Implementation of Best Management Practices of Collaboratively Developed Watershed Action Plans in the Maumee River Watershed

The Ohio State University
School of Environment and Natural Resources

Travis R. Shaul
Shaul.2@osu.edu

Faculty Advisor:
Dr. Tomas M. Koontz
Koontz.31@osu.edu

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Abstract

Significant time and effort are put into developing Watershed Action Plans (WAPs) to address water quality impairments throughout Ohio. These WAPs are developed collaboratively with a broad range of stakeholders representing various interests. Each one of these parties has an expressed concern as to how the watershed is managed. There is sufficient literature that addresses how collaborative watershed plans are developed, and how citizen participation is essential to plan development, Koontz, et al. 2004, Koehler & Koontz 2008, Leach & Pelkey 2001, Chess et. al 2000. However, implementation of best management practices (BMPs) is not addressed for WAPs in the literature. The main objective of this research is to see if WAPs affect implementation of BMPs, and if yes, to what degree. The research questions this study concentrates on are, "What factors affect implementation of BMP recommendations of WAPs?" and "After development of a Watershed Action Plan (WAP), who plays the central role in organizing the implementation?" The study includes three primary watersheds in Northeast Ohio; the Lower Maumee Watershed, the Portage River Watershed, and the Blanchard Watershed. Through the use of snow-ball sampling identification of key stakeholders responsible for implementation of BMPs, sixteen interviews were conducted to answer the research questions. The results suggest that watershed coordinators are not only essential to the development of collaboration, but also to prompt other parties to implement BMPs in the watershed. The significance of this research is that it can help other collaborative environmental plan developers to determine factors necessary in aiding implementation of their initiatives.

Watersheds Included in the Study

St. Joseph River Water Initiative Partnership 2013

St. Joseph River Water Initiative Partnership 2013
(Area of study indicated by red surrounding border)

Introduction

The Clean Water Act of 1972 was the first step in addressing growing national concerns of America's polluted waterways (Houck 2002). One could spend significant time analyzing and interpreting the benefits of this law, but section 319 may be the most prominent for collaborative watershed management approaches. This section focus on nonpoint source pollution, which is defined as: "water pollution that does not meet the legal definition of point source in section 502(14) of the Clean Water Act" (USEPA 2012). The U.S. EPA describes point source pollution as deriving from a "discernible" discharge of a pollution point such as pipe or concentrated animal feeding operations (USEPA 2012). Nonpoint source pollution is drastically more difficult to pinpoint the exact location of discernible discharge. These sources are further described by the EPA as "diffuse" and potentially carried away by "rainfall or snowmelt" (USEPA 2012). These pollutants range from agricultural runoff such pesticides, fertilizers, and nutrients from animal waste to urban runoff of oil and other various chemicals. Nonpoint source pollution derived from agricultural runoff is the leading cause of water quality problems in the Maumee River Watershed, an area that includes watersheds with as high as 86% agricultural land usage (WAP Outlet 2011, WAP Portage 2011).

Section 319 also utilizes Total Maximum Daily Load (Henceforth TMDL) calculations to determine how best management practices influence water quality within the watersheds (Houck 2002). TMDL is the "maximum amount of a pollutant allowed to enter a waterbody so that the waterbody will meet and continue to meet water quality standards for that particular pollutant" (USEPA 2013). TMDLs, specified in detail in section 303(d) of the Clean Water Act, allow for Watershed Action Plans (WAPs) to be developed under section 319 funding guidelines to address water quality impairments and implementation to address these impairments through direct means such as the use of best management practices (BMPs) or through educational

programs (Houck 2002, USEPA 2014, Barton 1999). Furthermore, plans must describe financial and technical assistance required to implement BMPs. The 319 program is voluntary, but has funding attached to TMDL analysis and identification (Houck 2002). In Ohio, collaborative watershed groups often use this funding to pay a salary to watershed coordinators, who organize WAPs and can play an integral role in identifying impairments that TMDLs can quantify.

Section 319 requires both assessment of nonpoint source pollution, often in TMDLs, and development of a program to manage the nonpoint source pollution. For Ohio, this is the watershed action plan, or WAP (Barton 1999). These two intrinsically tied items of section 319, nonpoint source pollution and TMDL, allow Ohio's Department of Natural Resources (ODNR) to offer watershed coordinator grants. These grants are designed for either local government or non-profit organizations and provide funding to pay a salary to a watershed coordinator (ODNR 2014). The financial support to fund watershed coordinator positions is conditional on development of the WAP. The funding continues to aid in implementation after the plan has been completed. This is also seen as a way to empower both these local governments and non-profits to manage their local watersheds (ODNR 2014). The watershed coordinator is given a two year time frame to develop the WAP after funding is awarded, however, the funding may last up to six years. Failure to produce a plan risks the funding being withdrawn beyond year four (OHEPA & ODNR 2003). These grants began at nearly the same time as section 319 addressed nonpoint source pollution and TMDL (OHEPA & ODNR 2003, Houck 2002). Although, both the Ohio EPA and Ohio DNR recognize the 319 watershed coordinator grant funding is insufficient to address all of the water quality impairments; they do recognize the importance of watershed coordinators in addressing Ohio's water quality impairments. In a

document from 2003, outlining these agencies' vision for Ohio's watershed coordinator program, policy makers stated that:

> *Ohio EPA and ODNR are extremely proud of the work that the coordinators have done in assisting their organizations and stakeholders to accomplish to protect and restore water resources. Our primary vision is that nonpoint source and watershed programs are ideally developed and implemented locally. As watershed plans are produced by the watershed stakeholders and their technical partners, we plan to recognize these efforts and endorse the plans as the cornerstone for addressing nonpoint source water pollution in Ohio.*
> OHEPA & ODNR – 2003

This statement shows Ohio's chief government environmental agencies supporting the initiative and maximizing the utility of 319 grant funding. It also reflects these organizations' desire to have collaborative decision making in both planning an implementation efforts. The USEPA also recognizes Ohio's effort to foster support for collaborative watershed groups. In a section of the US EPA's Handbook for Developing Watershed Plans to Restore and Protect our Waters titled, "Ohio Builds Strong and Effective Watershed Groups", the US EPA praises Ohio:

> *Ohio has adopted a program philosophy that strong and effective local watershed stakeholder groups are necessary to develop and implement integrated watershed plans. According to Ohio, the key to watershed organization capacity-building is active stakeholders that provide technical knowledge, financial ability, networking ability, organizational skills, and legitimacy (decisionmakers with the authority to implement and support problem and solution statements and recommended action items).*
> US EPA 2008

This study examines how BMPs recommended in the WAPs are implemented in watersheds with collaboratively developed WAPs. The primary research questions are as

follows. (1)- What factors affect implementation of BMP recommendations of WAPs? (2) - After development of the WAP, who plays the central role in organizing the implementation, if anyone? To answer these questions the WAPs serve as the primary reference instrument to determine the BMPs designed for each watershed. These plans are developed by collaborative groups, which can include governmental agencies, citizens, and environmental groups. Many states have manuals which serve, as Robertson states:

> *"As a technical resource for designing and implementing BMPs. However, there is limited information on the extent to which the technical standards have been implemented consistently and whether practices have been maintained over time. There continue to be social, political, and cultural issues associated with the adoption of BMPs."*
> Robertson 1999

The plans are highly detailed, but offer no insight into how, and in some cases, what BMP's will be implemented. The interviews expound on the initial information in the WAPs to determine which BMPs have been implemented, if any, any factors contributing to the implementation. This research aims to aid other collaborative environmental plan developers to determine focal factors needed to successfully implement their initiatives and address the knowledge gap in implementation of collaboratively developed plans.

Involvement in WAP Planning

Watersheds are inherently cross-jurisdictional, in that they often span different, municipalities, counties, states, and other political boundaries. Often watersheds overlap, adding to the challenge of determining how to manage these units, because smaller watersheds are, nested within others. (Blomquist & Schlager 2004). However, in the Maumee River Watershed,

the study's area of focus, the watersheds are clearly defined and the WAPs are complete for the Lower Maumee, Blanchard, and Portage watersheds. Collaborative watershed groups involve multiple stakeholders and offer more equity than traditional top-down governments run approaches (Sabatier, Weible, & Ficker 2005). These stakeholders include governmental actors, who are often from local municipalities or soil and water conservation districts. Nongovernment involvement may include nonprofit organizations, private firms, and concerned citizens (Koontz 2004).

Although the study does not focus on the collaborative watershed group composition, it is nonetheless important to have a baseline understanding of the key participants and the level of participation in the WAP planning process. In a review of what makes water partnerships work, three of the four main characteristics were related to stakeholder participations. These were: effective leadership and management, interpersonal trust, and committed participants (Leach & Pelkey 2001). Effective leadership was regarded as an important resource for these collaborative watershed groups in achieving desired goals (Koehler & Koontz 2008). This study derives some its independent variables such as: a central coordinator and implementer involvement in the planning process from the literature on collaborative watershed planning.

In political/policy literature, an aspect of implementation applies to the implementation of WAP BMPs. This involves the target of the implementation (farmer, citizen, public entity, etc.) having the power to decide which, if any, BMP recommendations to follow (Schneider & Ingram 1993). Because WAPs are non-regulatory, and essentially suggest actions, the target of implementation has a choice regarding whether to implement, and a choice on which BMP works best for them. Also originating from policy literature are the concepts of macro and micro implementation levels. Macro implementation involves central actors creating a governmental

plan. Micro implementation differs as, "local organizations react to the macro level plans, develop their own programs, and implement them." (Matland 1995). This is how Ohio's EPA and DNR are promulgating section 319 grants within the state. They allow local governments, citizens, and watershed groups to collaboratively develop WAP plans based on TMDL data, and to implement these distinctive plans (OHEPA & ONDR 2003). Both of these implementation concepts follow the bottom-up approaches. Collaborative watersheds groups are often driven by bottom up approach and follow a micro level method of plan development. A problem with this micro level planning is, "most implementation problems stem from interaction of a policy with the micro level institutional setting" (Berman 1978). For example, the power to implement section 319 rests with local authorities, not the original developer of the law, which is the federal government. Ohio promotes this local authority, including lack of specificity about how BMPs will be implemented. Although these concepts are derived from more traditional policy process literature, the problems they present can readily apply to collaborative watershed groups, their WAPs, and the BMPs suggested by the WAPs.

Region Significance

The Maumee River Watershed drains 5,024 miles in Ohio. It fully encompasses or at least touches 18 counties in Ohio. The Maumee River Watershed is also home to several Ohio medium to large sized municipalities, the largest being the city of Toledo, which had a population of 287,208 in 2010 (OHEPA 2014, Census Viewer 2012). The largest factor that makes the Maumee River Watershed significant is that it is a tributary of the western Lake Erie Basin (OHEPA 2014). The western Lake Erie Basin has been in the national spotlight due to massive algal blooms. In 2011, the bloom reached close to 2,000 square miles; three times larger than any prior recorded blooms in the area. The main cause of the 2011 algal bloom was nutrient

runoff resulting from higher than usual spring precipitation flushing pollutants from agricultural fields (Wines 2014, Borre 2013).

Algal blooms in the western Lake Erie Basin are attributed primarily to agricultural nonpoint source pollution, placing additional importance of WAP efforts to implement BMPs to prevent nutrient runoff. Agricultural activities involving fertilizer use increases phosphorus runoff, which is the main nonpoint source pollutant that creates the algal blooms. The blooms release toxins that are harmful for swimmers, fisherman, and boaters (Krouse 2012, OHEPA 2013). The effects of algal blooms are not limited to people; they are also the cause of hypoxia, which is low oxygen in the water (Daloğlu 2012). This is quite significant because it will kill fish populations as well as any organisms dwelling on the lake floor. Hypoxia from algal blooms will place both fisheries and the food web in the western Lake Erie basin in danger (Daloğlu 2012). Lake Erie is also unique among the great lakes by having the most urbanized development surrounding it. This urbanization coupled with Lake Erie having both the smallest volume of water and the shallowest depth of water; create an environment ripe for blue-green algal blooms to occur (USEPA 2012).

There is heavy agricultural land use in the northern counties of Ohio, thus farming practices must be adjusted to prevent and reduce future algal blooms. The application of fertilizers containing phosphorus in the spring causes these blooms to spread from Toledo to Cleveland (Hunt 2012). The algal blooms in Lake Erie are not a new phenomenon; they have been occurring for over 40 years. In the 1970s, the algal blooms were massive and this made the problem a priority for officials and collaborative watershed groups in the Lake Erie area (Hunt 2012). Through the efforts of these collaborative watershed groups and officials, farmers in the area adopted better agricultural practices to reduce runoff of phosphorus. These efforts, coupled

with stricter regulations on sewage treatment plants (also a source of phosphorus), and phosphorus reduction agreements between the United States and Canada, attributed to improved water quality. Nonetheless, since 2000 the blooms have reemerged and have been increasing in severity each year (Hunt 2012).

The implementation of BMPs in the Maumee River Watershed must be assessed to find a solution. The current model of addressing water quality in this region is for collaborative watershed groups to coordinate with local governmental agencies, non-profits, citizens, and farmers to get their plans implemented. The efficiency of this method has been a source of concern, because WAPs are non-regulatory, thus they have no "teeth" for enforcement of their recommendations. As a result, no direct enforcement by the State or Federal government is needed for these collaborative watershed groups to implement their plans. It is difficult to judge the effectiveness these groups have on implementing policy options outlined in their plans. The interviews conducted with primary stakeholders involved in implementation of WAP recommendations address how implementation is occurring and obstacles that are pervasive in preventing additional BMPs to be implemented. Literature on collaborative watershed and environment groups allow for insight into how these groups function and what makes them successful. However, prior studies on BMP implementation stemming from collaborative plans are scarce.

Collaborative Approach

Involvement of stakeholders in development of WAP and forming a collaborative approach is a cornerstone to linking efforts to improve water quality and involving the affected communities (OHEPA & ODNR 2003). Ohio recognizes the importance of collaborative watershed groups and funds them through Section 319 nonpoint source pollution higher than the

average state in the US. Ohio directs 50% of its Section 319 funding to these groups (Hardy & Koontz 2008). Adequate funding was the most frequently identified factor of success to collaborative watershed groups and it was identified in 62% of 37 studies conducted in a review of what makes watershed partnerships work (Leach & Pelkey 2001).

The collaborative nature of these watershed groups allows anyone to become involved and focuses on bottom-up approaches to watershed management. There is emphasis on local knowledge and citizen commitment to their locale of residence (Sabatier, Weible, & Ficker 2005). The local composition also allows trust to be built between participating members to the group. Trust is indispensable in encouraging membership participation and is common among successful collaborative watershed groups (Kenney 1997, 1999). Interpersonal trust and committed participants were 2 of the 4 factors identified by Leach and Pelkey in the success of collaborative watershed groups (2001). Each of these factors was cited in 43% of the 37 studies reviewed.

> *"Trust involves knowing that one's fellow stakeholders are likely to negotiate honestly, are worthy of respect, and are sufficiently honorable and competent to keep any promises they make."*
> Leach & Sabatier 2005

Trust takes time to have an effect within the collaborative watershed group. Groups older than thirty-six months have a positive correlation between trust and agreements (Leach & Sabatier 2005). This is important when implementing BMPs from WAPs, because willing participants are necessary to begin the process. Each of the watershed groups involved with WAPs in this study have been functioning for longer than three years. For the Lower Maumee watershed, Partners for Clean Streams have been working since 2007. Prior to becoming Partners for Clean Streams, this collaborative watershed group was the Maumee Remedial

Action Plan (RAP) group, an effort of the Toledo Metropolitan Area Council of Governments (TMACOG) created to address water quality issues in the Maumee River watershed, as well as, Lake Erie. The Maumee RAP was created in 1987 (Partners for Clean Streams 2014). Another collaborative watershed group derived from TMACOG is the Portage River Basin Council (PRBC). As the name implies, the PRBC's efforts are focused on the Portage River watershed, and the group has been working on improving the watershed since 1994 (Portage River Basin Council 2014). The Blanchard River Watershed Partnership (BRWP) is the collaborative watershed group serving the Blanchard River watershed area and has been in existence since 2002 (Blanchard River Watershed Partnership 2014).

Each of these groups has had ample time to develop to develop trust amongst its member bases, and consequently, can influence agreements. Agreement is a "precursor to implementation" according to Leach and Sabatier (2005). Once an agreement is reached, implementation of BMPs is more dependent on time and funding (Leach & Sabatier 2005). The process of collaboration and trust building may take more time than top-down management approaches, but has the potential to yield WAPs that can be implemented more readily (Koontz & Newig forthcoming, Layzer 2008). The time intensive effort is also noted in a study of Lake Tahoe water governance, where the collaborative effort to build relationships and trust was a precursor for action. This action to implement continues to grow and effort increases through a process the authors aptly named the "bandwagon effect" (Imperial & Kauneckis 2003). The increased trust among the Lake Tahoe Basin collaborative groups allowed them to more readily implement their version of a watershed management plan, the EIP, or Environmental Improvement Plan (Imperial & Kauneckis 2003). This effort to build relationships or networks is also important for collaborative watershed groups because of the voluntary implementation

needed for WAP recommendations. Tapping into existing interpersonal networks is important to encourage adoption of WAP recommendations (Margerum 2011, Koontz & Newig forthcoming)

The last recurring theme for making collaborative watershed groups successful identified by Leach and Pelkey was "effective leadership and management" (2001). This was identified in the second most instances with 59% of 37 studies, behind only adequate funding. Leadership in collaborative watershed groups is often headed by a watershed coordinator. There is significantly more literature stressing the importance of effective leaders in group functioning and WAP creation (Bonnell & Koontz 2007, Koehler & Koontz 2008, Leach & Pelkey 2001) , than WAP implementation. However, this literature is relevant to understand how strong leadership in collaborative watersheds groups' can benefit implementation of WAP recommendations. Douglas Kenney describes leadership of watershed coordinators as "keeping the ball moving", in essence to keep the process of the group in continual motion (1999). This poses a challenge for collaborative watershed coordinators, especially considering they must assimilate programs at all levels of government; local, state, and federal, into WAP development and subsequently WAP implementation of BMPs (USEPA 2008).

Effective leaderships keeps members engaged and helps these members develop new leadership skills that can be used elsewhere in their lives. This serves two functions: 1. Members use their newfound leadership skills outside of the collaborative watershed group activities to create new connections between the broader community and the group itself (Robertson and Pincus, 2009). 2. Membership engagement through creating these new connections creates greater avenues for collaboration and implementation. The new connections arise from bringing awareness to potential stakeholders not involved in the collaborative watershed group. With engaged members, a collaborative watershed group has committed participants, identified

previously as one of the four most common characteristics of successful collaborative watershed groups (Leach & Pelkey 2001). Implementation will ultimately stem from empowered, informed, and effective groups making decisions (Conway et., al, 2003). Effective leadership is the catalyst for these group dynamics.

All four recurring themes for what makes successful collaborative watershed groups, adequate funding, effective leadership, trust, and committed participants, are intrinsically interrelated (Leach & Pelkey 2001). Effective leadership will create an environment of trust and promote committed participants (Imperial & Kauneckis 2003). However, without adequate funding, the collaborative watershed group will be without the resources to enact its WAP. Implementation relies heavily on funding, and during the interviews conducted with key stakeholders in the Maumee River Watershed, having necessary funding was the most often cited determinate of tool for implementation of WAP BMPs. The review of the collaborative approach offers great insight into many factors that also promote implementation within this watershed. Leach & Pelkey's "Making Watershed Partnerships Work: A Review of the Empirical Literature," as well as, Koontz & Newig's "From Planning to Implementation: Top Down and Bottom Up Approaches for Collaborative Watershed Management" both served as a baseline for theory development for the central research question of this paper. What factors affect implementation of BMP recommendations of WAPs?

Methodology and Data Collection

This research follows a case study design method. This method is preferred in contemporary real-life contexts, such as this research proposes, where multiple sources of evidence can corroborate causal explanations. Another reason for choosing case study research is that there is no way to control behavioral events, such as with an experimental research

method (Yin 2009). However, a limitation of this method is its lack of generalizability to a population. This limitation can be mitigated by drawing from multiple cases and by focusing on variables and classes of events, so that inferences can be made to classes of events rather than populations (George and Bennett 2005). This study included data collection and analysis of several watershed actions plans (WAPs) for the Maumee River Watershed, as well as, semi-structured interviews with key stakeholders.

Data collection first began with the review and analysis of the WAPs. The information contained in the WAPs was reviewed and distilled into various categories for cross referencing among plans. These categories include: time frame for planning process, plan focus, level of collaboration, group membership composition, breadth of stakeholder engagement, physical landscape, resources, target specific actions, and best management practices (BMPs) listed. These will serve to demonstrate clear similarities and differences between the plans and their development. The WAPs provide ample information, as they are often several hundred pages and contain geological, biological, social, historical, and hydrological data. The plans also served as the first step to identifying interviewees.

The interviewees were identified by their heavy involvement in the development of the WAPs, as identified by the WAPs themselves. In the Maumee River Watershed the interviewees were often watershed coordinators, soil and water conservation district (SWCD) officials, or local government officials. Each of these three groups has a watershed coordinator who served as the initial point of contact due to their extensive knowledge of the watershed and participation in collaboratively developing the WAP itself. The interviews were semi-structured in format and included a series of standardized questions given to all participants; however, the interview was not rigid to the degree to forego asking other questions arising from the conversation. The

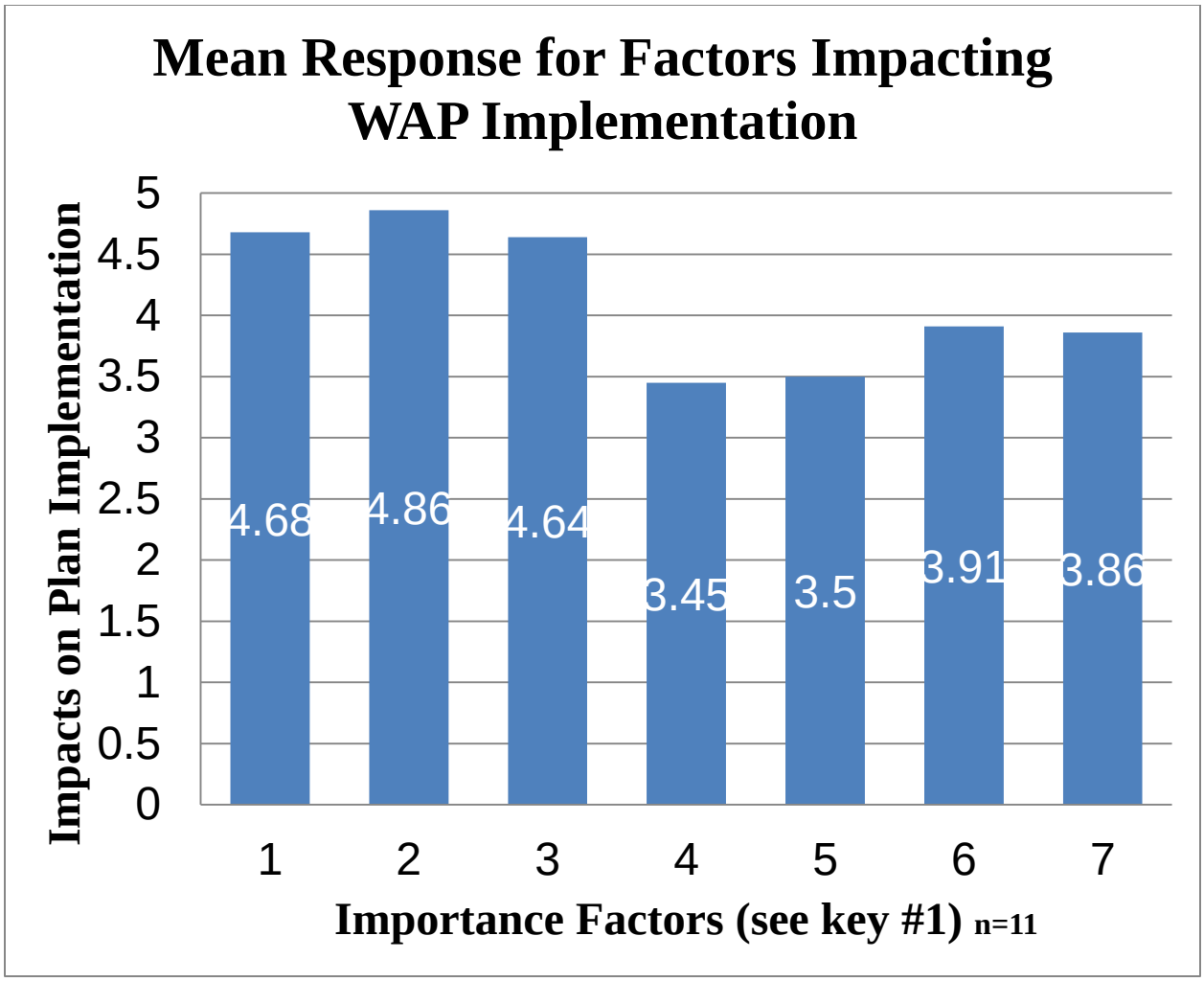
researcher asked a broad range of questions regarding WAP development, stakeholder engagement, resources used in development, and implementation of BMPs. Often, appropriate implementers for specific BMPs were not directly listed, or a BMP an implementer might be expected to enact was not tied to that implementer. This is another reason why watershed coordinators were chosen to be the first interviewees.

Additional participants were recruited via the snowball sampling method. This mode of sampling asks the interviewed parties to suggest other parties to be interviewed (Rowland & Flint 2001). Watershed coordinators have worked with many parties to plan and complete their WAPs thus were able to direct the researcher to other parties to interview. This first stage of interviews involved more questions regarding processes, while subsequent interviews centered predominately on WAP implementation of BMPs. Questions regarding implementation include: Which factors most affect implementation of recommendations? Do these make implementation easier or harder? Which recommendations are being done before others, and why? Interviews are kept confidential and any use of information relating to the participants or direct quotes is listed under a pseudonym. In some instances, participants outside of the watershed coordinator were identified by the researcher from analysis of the WAP.

Results and Discussion

Using a traditional five-point Likert scale design the researcher asked seven importance factors derived from the review of literature on collaborative approaches and from the preliminary process interviews with the watershed coordinators. The five category Likert scale is the most frequently used version with a symmetrical balance in its response categories (Lavrakas 2008). The response items listed in key #1 (below) are typified by two extremes and in the interviews were asked as such: On a scale of 1-5, 1 being not at all important, 5 being very

important, please rate the following items in their impacts on plan implementation. Using extreme poles in a Likert scale design there is the risk for bias. This design does not appear to suffer from the central tendency bias, which implies the respondent is hesitant to select



Importance Factors Key #1

1. Dedicated watershed coordinator or other leader.
2. Willing landowners.
3. Funding for recommendation.
4. Involvement in the WAP planning process.
5. Level of concern in community
6. Networks within community.
7. Links between WAP and other land use planning efforts or other efforts (another improvement plan).

either response one or five (Lavrakas 2008). However, this design may be biased by either the acquiescence bias or the social desirability bias. The acquiescence bias refers to respondents answering based on what they consider to be the correct or appropriate response option (Lavrakas 2008). To account for this the researcher ensured confidentiality to the participant and kept the importance factors simple to avoid confusion. The social desirability bias is when a respondent will "attempt to portray themselves or an organization to which they belong in a favorable light" (Lavrakas 2008). This is minimalized by again, ensuring confidentiality to the participant and the use of pseudonyms in using information from the interview process.

The Likert scale questions developed from the collaborative literature and the initial point of contact interviews with watershed coordinators align with the factors that make collaborative watersheds work (Leach & Pelkey 2001). Importance factor one, which was a dedicated watershed coordinator or other leader, had the second highest mean score with 4.68. The participants also rated funding for recommendation, importance factor three, with near identical importance. Funding for recommendation had a mean response score of 4.64. Although, funding was identified as recurring more often than leadership to success of collaborative watersheds groups, both of the categories were within narrow margins of importance from each other in both Leach & Pelkey's results and the results of this study (2001).

As for trust and committed participants, these can be tied with importance factors two, four, five, and six. These factors are willing landowners, involvement in the WAP planning process, level of concern in community, networks in community, respectively. Committed participants can be distilled from responses indicating the importance of involvement in the WAP planning process and level of concern in the community. These two factors have a similar mean score. Involvement in the WAP planning process has the lowest score of the seven

importance factors to implementation with a 3.45 mean response score and level of concern in community with a mean response score of 3.5. While not identified as highly on having an impact of WAP implementation, these importance factors are still on the important side of the study's five point Likert scale. Committed participants were only identified in 43% of 37 case studies by Leach and Pelkey, and the mean response scores of this study show a relatively higher perception that these factors are significant (2001). However, the contexts are different and may account for these discrepancies. Leach and Pelkey focused on what made the collaborative group itself work, whereas this study focused on importance of the factors in implementing the WAP.

The importance factor, networks within community, is tied closely with interpersonal trust. In review of the collaborative approach, trust is building relationships within the collaborative group itself, as well as, in the broader community. Building relationships is equivalent to creating networks or networking. Establishment of networks within the community is based on mutual trust between individuals, groups, or individuals and groups (Koontz & Newig forthcoming, Layzer 2008). This importance factor had a mean response score 3.91. The study's result confirms Leach and Pelkey's conclusions that interpersonal trust is significant. This study's results show slightly higher relative importance placed on this trust dependent factor possibly due to this study's focus on implementation which involves more participants outside the collaborative watershed group, which was the focus of Leach and Pelkey (2001).

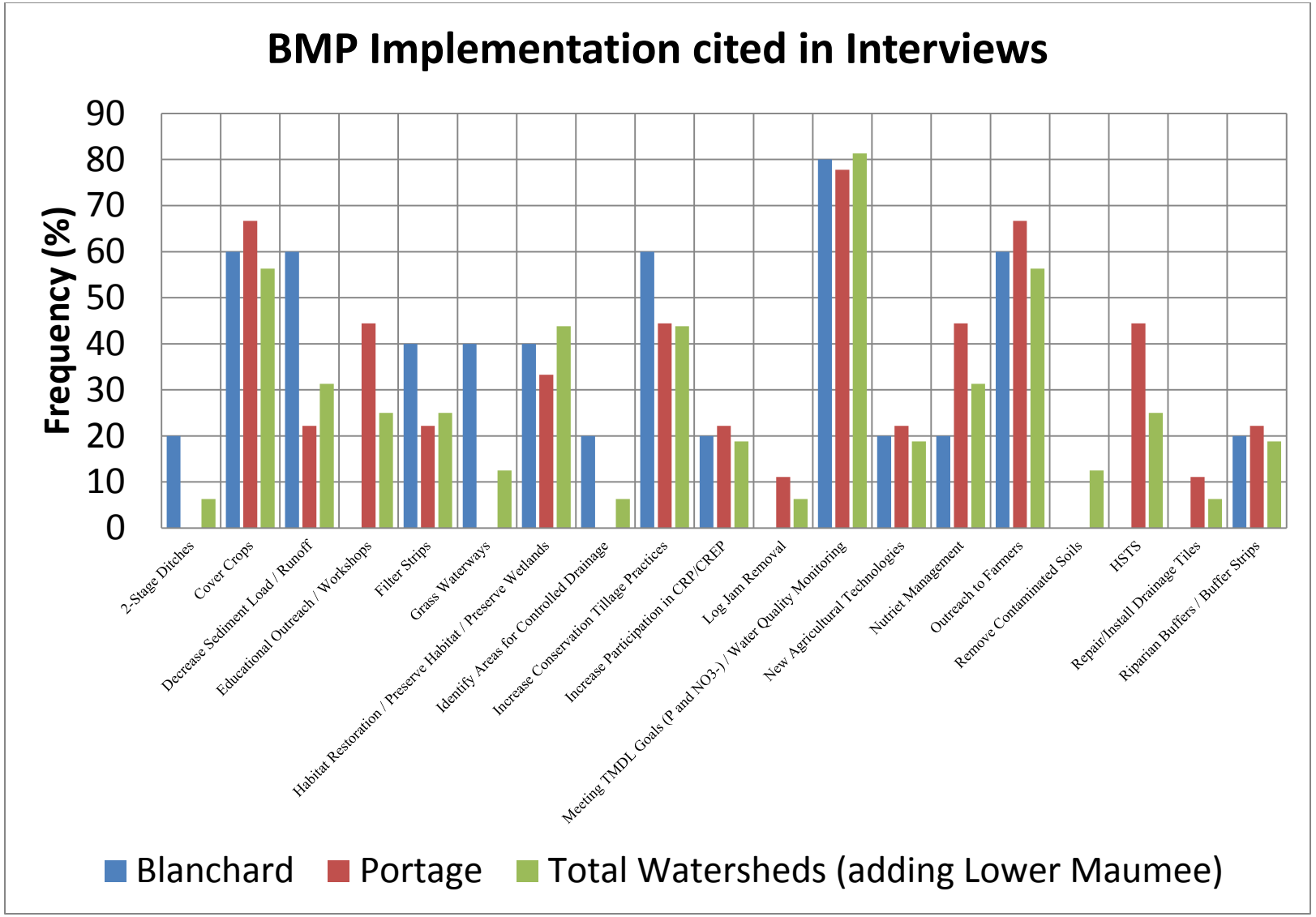
The most intriguing importance factor is willing landowners. This was identified as the highest factor to successful implementation that was not specifically identified by Leach and Pelkey's empirical literature review. Willing landowners had a mean response score of 4.86. Willing landowners ties together all of the factors that make collaborative watershed groups

work together. These factors: adequate funding, effective leadership, interpersonal trust, and committed participants all play a role in the willing landowner's importance factor response. Funding is necessary in many cases to incentivize the landowner to participate in a BMP. Leadership and trust are necessary to convince the landowner the BMP is beneficial to them and the watershed. Committed participants can be the willing landowners themselves, either through involvement in the collaborative watershed group, a personal relationship with a member from a collaborative watershed group, or outreach by collaborative watershed group leadership. This importance factors suggests that all of the most recurring factors that make collaborative watersheds work are necessary for plan implementation to occur at the most fundamental level; with the landowner.

The last importance factor, links between WAP and other land use planning efforts or other efforts (another improvement plan), does not relate to Leach and Pelkey's factors that make collaborative watershed groups work. Instead, it is derived from Koontz (2005) in which involved local government adoption of collaborative farmland preservation planning. This importance factor identified the importance of other plans in which the WAP could be linked, and was particularly relevant to the Lower Maumee, in which a prior watershed management plan served as guide to formulating the WAP (Koontz 2005). This importance factor had a mean response score of 3.86, indicating participants considered this factor more important than involvement in the WAP planning process and networks within the community.

The Likert scale questions offer useful insight into what factors affect implementation of BMP recommendations of WAPs, which is the central research question of this study. Yet, to understand what specific implementation of BMPs detailed in the WAPs is occurring and why, this study analyzes the frequencies of BMP implementation mentioned in the interviews and

displays it as a percentage of total interviews. The results of the sixteen interviews conducted in the Maumee River Watershed are shown in BMP implementation figure. The BMPs derived for this figure stem from direct listing in at least one of the WAPs outlined for this case study. The figure compares the frequency of BMP implementation occurrence referenced in the interviews for the Blanchard River Watershed, the Portage Watershed, and the total from all three watersheds; including the Lower Maumee. The Lower Maumee was not parsed out due to insufficient quantity of participants (n=2), however, it was included in the total watersheds analysis. Interpretations from the interviews and an in press study conducted by Koontz and Newig forthcoming, which compares the bottom-up collaborative implementation of Ohio WAPs with top-down implementation of Lower Saxony, Germany.


BMP Implementation cited in Interviews
Frequency (%)
90
80
70
60
50
40
30
20
10
0
2-Stage Ditches
Cover Crops
Decrease Sediment Load / Runoff
Educational Outreach / Workshops
Filter Strips
Grass Waterways
Habitat Restoration / Preserve Habitat / Preserve Wetlands
Identify Areas for Controlled Drainage
Increase Conservation Tillage Practices
Increase Participation in CRP/CREP
Log Jam Removal
Meeting TMDL Goals (P and NO3-) / Water Quality Monitoring
New Agricultural Technologies
Nutriet Management
Outreach to Farmers
Remove Contaminated Soils
HSTS
Repair/Install Drainage Tiles
Riparian Buffers / Buffer Strips
Blanchard
Portage
Total Watersheds (adding Lower Maumee)

Implications for Collaborative Implementation and Interview Themes

The BMP frequency table shows certain BMPs are implemented more than others. The explanations can be teased out from data from the interview participants. Collaborative implementation literature offers some context to understanding why BMPs such a nutrient management is discussed in 31% of interviews, and removing contaminated soils is only mentioned in 12.5% of interviews. Collaborative environmental management of complex socio-ecological systems is influenced by a myriad of variables that may have significance in one instance, but lack significance in another (Ostrom 2007, Koontz and Newig forthcoming).

The most frequently referenced BMP was: meet TMDL goals for phosphorus and nitrate loadings/water quality monitoring. Initial interviews with watershed coordinators indicated the significance of meeting TMDL goals as the "main parameter" of the WAP (Interview OH-2). Another indicator that explains the frequency of this BMP is that plan endorsement is conditional on addressing impairments in the TMDL. "With the plan [WAP] we offer suggestions to go after impairments" (Int. OH-1). This participant also expressed more interest in the implementation of BMPs dealing with phosphorus and sediment loadings over habitat alterations in November of 2012 (Int. OH-1). The frequency can also be correlated to how water quality monitoring does not require the buy-in from stakeholders, particularly landowners in the region. However, it was mentioned that streams or tributaries required to conduct water quality monitoring often require the permission of the landowner (Int. OH-1).

The results from the interviews and indicators listed in the frequency table follow three themes, the need for funding for implementation, outreach to landowners in form of networks and education, and the voluntary nature of the plan. To meet TMDL goals for phosphorus and nitrate loadings/water quality monitoring.BMP is primarily related to the need for funding theme.

WAP development and payment of the watershed coordinator salary through Section 319 grant money necessitates the need to focus on meeting TMDL goals.

Funding for BMP Implementation

There is an expression often used in politics, "that dog won't hunt." This expression means that an idea may look great on paper, but it is not practical for one reason or another. This is something that is recurrent in interviews in this study and is in reference to funding BMP recommendations. Koontz and Newig's research of implementation of Ohio WAPs showed that "linking funding to the collaborative plan recommendations is an important means to foster implementation" (Forthcoming). The authors also state that without funding, implementation is challenged (Koontz & Newig forthcoming). This study's findings show that without funding for a particular BMP, it is not offered as an option for implementation to the landowner. After addressing funding as a factor most affecting implementation of recommendation, one respondent added the need to "make the guy money" in reference to the landowner, and also in reference to the landowner stated, "[There is] too much risk without economic gain" (Int. OH-14). The same respondent went on to say that landowners were not implementing BMPs for the good of the watershed itself (Int. OH-14). Cover crops and conservation tillage practices are highly implemented in these watersheds, and one explanatory factor for this is funding availability for these BMPs. Landowners on the fence as to whether to implement a BMP or not are often convinced to implement if grant funding is available (Int. OH-6, OH-12). One respondent put it quite simply when describing why particular BMPs are occurring before others; "Money talks, bullshit walks" (Int. OH-12).

Educational Outreach and Networking

Another emergent theme from the interviews was educational outreach and networking. Koontz and Newig's research and this study both conclude that a paid watershed coordinator who fosters implementation through networks (Forthcoming). The review of literature focused on the importance of both trust and effective leadership in success of collaborative watershed groups, and the networks that fostered implementation were often created by watershed coordinator outreach efforts (Leach & Pelkey 2001, Koontz & Newig forthcoming). There were many different approaches to developing networks in the broader community, particularly with landowners to turn them into willing (to implement) landowners. One watershed group used funds to hire outreach personnel to help farmers understand how to get grant money for BMP implementation and to make sure the BMP chosen was implemented correctly (Int. OH-1). This particular method of outreach and networking both educates the landowner and creates trust through supporting their implementation efforts. Another respondent understood their responsibility as finding funding and networking, to "sell the landowners" (Int. OH-3). The same respondent stated a goal of theirs was to reach all the operators (landowners) and have "Generalized increased awareness" in reference to BMPs available for implementation.

Educational outreach was also an important theme. One respondent quoted a neighbor landowner as saying "I don't have a clue where to start" in regards to BMP implementation (Int. OH-12). This was one of the issues that many members of collaborative watershed groups want to address. The outreach personnel incorporated by one watershed were an innovative approach to educating landowners of BMPs available to them. In an interview with one such landowner, his choice on BMP was "what was being promoted" by the outreach efforts (Int. OH-11). This may be an explanatory factor of why certain BMPs such as cover crops, nutrient management, and conservation tillage are being implemented more than BMPs such as riparian buffers/buffer

strips. It is what is being promoted by the outreach efforts of collaborative watershed group personnel. Another landowner interprets the local soil and water conservation districts as "an education service" (Int. OH-12). One landowner involved in BMP implementation did not even know the WAP existed (OH-11). Some participants acknowledged that implementation is not occurring as a result of the WAP, but as a result of outreach efforts (Int. OH-5, OH-12).

Non-regulatory WAP

The BMPs outlined within WAPs are strictly voluntary. This was cited as both an advantage and disadvantage (OH-1, OH-3, OH-5, OH-6, OH-7, OH-10, OH-12, OH-13). The voluntary nature of WAPs allows landowners to "do whatever they would like" (OH-5). This can either lead to inaction or promote buy-in from implementers. The same respondent, however, mentioned that with implementing BMPs "we're having to get creative", a flexibility that may not be available if WAP BMPs were regulatory (Int. OH-5). One landowner remarked, "there is no set recipe" for BMP recommendation (Int. OH-12). The choice of recommendations also empowers landowners; one respondent states "Yea, I can make this work" when choosing a BMP among many (Int. OH-6).

Voluntary WAPs are almost entirely dependent on willing landowners, according to one respondent (Int. OH-13). Other respondents were also concerned about the reliance on willing landowners (Int. OH-7, OH-10). The concern goes beyond not getting BMPs implemented, to repercussions from the federal government that may stem from continued water quality impairments in the region. One respondent said mandatory mechanisms for implementation will cause rebellion from landowners and farmers (Int. OH-10). The non-regulatory aspect of WAPs is affecting implementation of WAP recommendations, although further research into this area is

necessary. The results of this study cannot conclude whether voluntary mechanisms are an advantage or disadvantage to BMP implementation.

Conclusions

This study has found that the factors identified by Leach & Pelkey (2001) on what makes collaborative watershed groups work also influences implementation of WAP implementation. This study also demonstrates some factors important to collaborative implementation identified by Koontz and Newig (forthcoming) were supported, such as networking through interpersonal trust based relations and funding for recommendations. A summation of some challenges that exist in addressing implementation of BMPs in the Maumee River Watershed:

> *"States report that farmers continue to resist changes in practices when they cannot visibly see the impacts of their farming activities. In other words, the nature of nonpoint source pollution continues to present challenges in convincing landowners of the need to modify behavior."*
> Robertson 1999

Further research is needed to determine if the factors identified in these studies of collaborative plan implementation apply to a broader range of collaborative watershed groups and/or collaborative groups. Research will also be needed to link collaborative implementation of BMPs to water quality improvement. The results of this study indicate BMPs are readily being implemented in the Maumee River Watershed and continued outreach, funding, networking, trust, and effective leadership will ensure continued implementation. One respondent summarizes the goal of many of these collaborative efforts to implement BMPs from WAPs in referencing his own farm, "I try to leave things better than when I got them" (Int. OH-11).

References

Atkinson, Rowland, and John Flint. "*Accessing hidden and hard-to-reach populations: Snowball research strategies.*" Social Research Update. 33.1 (2001): 1-4.

Barton, Betty. "*Agriculture and section 319 of the Clean Water Act*." Implementation of Nonpoint Source Policies in Southern Agriculture. (1999): 1.

Berman, Paul. "*The study of macro and micro implementation of social policy"*. (1978). Rand.

Blanchard River Watershed Partnership. "*About*" (2014). Blanchard River Watershed Partnership. Web. April 2014. <http://www.blanchardriver.org/organization/about/>.

Blanchard River Watershed Partnership. "*The Outlet/Lye Creek Watershed Action Plan*." (2011). Blanchard River Watershed Partnership.

Blomquist, William, and Edella Schlager. "*Political pitfalls of integrated watershed management.*" Society and Natural Resources 18.2 (2004): 101-117.

Bonnell, Joseph E., and Tomas M. Koontz. "*Stumbling forward: the organizational challenges of building and sustaining collaborative watershed management*." Society and Natural Resources. 20.2 (2007): 153-167.

Borre, Lisa. "*Harmful Algae Blooms Plague Lake Erie Again*." (24 Apr 2013). National Geographic News Watch. Web. <http://newswatch.nationalgeographic.com/2013/04/24/harmful-algae-blooms-plague-lake-erie-again/>.

Census Viewer. "*Toledo, Ohio Population: Census 2010 and 2000 Interactive Map, Demographics, Statistics, Quick Facts.*" (2012). Moonshadow Mobile, Inc. Web. April 2014. <http://censusviewer.com/city/OH/Toledo>.

Chess, Caron, Billie Jo Hance, and Ginger Gibson. "*Adaptive participation in watershed management.*" Journal of Soil and Water Conservation 55.3 (2000): 248-252.

Conway, Flaxen DL, et al. "*Watershed stewardship education program—a multidisciplinary Extension education program for Oregon's watershed councils*." Journal of Extension. 42.4 (2003).

Daloğlu, Irem, Kyung Hwa Cho, and Donald Scavia. "*Evaluating causes of trends in long-term dissolved reactive phosphorus loads to Lake Erie.*" Environmental Science & Technology. (2012).

George, Alexander L., and Andrew Bennett. *Case Studies and Theory Development in the Social Sciences.* 2004. Belfer Center for Science and International Affairs. Cambridge, MA. Print.

Hardy, Scott D., and Tomas M. Koontz. "*Reducing nonpoint source pollution through collaboration: policies and programs across the US States*."Environmental Management 41.3 (2008): 301-310.

Houck, Oliver A. "*The clean water act TMDL program: Law, policy, and implementation*." Environmental Law Institute, (2002).

Hunt, Spencer. "*Algae, invaders threaten Lake Erie*." Columbus Dispatch (25 Nov 2012). n. pag. Print.

Imperial, Mark T., and Derek Kauneckis. "*Moving from conflict to collaboration: watershed governance in Lake Tahoe.*" Natural Resources Journal. 43 (2003): 1009.

Kenney, Douglas S. "*Historical and Sociopolitical Context of the Western Watersheds Movement*" Journal of the American Water Resources Association. 35.3 (1999): 493-503.

Kenney, Douglas S. "*Resource management at the watershed level: An assessment of the changing federal role in the emerging era of community-based watershed management*." (1997).

Koehler, Brandi, and Tomas M. Koontz. "*Citizen participation in collaborative watershed partnerships.*" Environmental Management 41.2 (2008): 143-154.

Koontz, Tomas M. "*We finished the plan, so now what? Impacts of collaborative stakeholder participation on land use policy.*" Policy Studies Journal 33.3 (2005): 459-481.

Koontz, Tomas M., ed. "*Collaborative environmental management: What roles for government?"* Resources for the Future. (2004).

Koontz, Tomas M., and Jens Newig (forthcoming). "From Planning to Implementation: Top Down and Bottom Up Approaches for Collaborative Watershed Management." (2012). Policy Studies Journal.

Krouse, Peter. "*Dangerous algal blooms on Lake Erie may be fewer this year, scientists say.*" (06 Jul 2012). Cleveland Plain Dealer. Web. <http://www.cleveland.com/metro/index.ssf/2012/07/dangerous_algal_blooms_on_lake_1.html>

Lavrakas, Paul J., ed. "*Encyclopedia of survey research methods*." Sage, 2008.

Layzer, Judith. "*Natural Experiments: Ecosystem Management and the Environment*." Cambridge: MIT Press. Species Distribution to Biodiversity Conservation. Diversity and Distributions 13 (2008): 243-251.

Leach, William D., and Neil W. Pelkey. "*Making watershed partnerships work: A review of the empirical literature.*" Journal of Water Resources Planning and Management 127.6 (2001): 378-385.

Leach, William D., and Paul A. Sabatier. "*Are trust and social capital the keys to success? Watershed partnerships in California and Washington.*" Swimming Upstream: Collaborative Approaches to Watershed Management. (2005): 233-258.

Margerum, Richard D. "*Beyond Consensus: Improving Collaboration to Solve Complex Public Problems.*" (2011).

Matland, Richard E. "*Synthesizing the implementation literature: The ambiguity-conflict model of policy implementation."* Journal of Public Administration Research and Theory 5.2 (1995): 145-174.

Ohio Department of Natural Resources. "*Watershed Management Program – About.*" (2014). ODNR. Web. April 2014. <http://www.dnr.state.oh.us/tabid/24085/Default.aspx>.

"*Ohio EPA/ODNR Vision/ Expectations for Watershed Projects Under Ohio's Watershed Coordinator Program*." (2003). ODNR. Web. April 2014. <http://www.dnr.state.oh.us/Portals/12/water/watershedprograms/Coordinator%20program%20overview.pdf>.

Ohio Environmental Protection Agency. "*Harmful Algal Blooms*." (2013). Ohio EPA. Web. 11 Feb 2013. <http://epa.ohio.gov/ddagw/HAB.asp&xgt>.

Ohio Environmental Protection Agency. "*Maumee River Watershed*." (2014). Ohio EPA. Web. April 2014. <http://www.epa.ohio.gov/dsw/tmdl/MaumeeRiver.aspx>.

Ostrom, Elinor. "*A diagnostic approach for going beyond panaceas.*" Proceedings of the national Academy of sciences 104.39 (2007): 15181-15187.

Partners for Clean Streams. "*About Us*" (2014). Partners for Clean Streams, Inc. Web. April 2014. <http://www.partnersforcleanstreams.org/index.php/about-us>.

Portange River Basin Council. "*Portage River Basin Council*." (2014). Toledo Metropolitan Area Council of Governments. Web. April 2014. <http://www.tmacog.org/prbc.htm>.

Robertson, Peyton. "*Agricultural Pollution in Coastal Zone Management Areas of the South Implementation of Section 6217 of the Coastal Zone Act Reauthorization Amendments of*

1990." (1999). Implementation of Nonpoint Source Policies in Southern Agriculture. 7-15.

Robertson, Sara, and Max Nielsen-Pincus. "*Keys to Success for Watershed Management Organizations."* (2009).

Sabatier, Paul A., Chris Weible, and Jared Ficker. "*Eras of water management in the United States: Implications for collaborative watershed approaches."* Swimming Upstream: Collaborative Approaches to Watershed Management (2005): 23-52.

Schneider, Anne, and Helen Ingram. "*Social construction of target populations: Implications for politics and policy*." American Political Science Review 87.02 (1993): 334-347.

St. Joseph River Watershed River Initiative Partnership. (2013). <http://www.sjrwi.org/>

Thomas, Craig W., and Tomas M. Koontz. "*Research designs for evaluating the impact of community-based management on natural resource conservation."* Journal of Natural Resources Policy Research 3.2 (2011): 97-111.

Toledo Metropolitan Area Council of Governments. "*Portage River Watershed Plan.*" (2011). Toledo Metropolitan Area Council of Governments Portage River Basin Council.

United States Environmental Protection Agency. "*Great Lakes: Basic Information.*" (2012). U.S. EPA. Web. April 2014. <http://www.epa.gov/greatlakes/basicinfo.html>.

United States Environmental Protection Agency. "*Great Lakes: Facts and Statistics.*" (2012). U.S. EPA. Web. April 2014. <http://www.epa.gov/greatlakes/lakestats.html>.

United States Environmental Protection Agency. "*Handbook for developing watershed plans to restore and protect our waters*." (2008). DIANE Publishing. US. EPA.

United States Environmental Protection Agency. "*Water: Pollution Runoff: What is Nonpoint Source Pollution?*" (2012). U.S. EPA. Web. April 2014. <http://water.epa.gov/polwaste/nps/whatis.cfm>.

United States Environmental Protection Agency. "*Water: Total Maximum Daily Loads (303d) Impaired Waters and Total Maximum Daily Loads.*" (2014). U.S. EPA. Web. April 2014. <http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/>.

United States Environmental Protection Agency. "*Water: Total Maximum Daily Loads (303d) What is a TMDL?*" (2013). U.S. EPA. Web. April 2014. <http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/overviewoftmdl.cfm>.

Wines, Michael. "*Fertilizer Limits Sought Near Lake Erie to Fight Spread of Algae*." (26 Feb 2014). The New York Times. Web. <http://www.nytimes.com/2014/02/27/us/fertilizer-limits-sought-near-lake-erie-to-fight-spread-of-algae.html?_r=0>.

Yin, Robert K. *Case study research: Design and methods*. Vol. 5. sage, 2009.