, Nicholas Babin<sup>2</sup>, Belyna Bentlage<sup>3</sup>, Michael Dunn<sup>4</sup>, Jessica D. Ulrich-Schad<sup>5</sup>, Pranay Ranjan<sup>6</sup>, Joe Magner<sup>7</sup>, Eileen McLellan<sup>8</sup>, Susi Stephan<sup>9</sup>, Mark D. Tomer<sup>10</sup>, and Linda S. Prokopy<sup>6</sup>

<sup>1</sup>Department of Earth Sciences, Montana State University, Bozeman, Montana, USA; <sup>2</sup>Natural Resources Management and Environmental Sciences Department, California Polytechnic State University, San Luis Obispo, California, USA; <sup>3</sup>Verdis Group, Omaha, Nebraska, USA; <sup>4</sup>Social and Economic Research Group, UK Forestry Commission, Northern Research Station, Bush Estate, Roslin, Scotland; <sup>5</sup>Department of Sociology, Social Work, and Anthropology, Utah State University, Logan, Utah, USA; <sup>6</sup>Department of Forestry and Natural Resources, Purdue University, West Lafayette, Indiana, USA; <sup>7</sup>Department of Bioproducts and Biosystems Engineering, University of Minnesota, St. Paul, Minnesota, USA; <sup>8</sup>Environmental Defense Fund, Washington, D.C., USA; <sup>9</sup>Wabash County Farm Service Agency, Wabash, Indiana, USA; <sup>10</sup>USDA Agricultural Research Service, Ames, Iowa, USA;  
 \*Corresponding Author

**Abstract:** This paper presents the case of a voluntary watershed project that addressed the need for improving water quality by reducing agricultural nutrient loss. The Beargrass Creek Watershed Approach Project in Wabash County, Indiana aimed to demonstrate that it is possible to achieve ambitious water quality goals and maximize the effectiveness of conservation funding through locally-led efforts that bring together multiple stakeholders throughout the process. The project focused on implementing the “right practices” in the “right places” through a goal-oriented, science-based, and locally-adapted approach to voluntary conservation. We examine and evaluate all three phases of the project and discuss successes and lessons learned from the point of view of both agricultural producers and agency staff from the local Soil and Water Conservation District and the Natural Resources Conservation Service.

**Keywords:** *watershed, water quality, agriculture, applied social science, evaluation, surveys, interviews, observations*

Growing public concern over nutrient related problems such as algal blooms in Lake Erie and dead zones in the Gulf of Mexico has intensified pressure on agricultural producers to decrease nutrient loss from agricultural watersheds. Increasingly, this concern is expressed through calls for regulatory and prescriptive approaches to achieving water quality goals. However, the agricultural sector prefers a voluntary approach to nutrient loss reduction (e.g., Church and Prokopy 2017), which producers believe allows for flexibility in land use decision making that acknowledges variation in different farming operations.

This paper presents one example of a voluntary watershed project that sought to address the need for improved water quality through agricultural

nutrient loss reduction. The Beargrass Creek Watershed Approach Project (henceforth referred to as the Beargrass project) in Indiana aimed to demonstrate that it is possible to achieve ambitious water quality goals and maximize the effectiveness of conservation funding through locally-led efforts that bring together multiple stakeholders throughout the process. The project focused on implementing the “right practices” in the “right places” through a goal-oriented, science-based, and locally-adapted approach to voluntary conservation (Bentlage et al. 2016).

## Background

The Mississippi River/Gulf of Mexico Watershed Nutrient (Hypoxia) Task Force calls for a 45%

reduction in nutrient load over the average load measured between 1980 to 1996 (Gulf Hypoxia Action Plan 2008). Achieving this goal will require a combination of in-field practices (such as improved nutrient management, conservation tillage, and cover crops) and practices that intercept and treat nutrients at the edge of a field, at a tile outlet, at the edge of a stream or drainage ditch, or within a stream or drainage ditch. Equally important is targeting these practices to the “right places” in the landscape where they can most effectively intercept and treat the greatest nutrient loads (targeted conservation).

As part of a Conservation Innovation Grant (CIG) from the Natural Resources Conservation Service (NRCS), the Wabash County Soil and Water Conservation District (SWCD), Manchester University, and Environmental Defense Fund (EDF) joined together in 2014 to address this call for increased nutrient load reduction through outreach aimed at increasing the voluntary adoption of conservation practices in conjunction with targeted conservation. The Beargrass Creek Watershed was selected in part because it met key social criteria (e.g., funding availability, funded watershed group with paid staff, project interest, problem salience, and stakeholder collaboration and trust). Research had shown that such social criteria can contribute to eventual watershed project success (Babin et al. 2016; Church and Prokopy 2017).

It was envisioned that scientists, producers, and local stakeholders would work together to reduce nutrient loss through the following approach: 1) Scientists would determine the sources of nutrients and how the nutrients move across the landscape; 2) Farmers and other local stakeholders would provide input on natural resource concerns, watershed needs and opportunities, past and current conservation efforts, and how to integrate conservation and agricultural production (and other) goals; 3) The combined information (from scientists, producers, and stakeholders) would then be used to suggest how to meet water quality goals in order to effectively and efficiently utilize conservation funding (McLellan et al. 2015).

In addition to scientific information that generated recommendations for implementing the “right practices” in the “right places” (along with water monitoring data), we utilized social science

methods before, during, and after the project in order to understand the human components of the project. Having good natural and physical science available for land use decision-making does not mean that producers will actually decide to implement recommended practices. Through social indicator studies of current and potential program participants, land managers and conservation staff can learn about motivations and barriers to producers’ voluntary participation in conservation programs (see Prokopy et al. 2009; Genskow and Prokopy 2011). Moreover, through evaluations of specific conservation initiatives, social science can illuminate issues and opportunities with program elements as well as with program implementation staff.

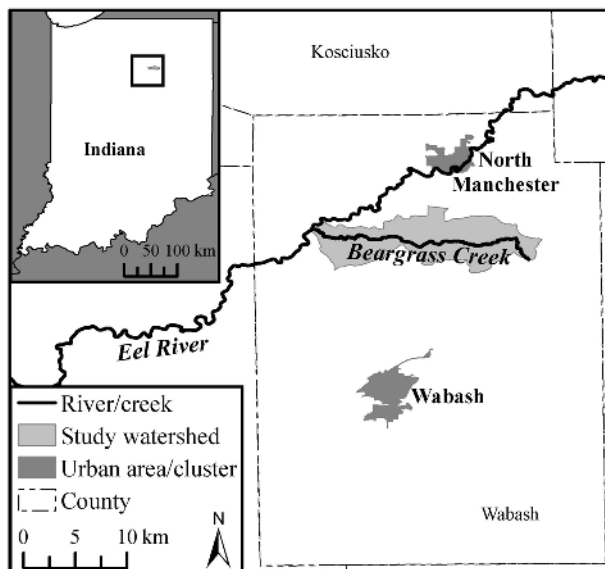
Purdue University’s Natural Resources Social Science (NRSS) Lab staff used a variety of social science methods to inform and evaluate the project, including surveys, interviews, and observations. In this paper, we review the following three phases of the project and explore how social science evaluation techniques were used:

1. Formative evaluation. In 2014, NRSS Lab staff conducted surveys and interviews with agricultural producers and agency staff to collect baseline data that fed into project development.
2. Process evaluation. During the project, NRSS Lab staff observed large watershed meetings and smaller on-farm meetings, reporting to project partners on key takeaways to further refine such interactions.
3. Summative evaluation. As the project drew to a close in 2016, a second round of surveys and interviews was conducted to evaluate the project from the perspectives of producers and agency staff.

## Project Context

Beargrass Creek is a sub-watershed of the Middle Eel River Watershed in Wabash County, Indiana. In 2009, Manchester College (now Manchester University) spearheaded the Middle Eel River Watershed Initiative (the Initiative) – a collaborative, community-wide effort to protect and enhance water resources through education and implementation of soil and water

conservation practices. This initial effort was funded through a \$1 million Indiana Department of Environmental Management Section 319 grant to write a watershed plan, monitor water quality, and conduct education and outreach; \$212,000 of this was designated to cost-share funding to local landowners. In 2010, the Initiative received a Mississippi River Basin Healthy Watersheds Initiative (MRBI) grant from NRCS. In 2013, the Initiative received a second Section 319 grant totaling \$833,000, \$250,000 of which went to fund cost-share projects. In 2014, project partners Manchester University and the Wabash County SWCD agreed to work with EDF as part of a new project grant (the NRCS funded CIG) to demonstrate the efficacy of *the watershed approach* – a systemic and strategic approach to reducing nutrient losses from agricultural landscapes. This implementation grant funded water monitoring and research, but provided no cost-share funding to local landowners. One watershed coordinator managed all aspects of local project efforts. Project partners focused efforts on the Beargrass Creek Watershed (Figure 1), a 5,985-hectare HUC 12 watershed with approximately 45 producers.



**Figure 1.** Beargrass Creek Watershed.

Notes: One watershed of interest (Beargrass [HUC 12]) within one Indiana county (Wabash). Extent area shown by box in the inset map. Urban area/cluster as defined by population. Sources: U.S. Census Bureau 2010; U.S. Census Bureau TIGER 2015; USGS n.d.

A major goal of the three-year project was to demonstrate how a locally-led partnership approach could encourage voluntary adoption of conservation practices to meet water quality goals. Manchester University scientists conducted water quality monitoring and USDA Agricultural Research Service (USDA-ARS) staff explored the use of the Agricultural Conservation Planning Framework (ACPF) (Tomer et al. 2013) to better understand where the practices could be located to provide the greatest water quality benefit (see Figure 2 for project photos).



**Figure 2.** Project photos. Top) Water sampler. Middle) Corn field in the Beargrass Creek Watershed. Bottom) Discussing an ACPF-generated map. Photo Credit: NRSS Lab.

## Phase One: Formative Evaluation

### 2014 Surveys

In the first year of the project, 2014, a social indicators survey of all agricultural producers in the Beargrass Creek Watershed was conducted using an address list provided by the local SWCD. Those on the list were contacted up to four times (advance letter, 1st mailing of paper survey, reminder postcard, drop off and pick up of 2nd paper survey with a reminder postcard) which achieved a response rate of 73% (n=60). Questions on the survey included characteristics of the farming operation and farmer, opinions about water quality and sources of pollution, and usage and opinions about various conservation practices. After following lab protocols for quality checking and cleaning, the data were analyzed using a statistical software package.

### 2014 Interviews

In-depth interviews with 13 producers (11 different farm operations) and five conservation agency staff within the Beargrass Creek Watershed were also conducted. With the insight and assistance of the local SWCD, the selection of the decision-makers was designed to reflect the diversity of farm type, size, conservation attitudes (“supportive” of adopting/already adopted conservation practices, “unsure” about adopting, “unsupportive” of adopting), and inclination to participate in collaborative initiatives. Most interviews with staff were conducted in April 2014 and all interviews with producers were conducted in August and September of 2014 at conservation offices and producers’ homes or farm buildings. Interviews typically lasted 45 minutes. Interviews were recorded, with permission from the interviewee, and later transcribed.

After reading all transcribed interviews, one researcher developed two coding frameworks: 1) agency staff and 2) producers. The codebook was refined by two researchers and all transcriptions were coded in NVivo 11 qualitative research software. Coding comparison queries resulted in overall Cohen’s kappa scores above 0.7 for both sets of interviews, which indicates “substantial agreement” (where 1 is perfect agreement) (Viera and Garrett 2005). Through an analysis

of the coding frameworks, key interview themes emerged. Illustrative quotes are used throughout this chapter.

### Formative Evaluation Results

The findings from the 2014 interviews and surveys provided insight into current use of agricultural conservation practices, factors which encourage and discourage the adoption of these practices, relationships between project partners and producers, and recommendations for effective outreach. Specifically, the NRSS Lab made several recommendations to project leaders related to communicating about the project and holding meetings, including:

- Clearly articulate the goals of the project. While it is necessary to outline the environmental issues that create a need for action, it is also important to acknowledge that producers are not solely responsible for these issues. For example, there are other contributory factors such as heavy rains, fertilizer use on non-farmland, urban discharge, etc. Producers are, however, an important piece of the puzzle and the project must be portrayed as a means of demonstrating that if producers have access to adequate support and information, voluntary positive change can ensue.
- Emphasize how the project represents an opportunity for producers. Despite a degree of unfamiliarity, many producers are willing to consider novel conservation practices. Implementing creative cost-share programs would allow for adoption with reduced financial risk – thus helping to overcome the single most important discouraging factor. Additionally, it should be emphasized that the project’s success would lessen the likelihood of future regulation.
- Alleviate fears about the project. There is a need to stress that participation is voluntary and to clarify what might be expected of producers if they are to participate. Flexibility to opt out would help to ease producers’ concerns about being tied to a plan that may not be working on their land or with their operation. Because of fear of

further regulation, producers' concerns over privacy and information/data use also need to be addressed. Specifically, there is a need to explicitly explain what type of data would benefit the project, how and by whom it would be collected, who would have access to it, and what it would (and would not) be used for.

- Have trusted individuals help to convey or back messages and findings. NRCS and SWCD staff have established good relations with a number of producers within the watershed. Their reputations – built on trust, a local connection, and first-hand experience of farming practices – represent an extremely important resource. Producers will be more inclined to consider participating in the project if these staff are present when findings are communicated, and are able and willing to reiterate to producers the intricacies of the available practices. Other local champions including individuals from Manchester University, well-respected local farmers, and the county surveyor also have a role to play in promoting the value of the project, ideally as an active advisory committee. In addition, news of the project's progress should be communicated to producers regularly. Those participating in the Middle Eel Initiative bemoaned irregular communication which threatened producers' sense of involvement and ownership in the project.
- Provide multiple opportunities for dialogue. Since the project will only be a success if participation is widespread throughout the watershed, it is important to generate a sense of togetherness and collaboration. Introducing the project in a group setting can help to achieve this goal without conveying that individuals are being singled out or targeted. While a group setting is appropriate for explaining the concept of the project, producers would also benefit from one-on-one meetings to discuss issues and opportunities specific to their operation. A flexible approach to meeting producers, including on-site visits, minimizes producers' inconvenience and

helps to reassure them that details of their operation will remain private.

- Familiarize producers with the range of conservation practices and their purpose. Although certain practices such as no-till, cover crops, and grassed waterways were commonplace in the watershed, a large proportion of producers were unaware of more novel approaches. Without the knowledge of what a practice is designed to achieve, whether it will require land to be removed from production, and how costly it will be in terms of time and money, producers are unlikely to move towards adoption. A series of unwarranted and disproportionate concerns emerged during interviews. For example, fears over a loss of farmable land and reduced resale value could be lessened if producers were aware that a number of novel practices require very little land to be taken out of production. Similarly, familiarity with the mapping process for targeted conservation could help producers recognize that practices would not be mandated, but rather suggested for select localities where a significant environmental benefit could be expected to result.

These recommendations were discussed with the watershed team and influenced the planning of project meetings and how information was communicated. A very tangible output was the generation of a booklet for the watershed that described practices, included quotes from local users of the practices, and provided information about cost share (Figure 3). Other outputs included the design of watershed meetings and the way the ACPF-generated maps (Figure 4) were presented.

## **Phase Two: Process Evaluation**

### **Meeting Observations**

Over the three-year grant period, project partners held three public watershed meetings that were attended by a variety of stakeholders, as well as three core project partner meetings. These meetings were developed to address concerns that emerged during the formative evaluation and focused on clearly articulating the goals of

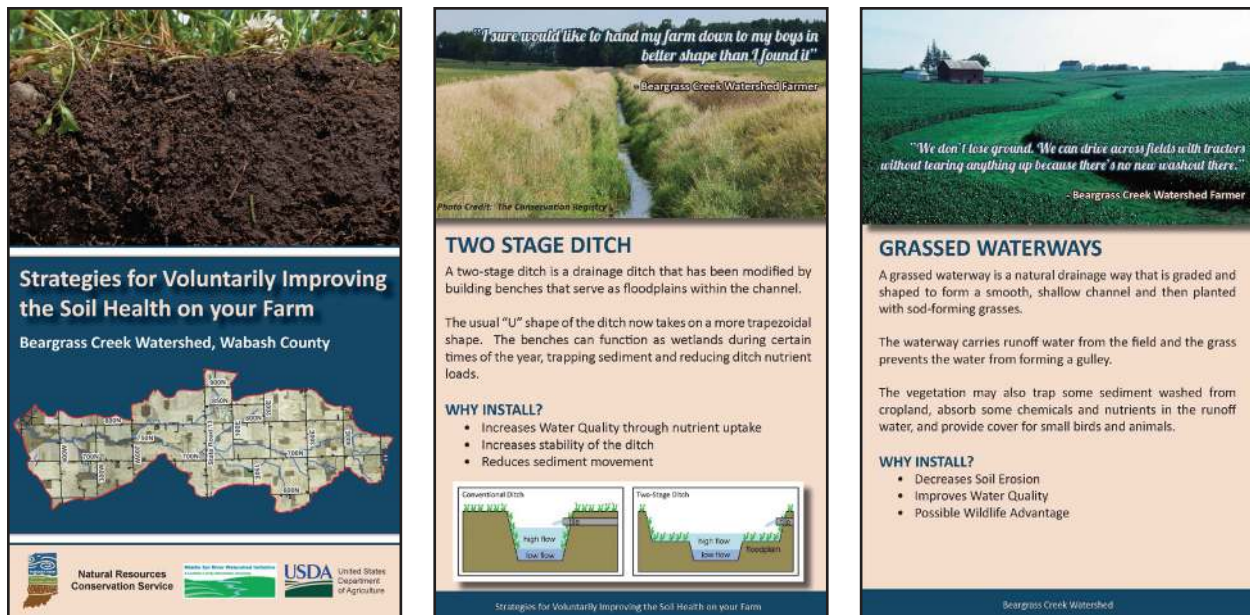


Figure 3. Practice booklet, examples. Top) Booklet cover. Left) Two-stage ditch. Right) Grassed waterway.

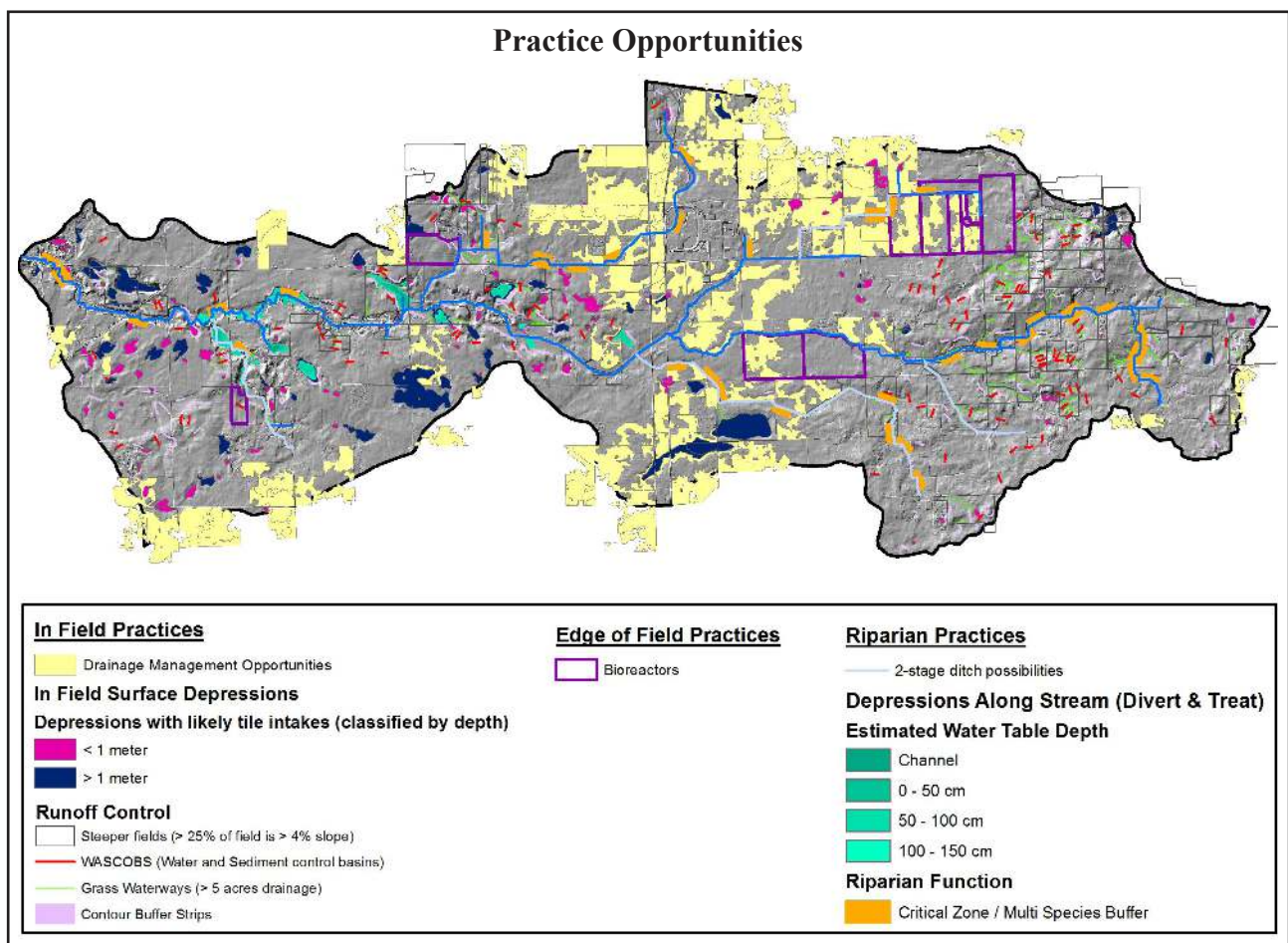


Figure 4. An ACPF-generated map. Map generated by research staff at the National Laboratory for Agriculture and the Environment, USDA-ARS (Ames, Iowa), utilizing ACPF software (Porter et al. 2015).

the project, emphasizing the opportunities for producers, and alleviating fears. Specifically, the meetings included discussions about project intent and progress, educational presentations on project-specific conservation practices, data presentations (e.g., water monitoring outcomes, ACPF-generated maps), and opportunities for informal networking and peer-to-peer learning among producers.

In addition to these large meetings, many on-farm meetings took place throughout the project. In on-farm meetings, producers, project scientists, and SWCD staff reviewed the maps generated by ACPF that highlighted targeted conservation opportunities within the watershed. This allowed producers to consider the suggested practices in a private setting, while also discussing the accuracy of the maps in relation to producers' land. Staff from the NRSS Lab attended and observed watershed and on-farm meetings. Staff took detailed research notes and generated reports based on these observations and meeting notes.

### **Process Evaluation Results**

Suggestions included changing the room configuration to foster dialogue and including additional opportunities for farmer-to-farmer networking. Project staff utilized meeting observation reports to improve future meeting formats and content.

## **Phase Three: Summative Evaluation**

### **2016 Surveys**

Survey data were collected by mail during the summer of 2016 (see Figure 5 for example survey pages). The content of the 2016 survey was identical to the 2014 baseline surveys except that some items were replaced with questions specifically designed to evaluate the Beargrass project.

A modified list of respondents created by the SWCD for the 2014 survey was used for distributing the 2016 surveys. In 2016, respondents were contacted up to four times (advance letter, 1<sup>st</sup> mailing of paper survey, reminder postcard, drop off and pick up of 2<sup>nd</sup> paper survey with a reminder postcard). This methodology achieved a 47% response rate (n=40). Respondents were assigned the same 4-digit ID number in 2014 and 2016.

Based upon these ID numbers, we found that 28 respondents completed the survey in both years. Data cleaning and analysis followed the same processes as the 2014 surveys.

### **2016 Interviews**

In August 2016, four agency staff members and 13 producers (representing 10 different farm operations in the Beargrass Creek Watershed) were interviewed regarding their experiences with the project. SWCD staff selected interviewees with varying levels of engagement in the project. Interviews lasted approximately 45 minutes and took place at producers' homes or shops or at the SWCD office. Interviews were recorded, with permission from the interviewee, and later transcribed. The same coding process utilized for the 2014 interviews was followed for the 2016 interviews.

### **Summative Evaluation Results**

The final social science evaluation provided data that highlighted the efficacy of the project and the results will be used to inform continued improvement of the watershed approach to conservation. Below we present some project outcomes, including benefits and successes as seen through project participants' eyes, that were gathered through a variety of social science methods.

### **Producer Attitudes, Awareness, and Adoption**

The 2016 surveys were, in part, intended to assess changes in environmental attitudes and conservation practice awareness over the two years of project activities. Means for variables across the two different years (2014 pre-project and 2016 post-project) were generally very similar, and no significant differences were found. For example, survey respondents' opinions about the severity of various water quality impairments (e.g., sedimentation, nitrogen, phosphorus, etc.) increased between 2014 and 2016, but not to a significant degree. Similarly, respondents' awareness of denitrifying bioreactors, saturated buffers, stream channel restoration, and two stage ditches increased in the Beargrass Creek Watershed, however not by a statistically significant number. While there was interest among some interviewees

## Your Views on Local Water Resources

### Beargrass Creek Watershed

Dear Agricultural Producer,

In 2014, a survey about local water resources was mailed to producers in the Beargrass Creek watershed. The results of this survey have helped Purdue University, the Wabash County Soil and Water Conservation District, and the Middle Eel River Watershed Initiative better understand local perspectives about conservation and water quality. We are now conducting a follow-up survey to measure changes and to gather feedback on related outreach efforts. Your insights are important to us even if you did not complete the survey in 2014.

There are two ways in which you can complete our survey:

The most convenient way is for you to enter the following website address into your web browser and provide your responses securely online:

<http://linvurl.com/beargrass2016>


If you choose to complete the survey online you will need to enter the following code: \_\_\_\_\_  
This will let us know that you have completed the survey so that we will stop sending reminders.

We have also included a paper version with a postage-paid return envelope if you prefer to respond by mail. The information you provide is confidential and will never be linked to your name, only to this code, which is used only for the purpose of knowing who has responded to the survey.

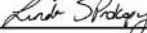
We ask that this survey be completed by the person in your home that makes most of the land management decisions and is at least 18 years old. Your participation in this survey is voluntary. Your answers will be kept confidential and will be released only as summaries where individual answers cannot be identified.

Unless otherwise instructed, please check the selection that best describes your situation for the agricultural operation located within the Beargrass Creek watershed. The survey should take approximately 20 minutes to complete.

For more information about the Middle Eel River Watershed Initiative, please contact Susi Stephan at susan.stephan@lin.nadnet.net or at (260) 563-7486 Ext. 3. For more information regarding the survey, please contact Linda Prokopy at lprokopy@surdue.edu or at (765) 494-0825. Thank you in advance for your help!



Susi Stephan, Executive Director  
Wabash County  
Soil and Water Conservation District



Linda Prokopy  
Purdue University

#### Two Stage Ditches

A two stage ditch incorporates a floodplain zone, called benches, into the ditch by removing the ditch banks roughly 2 to 3 feet above the bottom for a width of about 10 feet on each side. This gives the water more area to spread out, decreasing the velocity and allowing chemicals and sediment to settle.

16. Please select the option that best describes your experience with two stage ditches:

Not relevant (skip to page 8, question 19)

Never heard of it and not willing to try it (skip to page 8, question 19)

Never heard of it, but might be willing to try it (skip to page 8, question 19)

Heard of it and not willing to try it (skip to question 18, below)

Heard of it and might be willing to try it (skip to question 18, below)

Used it in the past and not willing to try it again (skip to question 18, below)

Used it in the past and might be willing to try it again (skip to question 18, below)

Currently use it (continue to question 17, directly below)

17. On what percentage of your ditches have you installed a two stage ditch?

0-25%

26-50%

51-75%

76-100%

18. How much do the following factors limit your ability to implement two stage ditches?

|                                                             | Not at all               | A little                 | Some                     | A lot                    | Don't know               |
|-------------------------------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| a. Don't know how to do it                                  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b. Time required                                            | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c. Cost                                                     | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| d. The features of my property make it difficult            | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| e. Insufficient proof of water quality benefit              | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| f. Desire to continue traditional farming practices/methods | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| g. Disapproval from others                                  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| h. Hard to use with my farming system                       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| i. Lack of equipment                                        | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Figure 5. 2016 survey examples.

in adopting these practices, survey results suggest that adoption rates are likely to remain low given the high costs of implementation.

In terms of actual conservation practice adoption, survey data show that grassed waterway use remained extensive between 2014 and 2016, with a majority of producers reporting grass coverage in 76-100% of their waterways. Of the respondents who completed the survey in both 2014 and 2016, conservation tillage use remained relatively consistent – conservation tillage on corn acres increased slightly from 37% to 40% and soybean acres decreased from 61% to 52%. Use of conservation tillage on corn and soybean acres might fluctuate based on an operation's use of cover crops. Interviews with producers revealed that cost-share contracts for cover crops required that producers not till their cover crop acres. Therefore, if an operation adjusted their cover crop acres, they might also adjust their acres in conservation tillage. Based on data from producers who completed surveys in 2014 and 2016, use and coverage of cover crops on corn and soybean acres remained about the same. However, interviewees

indicated that future usage of cover crops might be inhibited by negative experiences over the last three years.

Overall, there was increased awareness of water quality issues and various conservation practices over the course of this project. However, statistically significant changes cannot be reported. The lack of significant differences could be due to the small sample size (e.g., a larger sample size can ensure a more accurate mean) (see Schutt 2011), related to the small number of producers in the Beargrass Creek Watershed. Moreover, two years may not have been enough time to measure change since change – particularly behavior change – is complex and slow (e.g., De Young 2011).

## Successes, Benefits, Challenges, and Lessons Learned

The results we report in this section are primarily taken from end-of-project interviews because the surveys did not include measurements for respondent-defined project successes, benefits, challenges, and lessons learned; this type of



qualitative information is best ascertained via interviews. Indeed, by interviewing participants, we were able to learn details of perceived successes and benefits of the project as well as key takeaways and lessons learned. While data collected throughout the project informed the Beargrass project's development and refinement, these evaluations will inform future directions for the Beargrass Creek Watershed as well as conservation programs overall.

### “Success” Defined

Producer and agency staff interviewees were asked to define the Beargrass project's success. Both groups primarily defined project success as improving water quality in the watershed through implementation of conservation practices.

*“I think the main thing would be if, overall, if everybody that participated... actually made the water quality better, if we wound up with less nutrients in the water, less soil, sediments in the water because of the Beargrass project, then I'd say it was an overall success.” – Producer*

Given the goals of the project – reducing nitrogen loss to meet the Gulf Hypoxia Action Plan goals – this definition of success is not surprising; the project was built around expectations of improved water quality. However, almost all interviewees said they were uncertain about how successful the project was in terms of water quality improvements. Interviewees often stated that three years of water quality data are not sufficient to assess the project's success, a sentiment that was also expressed by Manchester University water scientists at project meetings. Some interviewees believed more time would be necessary to evaluate water quality improvements because the impacts of conservation practices might be delayed. One producer stated that, “Long term success may be literally five, ten years. Because it may take that long for some of these practices to really show its full effect.”

Beyond water quality, many producer and agency staff interviewees defined project success as increased awareness about conservation practices.

*“What I hoped to see out of the project was an opportunity for education...And it*

*very much did that...even if we didn't get as much...projects implemented as we wanted to, it still was an educational, an opportunity for knowledge. It's like, you got to plant a seed and let it grow.”*

*– Agency employee*

Both groups of interviewees had hoped to see more extensive implementation of conservation practices throughout the watershed. Despite a lag in practice implementation, interviewees placed great value on the project for facilitating educational opportunities about new conservation practices and structures. However, some producers and agency staff believed the success of the project would be confirmed only if producers continued to use newly adopted conservation practices. One producer described success and ongoing maintenance of conservation practices: “If it was a true, total success, everybody that was involved would probably stay involved and maybe increase their acreage. If some guys back out and say, ‘well this didn't work for me,’ then maybe it wasn't a total success.”

Success was also defined in terms of leadership. Producer interviewees often credited local NRCS and SWCD staff for being dependable sources of information and providing reliable support throughout the project. The local project coordinator was frequently mentioned by name, as were project personnel who presented “creative” conservation practice ideas and led the water quality monitoring efforts.

*“[Local project coordinator]'s been fantastic. [District coordinator]'s been great. Actually, the whole office has been very solid from that standpoint...It's been a concerted effort, you can tell, of the whole office.” – Producer*

In a related theme, agency staff interviewees valued the relationships they built with producers and the partnerships they formed between partner organizations.

*“One-on-one meetings with producers, telephone calls, got them out to some demonstration plots and stuff like that. But it's still... the best part of it though is still talking to those producers, you know, meeting them on the street, at the grocery*

*store, at the county fair, stuff like that.”*  
 – Agency employee

The community-led nature of the project, which entailed formal and informal mechanisms for learning through meetings and project outputs, was seen as a key benefit of participation, feeding into overall perceptions of success. Some of this success can also be seen through survey responses. For example, 83% of question respondents (n=29 of 35 respondents who answered the question) said they were *aware of The Beargrass Creek Watershed Approach Project* prior to taking the survey, and half (n=18) of the 36 respondents who answered the question had attended a producer meeting.

### Benefits of Participation

**Producers.** Perceived project benefits aligned with views on project success. Analysis of interview transcripts revealed that producers benefited from the project in multiple ways. Two key benefits were brought up in every interview: 1) Producers often described their experience with the project as “eye-opening” in terms of raising their awareness about environmental problems associated with farming and learning about what conservation practices are available to reduce their environmental impacts; and 2) Producers frequently referenced water quality monitoring by Manchester University as a major benefit associated with the project.

*“Probably the main thing for us would be that it’s shown us that there are different ways to go about farming than what we were doing before instead of just conventional [till] and all that, there’s a different way... So it’s kind of opened our eyes, you might say, a little bit.”* – Producer

*“Before the project started, there were some practices that we didn’t know about... so we have learned some new practices to use.”* – Producer

*“It brings your attention to what’s going on in the creek, in the whole watershed area. And going to the annual meeting, that’s pretty eye opening; what they’re finding when they’re testing the waters. The things I thought they would find are not what they’re finding – nitrogen seems to be the biggie here.”* – Producer

Project meetings provided opportunities for producers to learn about new practices from agencies and universities, and to hear from their peers about personal experiences with conservation practices such as cover crops. A few interviewees appreciated meetings where their peers shared experiences of cover crop successes, failures, and different management strategies. Both round table discussions and informal networking opportunities during project meetings helped interviewees learn from their fellow producers.

*“I think having other farmers come in that have done it, and share their experiences helps, too. Because, at our annual meeting, they’ve had different farmers from different areas come in and talk about that. I think people like to know, ‘I’m not out here by my own on this island.’ It’s like, other guys have done this, and yeah, they’ve had headaches, and they’ve learned. But you can do it.”* – Producer

Some interviewees mentioned additional social benefits, such as meeting and interacting with new people and collaborating with outside partners. The collaborative nature of the project gave some interviewees the sense that government agencies were willing to listen to the experiences of producers and learn about the difficulties associated with conservation practices such as cover crops.

*“We’ve been able to meet some people that we would not have been able to meet if it had not been for the Beargrass project... we would have never had an opportunity to meet or talk with or present our side of the table to them. And it’s not just all one-sided where they’ve [agencies] just been throwing the Beargrass stuff at us. We’ve been able to give some information back to those people...”* – Producer

These results suggest that the multi-faceted approach of the Beargrass project was a success, illustrating the learning process from problem awareness to behavior change (conservation implementation). Water monitoring legitimized the nitrogen reduction goals of the project, raising awareness of water quality issues in the watershed. The collaborative nature of the project fostered

a sense of being heard by government agencies (again legitimizing the watershed project), while informal data sharing and networking allowed producers to learn from each other about the ins and outs of various conservation practices (particularly cover crops). By participating in this project, it is also possible that producers and other partners in this watershed have expanded the social networks necessary for successful action on future social and environmental issues in the watershed (Floress et al. 2011).

**Agency Staff.** Interviews with agency employees revealed many of the same benefits expressed by producers. Agency employees saw the project as a valuable opportunity to bring funding to the watershed to improve water quality and soil health, which were said to “go hand-in-hand.”

*“It was nice that the district was able to bring in some funds...we get very little from the county to do anything with our programs...So we definitely would not have been able to do a watershed project obviously without the funding that EDF allowed the district to have...”*

– Agency employee

*“Benefits would be improving water quality, soil health promotion, reducing soil loss. Those are some of the things we try to quantify. That’s where Manchester University has been a big advocate on telling us – Are we making improvements? What best management practices are needed out here?”* – Agency employee

Employees from NRCS and SWCD also viewed the watershed project as beneficial for producers interested in learning about and trying new practices, saying that the project “sparked a lot of interest” in conservation practices and programs.

*“They’re [producers] very comfortable with the way they’ve been doing it, they know how to get it done that way and that’s what they stay with. But with this project, it has allowed some producers...to try it on a small part of their farm. Which is the way you want them to do it. You don’t want them to change everything overnight. Because there’s a learning curve, there definitely is.*

*So this was an opportunity for some of them to get their feet in the ground a little bit and try it a little bit at a time. And it gave others an opportunity that were willing to start something, to do something, it was a great opportunity for them to really get involved.”* – Agency employee

Project meetings were seen as a benefit, allowing for information sharing among partner organizations, as well as between outside organizations and the local producers. The ability to share information and to connect with producers was seen as a benefit from the agency perspective because local staff were able to build trusting relationships with participating producers. Benefits of the project are described by agency employee interviewees below.

*“The fact that these farmers sat in a group together to talk about it [conservation] is huge.”* – Agency employee

*“They [producers] put a lot of trust in what the group is saying, what NRCS is saying, what Soil and Water is saying...I mean they are basically making cropping decisions that affect what they do for a living on what [the agencies are] advising them to do.”* – Agency employee

Producers and agency staff expressed similar benefits of the project, particularly benefits surrounding information sharing and collaboration. These results point to the importance of building trust between agency employees and producers as a vital ingredient in watershed project success.

### **Project Outputs**

As noted above, much of the Beargrass project entailed processes that ensured collaboration and information sharing. Overall, interviews with agency employees and producers showed project outputs to be useful tools in encouraging education about different opportunities for conservation practices.

**Booklet.** Both agency employees and producers were pleased with the *Strategies for Voluntarily Improving the Soil Health on your Farm* booklet. Agency employees said they found the booklet useful because they could distribute it at project meetings and to producers who visited

their offices. An agency employee interviewee described the booklet as a helpful “Cliffs Notes of each practice and what it does.” Eighteen (52.9%) of the 34 respondents who answered the question reported they had seen the booklet. Although one respondent thought the booklet was *not very useful*, most thought it was *somewhat* (n=12) or *very* (n=5) useful. Producer interviewees appreciated the booklet, saying they were able to reference it if they wanted to refresh their memory about a practice they recently learned about at a project meeting. If they were interested in a practice depicted in the booklet, producer interviewees said they would check with their local NRCS/SWCD office for more information.

**ACPF-generated Maps.** Reviews of ACPF-generated maps were also generally positive. Agency staff interviewees described the maps as a “great tool for the NRCS to utilize,” “a huge ice breaker,” and a useful catalyst for conversations with producers about conservation practices. While helpful for providing “options” for practices such as bioreactors, two stage ditches, and Water and Sediment Control Basins (WASCOBs), agency employees noted that “there needs to be a practicality, because you’re not going to go out there and implement every practice that’s available.” Agency employees recognized that the maps were useful in an educational rather than a motivational sense, noting that cost and availability of cost-share funds were limiting factors for producers interested in implementing practices shown on the maps. When using the maps, agency staff interviewees said they reminded producers that they were not limited to only practices on the maps and that “waterways can go in any field, buffer strips... the biggies like no till, nutrient management, pest management, any type of manure management, those are big practices, cover crops, can apply anywhere.”

All producer interviewees (n=13) and 17 (51.4%) of the 35 survey respondents to the question “*I have seen Lidar maps of the Beargrass Creek Watershed that depict practice opportunities*” had seen the ACPF-generated maps. All survey respondents who had seen a map rated it as *somewhat* (n=11) to *very accurate* (n=6). Producer interviewees expressed similar confidence in the maps’ accuracy, but some went on to say they would

need to explore the physical characteristics of their property before agreeing that the maps showed the “right location” for a given practice. In terms of general location, many interviewees had difficulty finding their property on a map because there were no road numbers. Producer interviewees preferred map versions with key road numbers “so you kind of knew where your property and everything was.”

All producer interviewees believed the maps were not an invasion of privacy, saying that “it’s just basically public knowledge” and “pretty much anyone that knows how to use the computer can look [this] stuff up.” Of the survey respondents who took the survey in 2014 and 2016, attitudes remained fairly split between those who thought targeted conservation efforts and tools such as ACPF-generated maps invaded privacy. Interview data provide further insight into potential concerns over privacy. Some interviewees said the maps as they were being used at the time did not cause concern but they foresaw issues if in the future the maps were used for regulatory purposes. This type of attitude toward ACPF-generated maps is summarized in the following quote from a producer:

*“I would think they’d need to approach it with going to the farmer and saying, ‘We think this might fit. What do you think?’ Because the farmer’s going to have first-hand experience tilling the ground, and if he has any kind of a care for the land at all, he’s going to want to take that into consideration. But for them to come out and say, ‘Here’s something we need to do. You’re going to be forced to do it,’ that’s not going to be a pill that anybody’s wanting to swallow very well.” – Producer*

These tools facilitated awareness building and contributed to the collaborative, rather than top-down, feel of the project. For example, our observations of on-farm meetings revealed that the ACPF-generated maps were used as reference points to begin a conversation about implementation instead of a document of final, targeted decisions. This approach thus gave producers a feeling of autonomy and flexibility in considering changes to their farming operations and land. This is consistent with the intent of the ACPF approach (Tomer et al. 2013).

## Project Challenges

**Producers.** Other than extra paperwork and time, which interviewees acknowledged is “like anything else, everything takes more time than what you expect it to,” challenges associated with the project from the producers’ perspectives focused on the management of cover crops. When asked, “What was challenging about the project?” interviewees most frequently spoke of cover crops as the only challenge, rather than project-specific issues such as shifts in personnel or other types of concerns. For example, “Other than just the actual physical management of the cover crop, no” and “Other than that [cover crops], I don’t think there’s been any major challenges. Nobody’s caused us any grief or headaches.”

In a more general sense, when asked what they would improve about the project, producer interviewees said they would have liked the project to continue for a longer period of time. Extending the project into the future corresponds with producers’ difficulty of defining success within the project’s short timeframe. One producer interviewee said “we’re just getting started really” and “was kind of surprised the other day, when [local project coordinator] said that this meeting was more or less getting ready for the end of it [the project].” Overall, producer interviewees felt as though the project needed more time to implement conservation practices, collect more water quality data, and improve conservation decision-making in the watershed. Despite this feeling, projects like these that cover two to three years of funding and outreach efforts can expect successful outcomes such as building awareness about water resources and about the multiple benefits of conservation. Project activities and awareness building can contribute to the watershed’s capacity for conservation, while getting started with conservation implementation that then might build over time.

**Agency Staff.** Agency employees experienced different challenges than producers. Although they mentioned producers’ difficulty with cover crops, challenges for agency staff focused on communication, shifts in project personnel, and producer participation. While building relationships with multiple partners across different

states, agencies, and areas of expertise was a perceived benefit of the project, agency employees acknowledged that effective communication between all groups was, at times, a struggle.

*“Just keeping an open line of communication. The more partners becoming involved, it became more evident to us very quickly that we needed to keep these teleconferences going. A lot of the partners aren’t located in Wabash, Miami County. So we had to make special efforts to get everyone together in the same room. Keep everybody up to speed. That was a challenge. But [local coordinator] did a good job coordinating that. That’s an issue. Communication and off-site staff. Out of state staff.” – Agency employee*

There were also personnel changes within different partner groups that came as “a huge blow in momentum”; however, those were challenges outside the control of local agency employees. Within their control was recruiting producers to the project. Local NRCS and SWCD staff interviewees said one of their primary challenges was recruiting some producers, noting that it had taken quite a bit of “convincing them [producers] we are working with them, not really against them...that’s come a long way in this project...It’s been difficult, but it’s been fun.” Interviewees believed that changing the mindset of more resistant producers to motivate them to change their practices and to manage their operations in a more conservation-minded way would be an “ongoing” challenge.

*“...there are some farmers you are just not going to get...and you have to accept that...the farmers that farm in Beargrass, some of them, it was going to be a hard sell from the get-go. So in a way you set yourself up to fail but there’s probably not a perfect watershed or an easy watershed. There’s always going to be farmers that farm it that are going to be tough to get.” – Agency employee*

Additionally, although interviewees understood the benefits of, and advocated for, the adoption of new conservation practices, they also sympathized with producers over legitimate fears and risks associated with changing their operations.

*“...I understand that it sounds great, why wouldn't you just do all these things? Because at \$3.00 corn there's not a lot of extra money to do a lot of things with. And so I've been farming and I've been making a living so why would I all of a sudden change my management practices and not make as high of a yield? That's always a challenge as well to us, that it's not our bank account.” – Agency employee*

For producers who did implement conservation practices such as cover crops, agency staff interviewees said the next challenge would be helping producers continue the practices: “These EQIP applications are running out and you can't necessarily convince somebody to continue and so that obviously is a huge struggle.”

Other challenges agency employees experienced when recommending practices to producers were the differences in state NRCS construction specifications for conservation practices. Some project partners involved in making conservation practice recommendations were from states other than Indiana. Construction specifications for certain practices may have been within NRCS guidelines in these other states, but made them ineligible for funding in Indiana. Such discrepancies led to some frustration among agency employees and producers. One agency staff member said, “... there were a few curveballs as far as policy stuff goes...When I say policy, I mean NRCS policy.”

Overall, agency interviewees would have liked to see more practices implemented, but they struggled to pinpoint how exactly they could have improved rates of adoption throughout the project: “Well it's tough to say because... we tried our hardest.” Overall, agency staff felt satisfied with what they accomplished, given the time, staff, and other resources they had: “I look back at 2015 and the amount of work between the two counties. Beargrass, the lower Eel River, the Middle Eel River. We had so many irons in the fire. We did the best we could with what we had. I feel like we went above and beyond.” Generally satisfied with their efforts, the primary suggestion for improvement was increased guidance from EDF, the organization who funded the project. Challenges with communication subsequently led to uncertainty regarding the roles and deliverables

expected of the organizations and people involved: “I don't know that we've fulfilled what they [EDF] thought we were supposed to do and I'm not really sure what that was.” Local agency employees would have appreciated more specific guidelines at the beginning and throughout the project.

### Lessons Learned

**Producers.** When speaking about lessons learned, producers focused on cover crops. Despite the difficulties with cover crops, interviewees said they would encourage producers in other watersheds to try cover crops on a small scale and to get involved with a local initiative like the Beargrass project. Interviewees advocated for initial and continued participation and education, and advised other producers in similar projects to “keep an open mind.”

*“Join a project, because if you don't, you're not going to learn anything at all. Whereas if you do join the project, at least you're going to learn a little bit.”*  
– Producer

Because financial considerations are highly influential in conservation decision-making, producers also advised their peers to seek out cost-share opportunities.

*“You get out there and figure out what program is there, and what funding there is for different applications... If there's funding available, make use of them and try them out.”* – Producer

Many of the producers' comments revolved around difficulties of complex conservation practices such as cover crops. Integrating such practices into farm operations requires a long learning curve that entails patience, time, education, and funding. The Beargrass project included each of the elements to some degree – education, information sharing, farmer networking, and cost-share funding.

**Agency Staff.** Agency employees advocated for keeping the scale of a watershed project small to make interacting with and recruiting producers achievable. Within that smaller watershed, agency employees called for social science investigations prior to the project so that project personnel would have a sense of “who is in that watershed...”

what practices they are already doing...what practices they might be willing to do.” Based on that information, interviewees advised that their peers in other watersheds should first recruit conservation-minded producers. Moreover, if producers had already implemented project-specific conservation practices on their land, interviewees suggested asking these producer leaders to host a demonstration site for their neighbors in the watershed.

In addition, agency staff realized that implementation of conservation practices is not and should not be the sole measure of success for a project. For example, methods of recruiting and educating producers were especially important to interviewees.

*“The most interesting part of this concept of this project is what I realized really early on: That it’s not – with this particular project – it’s just not about getting the practices on the ground, but it’s a lot about how we got those practices on the ground.” – Agency employee*

*“The main thing is to realize your responsibilities...It’s our responsibility to realize that sustainable agriculture is possible, and to try to make other producers realize what sustainable agriculture really is and what it needs to be.”*

*– Agency employee*

Agency staff interviewees strongly recommended forming personal contacts with producers and taking responsibility for quality engagement and education regarding conservation practices. To do so, one agency employee summarized, “Definitely make it personable... You have to get face to face.”

Finally, agency employees saw Manchester University’s water quality monitoring as a crucial ingredient for a successful project. They highly recommended that future projects find partnerships and pathways to collecting water quality data when possible.

*“Start with the water quality monitoring and build those partnerships...Find out who’s doing water quality monitoring. And that’s tough. That takes money. I keep coming back to Manchester because*

*[of] their strong partnership... get that scientific baseline set.” – Agency employee*

Themes of trust (through building relationships) and legitimacy (through water monitoring and through trusted relationships) continued to emerge in each social science analysis of the project. It is also notable that although the ultimate goal of the Beargrass project was to reduce nitrogen loss through implementation of conservation practices, ancillary benefits such as trust, collaboration, and learning emerged as key project successes.

## Conclusions

The Beargrass project was developed as a partnership between government agencies, non-governmental organizations, universities, local stakeholders, and producers. The purpose of the project was for these partners to work together to reduce nutrient loss through scientifically-based conservation approaches and producer adoption of conservation practices. Social science was used throughout the project to inform project development and interim project information sharing, and to evaluate project successes, challenges, and lessons learned.

Prior to the project commencing, social indicator surveys were sent to watershed producers to assess their understanding of water quality issues, and their knowledge, attitudes, and perception of various conservation practices. The survey data indicated the degree to which producers had already implemented conservation practices, and were willing to try (or not to try) new practices. The data also highlighted constraints to conservation implementation and perceptions of the targeted conservation practices on which the Beargrass project focused. This information informed project development.

Once the project launched, NRSS Lab staff observed on-farm meetings and large information sharing meetings, and shared observations with project staff who continuously improved meeting format and content. At the project conclusion, a post-project social indicator survey was distributed to assess changes in environmental behaviors and conservation attitudes over the course of the project. Although no significant differences were found in the pre- and post-survey data, interviewees

suggested many supplementary project benefits and successes. Indeed, analysis of the interviews helped identify project benefits that may not have otherwise been recognized.

In this paper we highlighted information gathered through the project's evaluation. We found that producers benefited from the project through increased awareness of water resource issues and different ways of farming through conservation. Agency staff also saw these benefits and realized that the process of working with farmers through education and face-to-face interactions was key to getting conservation measures implemented on the ground. This pointed toward the efficacy of working in a small-scale watershed. The Beargrass project offers an example of how social science can be used to inform conservation watershed projects from project development to evaluation.

## Recommendations

### Beargrass Creek Watershed

Moving forward in the Beargrass Creek Watershed, producers will require motivation and assistance to continue and expand conservation practices. Final interviews and surveys demonstrated that conservation-minded producers in the watershed were largely limited by financial factors. Survey data showed that the number of producers who planned to apply cost-share funds to implement practices was similar to the number of producers who were not interested in applying for cost-share programs.

Continued outreach for cost-share opportunities might encourage future adoption of conservation practices to improve water quality. More survey respondents *agreed/strongly agreed* (n=20) than *disagreed/strongly disagreed* (n=5) that producers played a key role in reducing nutrient loading by 45%. More producers also *agreed/strongly agreed* (n=12) than *disagreed/strongly disagreed* (n=3) that the 45% reduction goal was achievable. These data, along with interviewee interest in continuing the Beargrass project and the practice of cover crops, suggest there is momentum to motivate producers to continue and potentially increase their conservation efforts.

### Future Projects

Based on our study, we recommend that future projects should:

- Incorporate water quality data through rigorous sampling methods and analysis. Both agency employees and producer interviewees cited water quality data, collected by Manchester University, as a primary benefit of the Beargrass project. If future projects set a goal to reduce nutrient loading in waterways, baseline and continued assessment of water quality must occur to track improvements in water quality over time. Evaluation of a project's success should also not be limited to a few years' worth of water quality data.
- Continue to assign a local project coordinator within the watershed. Personal contact and face-to-face meetings were highly valued by all interviewees. The local project coordinator and other project partners who directly interacted with producers were often mentioned as valuable assets and sources of information. Local staff should continue to be responsible for maintaining positive relationships with producers in the watershed. The local project coordinator should be provided with and have access to resources that will help them fulfill clear project goals. Overall, a consistent presence and commitment through the project's duration is crucial, especially given the long timeframes involved from initial producer engagement to eventual adoption of conservation practices.
- Keep project scale within manageable limits. Agency staff interviewees were in favor of focusing on relatively small watersheds so that outreach and education efforts would be effective and achievable. Producer and agency staff interviewees valued project meetings and in-person conversations, which are difficult to facilitate on a larger scale. If future projects are implemented in a larger watershed, assigning multiple local coordinators to cover smaller geographic areas or sub-watersheds should be considered.
- Consider extending timeframes of future



projects. In interviews, producers expressed interest in having more time to learn how to best incorporate conservation practices, specifically cover crops, into their operations. Three years may not be enough time for producers to effectively adopt and maintain new conservation practices.

Social science investigations should occur during the early stages of the project so that local agency staff may gain in-depth insights into producers' conservation attitudes, practices, and willingness to adopt new practices.

Evaluation of future projects should not be limited to strictly quantifiable measures, such as water quality data and number of acres enrolled in a conservation practice. Qualitative assessment, such as interviews with participants, should also occur. For example, producer interviewees often considered the Beargrass project successful based on the educational opportunities and awareness-raising throughout the area.

## Acknowledgements

Thank you to the producers, agency staff, and others who participated in this project. Thanks also to Jackie M. Getson (Research Associate, Natural Resources Social Science Lab, Purdue University) for GIS support. We appreciate the hard work by Manchester University staff and students who helped with water data collection and Purdue University NRSS Lab students who assisted with survey data entry. We are grateful for funding support to the Environmental Defense Fund from the Walton Family Foundation and a Conservation Innovation Grant from USDA-NRCS.

## Author Bio and Contact Information

**SARAH P. CHURCH** (corresponding author) is an Assistant Professor of Planning in the Department of Earth Sciences at Montana State University. Her current research focuses on studies of behavior change and processes of environmental learning, particularly in relation to water and climate change issues across urban and working landscapes. She may be contacted at [sarah.church@montana.edu](mailto:sarah.church@montana.edu).

**NICHOLAS BABIN** is an Assistant Professor in the Natural Resources Management and Environmental Sciences Department at California Polytechnic State University. His research and teaching interests focus on agroecology, food systems, and sustainable development. He may be

contacted at [nbabin@calpoly.edu](mailto:nbabin@calpoly.edu).

**BELLYA BENTLAGE** is an Associate with Verdis Group, a sustainability consulting and thought leadership organization in Omaha, Nebraska. Her work focuses on sustainability and climate resiliency planning, stakeholder engagement, and designing data-based behavior change programs. She may be contacted at [belyna@verdisgroup.com](mailto:belyna@verdisgroup.com).

**MICHAEL DUNN** is a Social Scientist in the Centre for Ecosystems, Society and Biosecurity at Forest Research (UK). His research covers attitudes, perceptions, behavior and engagement within the contexts of natural resource and wildlife management. He may be contacted at [michael.dunn@forestresearch.gov.uk](mailto:michael.dunn@forestresearch.gov.uk).

**JESSICA D. ULRICH-SCHAD** is an Assistant Professor of Community and Natural Resource Sociology in the Department of Sociology, Social Work, and Anthropology at Utah State University. Her research focuses on how natural resource related trends or events (e.g., amenity migration, oil and gas booms/busts) impact community making in rural places as well as the drivers of adoption and maintenance of conservation practices among agricultural producers. She may be contacted at [jessica.schad@usu.edu](mailto:jessica.schad@usu.edu).

**PRANAY RANJAN** is a Postdoctoral Research Associate in the Department of Forestry and Natural Resources at Purdue University. He studies non-operating landowner and farmer conservation behavior through the lenses of institutions, governance, and collective decision-making. He may be contacted at [ranjanp@purdue.edu](mailto:ranjanp@purdue.edu).

**JOE MAGNER** is a Research Professor in the Department of Bioproducts and Biosystems Engineering at the University of Minnesota. His research interest is the development and implementation of new innovative water quality best management practices in watersheds. He may be contacted at [jmagner@umn.edu](mailto:jmagner@umn.edu).

**EILEEN MCLELLAN** is a Lead Senior Scientist at Environmental Defense Fund. Her work focuses on ways to make agricultural landscapes more sustainable and resilient. She may be contacted at [emclellan@edf.org](mailto:emclellan@edf.org).

**SUSI STEPHAN** is the former Wabash County Soil & Water Conservation District Executive Director and Beargrass Creek Watershed Project Coordinator, who served as the link between local landowners and the project's science team. The SWCD works with farmers and landowners to help educate them on conservation practices and to install best management practices on their land. She may be contacted at [susan.stephan@usda.gov](mailto:susan.stephan@usda.gov).

**MARK D. TOMER** is a Research Soil Scientist with the USDA Agricultural Research Service at the National

Laboratory for Agriculture and the Environment in Ames, Iowa. His research is focused on conservation effects assessment in agricultural watersheds and development of conservation planning technologies. He may be contacted at [mark.tomer@ars.usda.gov](mailto:mark.tomer@ars.usda.gov).

**LINDA S. PROKOPY** is a Professor of Natural Resources Social Science in the Department of Forestry and Natural Resources at Purdue University. Her research primarily focuses on what motivates farmers and farm advisors to adopt conservation-minded practices. She may be contacted at [lprokopy@purdue.edu](mailto:lprokopy@purdue.edu).

## References

- Babin, N., N.D. Mullendore, and L.S. Prokopy. 2016. Using social criteria to select watersheds for non-point source agricultural pollution abatement projects. *Land Use Policy* 55: 327-333. Available at: <https://doi.org/10.1016/j.landusepol.2015.06.021>. Accessed June 20, 2019.
- Bentlage, B., P. Ranjan, and L.S. Prokopy. 2016. Social Science Evaluation Report: Beargrass Creek Watershed Approach Project. West Lafayette: Purdue University. Available at: [https://www.purdue.edu/fnr/prokopy/wp-content/uploads/2014/06/Beargrass\\_Social\\_Science\\_Findings\\_with\\_all\\_appendices\\_20161129.pdf](https://www.purdue.edu/fnr/prokopy/wp-content/uploads/2014/06/Beargrass_Social_Science_Findings_with_all_appendices_20161129.pdf). Accessed June 20, 2019.
- Church, S.P. and L.S. Prokopy. 2017. The influence of social criteria in mobilizing watershed conservation efforts: A case study of a successful watershed in the Midwestern US. *Land Use Policy* 61: 353-367. Available at: <https://doi.org/10.1016/j.landusepol.2016.11.030>. Accessed June 20, 2019.
- De Young, R. 2011. Slow wins: Patience, perseverance and behavior change. *Carbon Management* 2(6): 607-611. Available at: <https://doi.org/10.4155/cmt.11.59>. Accessed June 20, 2019.
- Floress, K., L.S. Prokopy, and S.B. Allred. 2011. It's who you know: Social capital, social networks, and watershed groups. *Society and Natural Resources* 24(9): 871-886. Available at: <https://doi.org/10.1080/08941920903493926>. Accessed June 20, 2019.
- Genskow, K. and L.S. Prokopy. 2011. The Social Indicator Planning and Evaluation System (SIPES) for nonpoint source management: A handbook for watershed projects. Great Lakes Regional Water Program. Available at: [https://iwr.msu.edu/sidma/Info/pdfs/SI\\_Handbook\\_v4\\_02012012.pdf](https://iwr.msu.edu/sidma/Info/pdfs/SI_Handbook_v4_02012012.pdf). Accessed July 12, 2019.
- Gulf Hypoxia Action Plan. 2008. Gulf Hypoxia Action Plan for Reducing, Mitigating, and Controlling Hypoxia in the Northern Gulf of Mexico and Improving Water Quality in the Mississippi River Basin. Washington, DC: Mississippi River/Gulf of Mexico Watershed Nutrient Task Force. Available at: [https://www.epa.gov/sites/production/files/2015-03/documents/2008\\_8\\_28\\_msbasin\\_ghap2008\\_update082608.pdf](https://www.epa.gov/sites/production/files/2015-03/documents/2008_8_28_msbasin_ghap2008_update082608.pdf). Accessed July 12, 2019.
- McLellan, E., D. Robertson, K. Schilling, M.D. Tomer, J. Kostel, D. Smith, and K. King. 2015. Reducing nitrogen export from the corn belt to the Gulf of Mexico: Agricultural strategies for remediating hypoxia. *Journal of the American Water Resources Association* 51(1): 263-289. Available at: <https://doi.org/10.1111/jawr.12246>. Accessed June 20, 2019.
- Porter, S.A., M.D. Tomer, D.E. James, and K.M.B. Boomer. 2015. Agricultural Conservation Planning Framework ArcGIS® User Manual (Ver. 1). USDA-ARS National Laboratory for Agriculture and the Environment. Available at: [www.northcentralwater.org/acpf/](http://www.northcentralwater.org/acpf/). Accessed June 20, 2019.
- Prokopy, L.S., K. Genskow, J. Asher, A. Baumgart-Getz, J. Bonnell, S. Broussard, C. Curtis, K. Floress, K. McDermaid, R. Power, and D. Wood. 2009. Designing a regional system of social indicators to evaluate nonpoint source water projects. *Journal of Extension* 47(2): 8.
- Schutt, R.K. 2011. *Investigating the Social World: The Process and Practice of Research*. Sage Publications, Thousand Oaks, California.
- Tomer, M.D., S.A. Porter, D.E. James, K.M.B. Boomer, J.A. Kostel, and E. McLellan. 2013. Combining precision conservation technologies into a flexible framework to facilitate agricultural watershed planning. *Journal of Soil and Water Conservation* 68(5): 113A-120A. Available at: <https://doi.org/10.2489/jswc.68.5.113A>. Accessed June 20, 2019.
- USGS. n.d. USGS National Hydrography Dataset (NHD) Best Resolution for 20160915 State or Territory File GDB 10.1 Model Version 2.2.1. U.S. Geological Survey, National Geospatial Program. Available at: <https://catalog.data.gov/dataset/usgs-national-hydrography-dataset-nhd-best-resolution-20180216-for-washington-state-or-territoryf90ea>. Accessed July 19, 2019.
- U.S. Census Bureau. 2010. 2010 Census Urban and Rural Classification and Urban Area Criteria. Available at: <https://www.census.gov/programs-surveys/geography/guidance/geo-areas/urban-rural/2010-urban-rural.html>. Accessed June 20, 2019.

U.S. Census Bureau. 2015. 2015 TIGER/Line Shapefiles.  
Available at: <https://www.census.gov/geographies/mapping-files/time-series/geo/tiger-line-file.html>.  
Accessed July 19, 2019.

Viera, A.J. and J.M. Garrett. 2005. Understanding  
interobserver agreement: The kappa statistic.  
*Family Medicine* 37(5): 360-363.