Abstract

Public opinion polls show that people are generally concerned about environmental problems. Yet, policies to address environmental and natural resource problems are often controversial. The way an individual perceives an environmental problem may influence his or her support for the policies to address that issue. Likewise, an individual’s support for a specific policy could influence the way he or she perceives the problem. Therefore, an individual’s reasoning about an environmental issue might be circular, with his or her values, ideologies, affiliations and identities influencing perceptions about the problem and policies to address the problem. This dissertation examines how individuals in the Maumee River Watershed, the largest of Lake Erie’s watersheds, perceive Lake Erie’s algal bloom issue. The first chapter synthesizes the previous research examining how individuals perceive and reason about environmental problems and policies. Chapter 2 examines the role the media plays in portraying and framing Lake Erie’s algal blooms. Chapter 3 examines how agricultural, rural and urban communities living near and distant to Lake Erie perceive and discuss the algal blooms and policies to address the algal blooms. Chapter 4 examines how different forms of farmer identity contribute to how farmers perceive conservation practices. Chapter 5 provides a summary of the studies and discusses the implications that public perception has on participatory decision-making in natural resource contexts.
Acknowledgments

I would like to thank my advisor Dr. Eric Toman and my committee members, Dr. Robyn Wilson and Jeremy Bruskotter. I would also like to thank the faculty, staff and graduate students associated with Ohio State University’s Environmental and Social Sustainability Lab, particularly my cohort members Emily Hutchins and Kate Rose.

I would also like to thank the members of the CHANS team that conducted the project that provided the data for this dissertation and the National Science Foundation for providing funding for the project. Finally, I would like to acknowledge the many individuals in the Maumee River Watershed who participated in this study.
Vita


2009 ................................................................. Certificate in Environmental Studies, Gaylord Nelson Institute, UW-Madison

2012 ................................................................. M.S. Natural Resource Management and Science, University of Minnesota

2012-2016 ......................................................... PhD. Student, School of Environment and Natural Resources, The Ohio State University

Publications


Fields of Study

Major Field: Environmental and Natural Resources
# Table of Contents

Abstract ........................................................................................................................................... ii
Acknowledgments ............................................................................................................................... iii
Vita ..................................................................................................................................................... iv
Publications ......................................................................................................................................... iv
Fields of Study ...................................................................................................................................... iv
Table of Contents ................................................................................................................................. v
List of Tables ......................................................................................................................................... vii
List of Figures ........................................................................................................................................ viii

**Chapter 1: Identifying the Solution or Identifying with the Problem** ......................... 1
  1.1 Introduction ...................................................................................................................................... 1
  1.2 Literature Review ................................................................................................................................. 9
  1.3 Applying Motivated Reasoning Theory to Environmental Problems ............................................... 20
  1.4 Conclusion ....................................................................................................................................... 24

**Chapter 2: The Novel, the Drastic and the Personal: The Toledo Water Crisis,**
**Agenda Setting, and Newspaper Coverage of Lake Erie’s Algal Blooms** .................... 32
  2.1 Introduction ...................................................................................................................................... 33
  2.2 Methods ......................................................................................................................................... 39
  2.3 Results .......................................................................................................................................... 41
  2.4 Discussion ....................................................................................................................................... 54
  2.5 Conclusion ....................................................................................................................................... 62

**Chapter 3: Public(s) Perception of Water Quality: A Qualitative Analysis of the**
**Water Quality Perceptions among Residents in the Maumee River Watershed** .......... 66
  3.1 Introduction ...................................................................................................................................... 67
  3.2 Methods ......................................................................................................................................... 73
  3.3 Results .......................................................................................................................................... 78
  3.4 Discussion ....................................................................................................................................... 86
  3.5 Conclusion ....................................................................................................................................... 92
Table of Contents (Continued)

  4.1 Introduction ........................................................................................................ 97
  4.2 Methods ........................................................................................................... 103
  4.3 Results ............................................................................................................. 108
  4.4 Discussion ....................................................................................................... 118
  4.5 Conclusion ..................................................................................................... 125

Chapter 5: Identity Politics and Implications for Environmental and Natural Resource Decision-Making and Communication ................................................. 129
  5.1 Summary ....................................................................................................... 129
  5.2 Conclusions and Implications ....................................................................... 133

Dissertation References .......................................................................................... 142

Appendix: Focus Group Guide ............................................................................... 151
List of Tables

Table 2.1: Top 15 Results of LexisNexis Newspaper Articles about Algal Blooms .......43
Table 2.2: Description of Themes Present in Newspaper Articles (Phase 1: Constructed
Week Sample) .........................................................................................48
Table 2.3: Concerns about Algal Blooms Mentioned in Newspaper Articles (Phase 1:
Constructed Week Sample) .....................................................................49
Table 2.4: Responses to Algal Blooms Mentioned in Newspaper Articles (Phase 1:
Constructed Week Sample) .....................................................................50
Table 2.5: Cross Tabs of the Responses to Algal Blooms (Phase 1: Constructed Week
Sample) .....................................................................................................51
Table 2.6: Source Attribution Pre and Post Toledo Water Crisis (Phase 2: Pre and Post
Crisis Random Samples) .........................................................................52
Table 2.7: Concerns about the Blooms Pre and Post Toledo Water Crisis (Phase 2: Pre
and Post Crisis Random Samples) ............................................................53
Table 2.8: Responses to the Blooms Pre and Post Toledo Water Crisis (Phase 2: Pre and
Post Crisis Random Samples) .................................................................54
Table 3.1: Comparisons of Themes Regarding the Causes of Problems in the Maumee
River Watershed ......................................................................................80
Table 3.2: Summary and Comparison of Themes to Regarding Regulation to Address
Water Quality Problems ...........................................................................84
Table 4.1 Description of BMPs ..................................................................104
Table 4.2: Descriptive Statistics and Confirmatory Factor Analysis of Willingness to
Adopt BMPs ............................................................................................111
Table 4.3: Descriptive Statistics and Confirmatory Factor Analysis of Beliefs about BMP
Efficacy .....................................................................................................113
Table 4.3: Descriptive Statistics and Confirmatory Factor Analysis of “Good Farmer”
Identity ....................................................................................................115
List of Figures

Figure 1.1 Cyclical Reasoning about Environmental Problems........................................4
Figure 1.2: The “Conventional” Policy Analysis Process...............................................6
Figure 1.3: A Motivated Reasoning Model of Policy Analysis ......................................7
Figure 2.1 Influence of Media Framing on Environmental Problem and Policy 
Perception.........................................................................................................................36
Figure 2.2: Number of Articles about Algal Blooms from 2000-2015 .........................44
Figure 2.3: Articles about Lake Erie’s Algal Blooms in 2014 by Month .......................45
Figure 3.1: The Maumee River Watershed and Focus Group Locations .....................75
Figure 4.1: “Good Farmer” Identities and Motivated Reasoning of Best Management 
Practices..........................................................................................................................103
Figure 4.2: “Good Farmer” Identities and Motivated Reasoning of Best Management 
Practices..........................................................................................................................117
Chapter 1: Identifying the Solution or Identifying with the Problem

Abstract

Public opinion polls show that people are generally concerned about environmental problems. Yet, policies to address environmental and natural resource problems are often controversial. One factor contributing to these controversies may be motivated reasoning, when individuals may be influenced to conceptualize problems in a particular way that supports a preferred solution that corresponds to his or her values, ideologies, affiliations and identities. Therefore, the desired solution to an environmental problem may influence the way an individual perceives the issue and defines the problem. The following chapter (1) synthesizes the existing research on motivated reasoning, (2) examines how such research may relate to the way individuals perceive toxic algal blooms in Lake Erie and (3) considers how this research can be applied to further develop our understanding of environmental and natural resource problems and policies.

1.1 Introduction

Alexander Hamilton once remarked “men are rather reasoning than reasonable animals” (Hamilton, 1802; cited in Chernow, 2005). While this observation well preceded the field of social psychology, Alexander Hamilton proved to be precocious in understanding human nature and its implications on governance and society. Modern
social and cognitive psychologists refer to the phenomena of an individual’s social or
cognitive desires motivating his or her perceptions of an issue as motivated reasoning
(Kunda, 1990). While motivated reasoning can occur in a variety of contexts, it is
especially prevalent in political issues where political ideologies or other types of
affiliations influence an individual’s attitude towards a problem or policy (Bolsen,
Druckman, & Cook, 2013; Leeper & Slothuus, 2014; Redlawsk, 2002). This often leads
to “identity politics,” where the discourse of debate revolves around an individual’s
affiliations, group membership, or identities rather than the issues themselves. In the
current climate of strong partisan trends, an understanding of socially motivated
reasoning and identity politics becomes all the more useful in understanding policy and
behavior.

One way in which motivated reasoning can influence policy and behavior is that it
can blur the boundary between the ways an individual perceives a problem with the way
that an individual perceives potential solutions to that problem. Rather than evaluating a
set of solutions in terms of how each solution would address a given problem, individuals
may be motivated to define the problem in a way to align with their preferred solution.
Therefore, given that individuals have different motivations and preferred solutions, they
may perceive the problem in different ways or, in some cases, may even disagree on
whether the issue is actually a problem that needs to be addressed. These differences in
perception can contribute to contentiousness and controversy surrounding social
problems.
Motivated reasoning and identity politics may provide substantial insight into the history of conflict regarding natural resource and environmental protection. Public opinion research has shown that the majority of the United States’ public considers themselves to be sympathetic to environmental problems (Gallup, 2015). The majority of Americans also worry a “fair amount” to a “great deal” about a wide variety of environmental problems such as air and water pollution, habitat loss, species extinction and rainforest deforestation (Gallup, 2015). Therefore, one may wonder with such high public concern, why there is such controversy over environmental problems such as climate change, pollution regulation and energy extraction. Is this one of the cases where Alexander Hamilton would describe people as being “unreasonable?” Or is there some sort of “reasoning” behind why these issues are so contentious in American culture?

Insight to these questions may be provided by additional public opinion research that beliefs about and support for the environment differ significantly by political affiliation, particularly in regards to climate change (Pew, 2013a, 2013b). Other polls have shown increased polarization among the American public over time. Over the last twenty years, the gap between consistently liberal Democrats and consistently conservative Republicans has increased (Pew, 2014). In other words, political party affiliation and political ideology has solidified and Republicans tend to be more conservative and Democrats more liberal than in past decades. Polarization among the electorate could be influencing the way policy makers, or individuals, perceive an environmental or natural resource problem. Although individuals with different political affiliations may express concern about environmental and natural resource problems,
they may be motivated to perceive them in very different ways based on their preferences and biases towards preferred solutions. In other cases, if the solution to an environmental problem is contrary to their views or values, they may be motivated to discount or dismiss the issue as being a problem (Figure 1.1).

Figure 1.1 Cyclical Reasoning about Environmental Problems

The way an individual perceives an environmental problem may influence his or her support for a policy to address the problem. However, an individual may prefer a certain policy if that policy aligns with his or her values, identities or affiliations. To prevent cognitive dissonance, an individual may engage in motivated reasoning where he or she perceives the problem in a way that supports the preferred policy. This results in a cycle with the perception of a problem influencing and being influenced by proposed policy responses.
While political ideology is one type of identity that might contribute to motivated reasoning, there are many other types of characteristics, identities, and affiliations that may influence the way an individual perceives environmental issues and solutions to environmental problems. For example, whether an individual was raised in an urban or rural setting may also contribute to motivated reasoning about the environment. While political ideology and political party affiliation are often the identities that come to mind when discussing policy issues, it is important to consider other identities and ideology along with the larger context of identity based politics and how environmental problems and policies are perceived.

Social and cognitive psychological research on behavior and decision-making is especially relevant to environmental policy issues. Most policy issues can be defined as a choice among alternatives with uncertain outcomes (Dahl, 1957). Environmental policy is no exception. Conventional policy analysis (Figure 1.2) teaches that the first step in policy formulation is defining the policy issue or problem, then examining the different options for addressing the problem (Bardach, 2015). A “rational” individual, or policy maker, should then choose the best alternative based on how well that solution aligns with the individual’s objectives. However, if individuals engage in motivated reasoning, the way that they view a problem can be influenced by biases towards certain solutions that align with their political ideology, social affiliations and identities (Figure 1.3). In essence, in motivated reasoning, the criteria and objectives influence the policy problem definition rather than vice versa. For example, an individual who opposes governmental regulation might be more inclined to view climate change as a natural phenomenon as
Figure 1.2: The “Conventional” Policy Analysis Process

The conventional approach to policy analysis (Bardach, 2015) consists of first defining a problem, then the expected outcomes of different policy options are evaluated, before deciding on which is the optimal alternative (based on a set of criteria or objectives). For example, algal blooms in Lake Erie have been found to be caused by excess nutrient pollution entering the lake by the Maumee river (ODA, ODNR, OEPA, & LEC, 2013; OEPA, 2010). Following Bardach (2015), one might define the policy problem as “there is too much nutrient pollution entering Lake Erie.” A policy analyst, or an individual trying to decide which policy to support, could then evaluate a set of policies such as: (A) establishing regulations and fines for industries polluting in the river, (B) providing incentives for farming practices that reduce nutrient run-off into the river and lake, and (C) providing educational workshops to individual residents about the consequences of yard waste and lawn fertilizer entering the water through municipal sewers. An individual or analyst would then select the policy that best met a set of criteria and objectives, for example, which one is the most cost-effective, fair, realistic, effective, etc.

opposed to being the result of anthropogenic greenhouse gas emissions (thus, no government intervention to mitigate emissions is needed). Likewise, a farmer, or someone residing in a rural community that is economically dependent on agriculture, may be more likely to view water pollution as the result of urban wastewater contamination than nutrient run-off from agricultural fields (thus, the appropriate solution would emphasize urban pollution rather than impose restrictions on the farmer’s
behaviors). In each case, an individual is motivated to perceive the problem in a certain light to align with his or her preferred method of addressing the issue. This can cloud and complicate the policy process, as individuals involved in the policy discourse may focus on different issues leading to partisanship and gridlock and a failure to address environmental and natural resource issues.

Figure 1.3: A Motivated Reasoning Model of Policy Analysis

If individuals engage in motivated reasoning, the conventional model of policy analysis is modified as the evaluation stage influences the way an individual perceives and defines the problem. An individual’s motives, identities, affiliations, or biases will influence which criteria and objectives are the most important and an individual will perceive the problem to align with their preferred solution. For example, in the case of Lake Erie algal blooms from Figure 1.2, an individual opposed to governmental regulation is likely to oppose Policy “A,” fining and regulating industry. They therefore might be motivated to view the algal bloom issue in a way that does not require regulation. Likewise, a farmer may be motivated to perceive the problem as a non-agricultural issue while an urban resident may be motivated to perceive it as an agricultural issue.
Such gridlock can occur due to cyclical reasoning between a policy problem and the policy options (Figure 1.1). The way a problem is framed or perceived can influence the way individuals evaluate the policy options to address the problem. However, with motivated reasoning, the way the problem is perceived or defined may also be influenced by an individual’s preferred method to address the problem. Cognitive motivations stemming from values, identities or social affiliations may drive this cycle of motivated reasoning.

Political ideology and party affiliation are often the most salient identities when considering “identity politics” and motivated reasoning; therefore, a considerable amount of research has examined these topics (Jost, Glaser, Kruglanski, & Sulloway, 2003). While politics lends itself well to this topic, any given individual has a number of different identities, characteristics, affiliations, or values beyond his or her politics that may motivate them to perceive environmental issues in a certain light (Stets & Biga, 2003; Stets & Burke, 2000). In order to properly address the concerns and needs of their constituents, it is important for environmental and natural resource managers to understand how individuals conceptualize environmental issues and how their conceptualizations influence their behavior and support for environmental policies. Therefore, the following section includes both a review of the existing literature on motivated reasoning as well as a synthesis of the research on how other identities and characteristics may relate to environmental and natural resource issues. This review will provide a foundation for future application of motivated reasoning theory and research into environmental behaviors and decision-making in regards to the environment and
natural resources. This work intends to shed light on how humans, as “reasoning animals” make decisions about our environment.

1.2 Literature Review

Psychology, political science, and communication research have provided a variety of models and frameworks that examine how individuals engage in motivated reasoning about social and political issues. These frameworks examine how individuals may be led to form opinions and beliefs on issues based not on the “facts,” but rather on previously held cognitions, values, or ideology. The early research on cognitive dissonance and the role of values in attitude formation provided a psychological foundation for the study of motivated reasoning. Political science and later psychologists built upon the work on dissonance and values to study how political ideology motivates individuals to perceive policy issues. Identity Theory and Cultural Cognition are two frameworks that extend motivated reasoning research beyond political ideology. These frameworks examine how individuals are motivated to perceive issues in a way that aligns with other identities and worldviews. Finally, substantial communication research on framing and agenda setting examines how motivated reasoning impacts the way individuals interpret information.

Motivated Reasoning and Cognitive Dissonance

Research on motivated reasoning was influenced by the pioneering work on cognitive dissonance by Leon Festinger (Kunda, 1990). Cognitive dissonance, described as a “psychological state in which an individual’s cognitions-beliefs, attitudes and
behaviors-are at odds” with one another is one of the most well researched psychological concepts (Egan, Santos, & Bloom, 2007; Festinger, 1962). Kunda (1990) provides a review of motivated reasoning and examines two competing “motivations,” a motivation to be accurate and a motivation to arrive at a preferred conclusion. In this context, motivation is defined as “any wish, desire, or preference that concerns the outcome of a given reasoning task” (Kunda, 1990). Any discrepancy between these two motivations produces cognitive dissonance (Kunda, 1990). This creates a situation in which an individual may then attempt to “reason away” the dissonance. For example, an individual may be motivated to come to a preferred conclusion regarding anthropogenic climate change (e.g., climate change is not occurring for those who desire no government intervention); however, this motivation is constrained by the motivation to be accurate (e.g., review of available evidence regarding anthropogenic climate change). The individual may counter any resulting cognitive dissonance from the perceived discrepancy between these two motivations by seizing on shortcomings in the scientific literature (real or perceived) to discredit the scientific information.

Other studies show that motivated reasoning also affects skepticism and the effort used to evaluate new information (Ditto & Lopez, 1992). Ditto and Lopez (1992) found that individuals examined information less critically when it supported a preferred conclusion (such as favorable results from a medical exam) than when it was not consistent with a preferred conclusion. Additional research shows that motivated reasoning may also play a role in optimistic time biases (the expectation of finishing a task more quickly than is possible) (Buehler, Griffin, & MacDonald, 1997), justifications
of unethical behavior (Bersoff, 1999) as well as the use of stereotypes (Kunda & Sinclair, 1999) and how individuals use heuristics to interpret information about new technologies (Druckman & Bolsen, 2011).

Values as the Foundations of Identity and Identity Protective Motivations

Psychological research on the role of values in attitude formation is another fundamental line of research associated with motivated reasoning. This research examines how core cognitive components, values, provide a foundation on which other cognitions (such as beliefs and attitudes) as well as behavior are based upon. Rokeach (1968) defines a value as “an enduring belief that a particular mode of conduct or that a particular end-state of existence is personally and socially preferable to alternative modes of conduct or end-states of existence.” He found that:

…various combinations of these terminal and instrumental values significantly differentiate men from women, hippies from nonhippies, hawks from doves, policemen from unemployed Negroes, good students from poor students, fifth-graders from seventh-, ninth-, and eleventh-graders, retail merchants from sales clerks, Jews from Catholics, Democrats from Republicans, and so forth. (Rokeach, 1968)

Rokeach did not examine values and attitudes in an explicitly environmental context. However, his work set an example that was very influential to later research. For example, Stern & Dietz (1994) took a similar value based approach. Likewise, Schultz & Zelezny (Schultz & Zelezny, 1999) extended on Rokeach’s research focusing on values: “Rather than investigating general attitudes about environmental issues, recent research has attempted to identify underlying values that provide a basis for environmental attitudes.” Schultz and Zelezny (1999) found in a cross-country comparison of students in 14 nations that general values and value systems (general grouping of similar values) are
predictive, albeit weakly, with values and attitudes related to the environment. Reviewing the literature on environmental values, Dietz, Fitzgerald, and Shwom (2005) identified a major line of social psychological research examining “value clusters,” or groupings of values. They found that the cluster related to “self-interest, altruism, traditionalism, and openness to change” were most associated with environmental concern as opposed to “self enhancement” values focused on social power and ambition.

Values have been used to examine how individuals perceive wildlife issues and environmental behaviors. For example, research in the field of human dimensions of wildlife has used value orientation to explain support for wildlife policy as well as angling and hunting behavior. Value orientations are similar to value clusters in that they are a grouping of related values (Fulton, Manfredo, & Lipscomb, 1996). This research identifies two value orientations related to fish and wildlife; a mutualistic scale that emphasizes a desire to coexist with wildlife and a dominion scale that emphasizes an acceptance to use and manage wildlife for the use of humans (Fulton, Manfredo, & Lipscomb, 1996; Manfredo, Teel, & Henry, 2009; Teel & Manfredo, 2010). Research using these fish and wildlife value orientations has been highly successful at linking values and attitudes to natural resource related behavior and policies (Fulton et al., 1996; Manfredo, Teel, & Henry, 2009; Teel & Manfredo, 2010). Motivated Reasoning and Political Ideology

This prior work on cognitive dissonance and values provides a foundation for the substantial amount of research examining the role of political ideology in motivated reasoning. Multiple studies have examined how motivated reasoning and partisanship
influence public opinion formation and information processing (Bolsen et al., 2013; Leeper & Slothuus, 2014; Lodge & Hamill, 1986; Slothuus & de Vreese, 2010) while related research has examined how different partisan groups may have differing cognitive processes and brain structures (Amodio, Jost, Master, & Yee, 2007; Dollinger, 2007; Joel, Burton, & Plaks, 2013; Jost & Amodio, 2011; Jost, Nam, Amodio, & Van Bavel, 2014; Schreiber et al., 2013; Tetlock, 1983; Vigil, 2010). Much of this research examines how individuals perceive political issues differently due to their political ideologies and how such ideologies are formed. For example, some individuals may support economic policies that are not in their own self-interest (Jost et al., 2003). Such research attempts to explain why individuals would hold such seemingly “irrational” views. A common hypothesis is that individuals are motivated to have consistent political ideologies even when such views may not consistently be in their own best interest.

Indeed, some researchers have argued that the formation of political ideologies have been influenced by motivated reasoning (Jost et al., 2003). In a meta-analysis, Jost et al. (2003) examined the existing research on the relationships between political ideology and personality traits and proposed a model of “political ideology as motivated social cognition.” Jost et al. (2003) argued that most individuals have a psychological motivation to reduce uncertainty and anxiety. Individuals with a strong motivation to do this may tend to be motivated to view things more conservatively and hold conservative ideologies than individuals with a higher tolerance for uncertainty and anxiety. Therefore, the need to view the world in a certain way results in two differing political ideologies, these ideologies in turn, lead individuals to view policy issues in a certain light.
According to this theory, an individual’s opinions about political issues are shaped by how he or she views risk and uncertainty, which then shapes his or her ideology. Jost et al. (2003) extends upon earlier work (such as Tomkins, 1963) which examined political ideology and polarity. Tomkins theory of polarity posited that ideology was an extension of personality and, therefore, extended beyond politics and into many other facets of life (Jost et al., 2007).

Among the factors examined by Jost et al. (2003) were attitudes towards authoritarianism, intolerance of ambiguity, a need for closure, a need to manage fear, and rationalizations related to social dominance and inequality. Across the 88 studies included in the meta-analysis (representing a dozen countries), death anxiety (a need to manage fear) had the strongest correlation with conservatism followed by intolerances for instability and ambiguity and uncertainty, a lack of openness to new experiences, needs for closure and structure, and fear of threat and loss. Jost et al. (2003) argued that motivations to reduce these risks would lead individuals to hold more conservative ideologies and interpret information in a way that minimizes threat and uncertainty; this approach is known as a socially motivated theory of conservatism.  

Motivated Reasoning and Identity Theory

Other studies have examined how identities based on shared values unrelated to political ideology contribute to environmental perceptions. Identity Theory (Stets & Biga, 2003; Stets & Burke, 2000; Stets & Carter, 2011) is one theoretical framework that may be useful in explaining motivated reasoning. Identity Theory comes from psychological and communication literature examining how an individual’s salient identities influence
his or her behavior (Brown, 2000; Stets & Burke, 2000; Stryker & Burke, 2000).

Essentially, Identity Theory posits that an individual has a number of salient roles and identities at any given moment. Each of these identities has an “identity standard” or a collection of meanings that are related or tied into the identity (Stets & Biga, 2003).

These identity standards are used as a comparison, or mental rubric, to evaluate new information. If the new information conforms to the identity standard, it is acceptable. If it is at odds with the standard, it may generate cognitive dissonance. In other words, an individual can use the standard to see whether their behavior, beliefs or attitudes, deviates from what is expected by someone who holds that identity. If there is a large discrepancy between the input and standard, it produces a negative affective or emotional response. An individual may then act to reduce the discrepancy (Stets & Biga, 2003).

Stets and Biga (2003) examined whether gender identity, how strongly someone identified with masculinity or femininity, predicted environmental attitudes and behaviors. Even though Stets and Biga (2003) did not find that gender identity was a significant predictor of environmental behavior, their application of Identity Theory to environmental policy can be used as a template for further research in applying the identity concept to predict environmental behavior.

Identity Theory has also been used to examine conservation identities among farmers in Iowa and how these identities translate into water quality and nutrient management behaviors (McGuire, Morton, & Cast, 2013). McGuire et al. (2013) used surveys and interviews to examine how identities related to conservation are activated; results indicated there were different farming identities. For example, some held a
“productionist” identity and viewed farming practices through impacts on crop yield and profit. Others held a “conservationist” identity lens and emphasized environmental stewardship. McGuire et al. (2013) hypothesize that when the conservationist identity is activated, norms about sustainable agriculture will be more salient to farmers. Overall, Identity Theory provides a framework to examine how, and when, norms are most salient and can influence individual’s perceptions about environmental issues.

*Cultural Cognition and Identity Protective Motivations*

The Cultural Cognition framework (Kahan, 2012; Kahan, 2010; Kahan & Braman, 2006) combines many of the elements of identity, politically motivated reasoning and dissonance. Cultural Cognition built upon the Cultural Theory of Risk (Douglas & Wildavsky, 1982; Kahan, 2012) by incorporating social psychological processes and mechanisms related to risk perception and cognitive dissonance (Kahan & Braman, 2006; Kahan, Jenkins-Smith, & Braman, 2010; Kahan, 2012). Cultural cognition argues that individuals form opinions about social issues in a way that reinforce his or her cultural worldviews, identity, or value set. As described in Kahan (2010) and Kahan et al. (2010) Cultural Cognition examines a form of motivated reasoning process based on “identity-protective motivations” or a desire to “conform one’s beliefs to those of like-minded others in order to avoid dissonance and protect social standing” (Kahan et al., 2010). Identity-protective motivation is a form of motivated reasoning based on cognitive dissonance and identity. It argues that individuals will be motivated to interpret messages and information in a way that corresponds with their cultural worldview, which in turn is based on a set of values and identities. They will pay more attention (and
believe the source is more credible) when the information supports their worldview and they will be skeptical or dismissive of information (or sources of information) that they perceive to be counter to their worldview (Kahan et al., 2010).

The Cultural Cognition working group has examined identity-protective motivations in the context of climate change (Kahan, Braman, & Slovic, 2007; Kahan, 2010) and found that cultural worldviews were better predictors of an individual’s belief in global warming than were other demographics, including political ideology. Additionally, subjects rated information about climate change as more credible and trustworthy when they shared a cultural worldview with the source (Kahan et al., 2007; Kahan, 2010).

Motivated Reasoning and Framing

Communication scholars have examined how individuals with different identities and worldviews interpret information differently. While some studies refer to the literature on framing and agenda setting as a “Limited Effects Theory,” it may actually be more accurate to refer to it as a “Limited Effects Approach” as there is no singular theory, rather a group of phenomena that describes human behavior, and therefore may be useful theoretically (Berger, Roloff, & Roskos-Ewoldsen, 2010). Framing is a common concept across several social science disciplines (Entman, 1993). Kahneman’s and Tversky’s pioneering research on decision-making featured framing as a prominent concept (Kahneman & Tversky, 1984; A Tversky & Kahneman, 1981; Amos Tversky & Kahneman, 1986). While the concept of framing is nearly ubiquitous across the social
sciences, the concept is often only “casually” defined (Entman, 1993). Entman (1993) provides a more formal definition:

“To frame is to select some aspects of a perceived reality and make them more salient in a communicating text, in such a way as to promote a particular problem definition, causal interpretation, moral evaluation, and/or treatment recommendation for the item described.”

An important component of this definition is the focus on a “perceived reality” or “social constructivism” (Entman, 1993; Scheufele, 1999). This is important because it argues that a message may not be salient based solely on the message’s content, but on how salient the message is to an individual’s cognitive and social characteristics; like values, identities and worldviews.

Scheufele (1999) uses a similar definition of framing (also reliant on social constructivism) and breaks framing into two categories: media frames and individual frames (Scheufele, 1999). Media frames describe how journalists and the media narrate an issue or a story while individual frames describe how an individual processes and organizes information. Both types of framing rely on socially constructed narratives and are relevant to motivated reasoning. Media frames examine how a journalist portrays an issue to appeal to certain audiences that might be motivated to perceive the issue in a certain way. Individual frames are a psychological information processing mechanism that can describe how an individual is motivated to interpret information in a certain light.

Another factor that makes framing difficult to study is that it is not clear whether it is a distinct concept from other closely related “media effects,” such as priming and agenda setting. For example, Scheufele (1999) argued that framing is a sub-component of
agenda setting. However, a year later he criticizes the literature for combining agenda setting, priming and framing (Scheufele, 2000). Generally, the literature tends to combine agenda setting, priming and framing together as all three concepts focus on the socially constructed salience of a message (Chong & Druckman, 2007; Dietram Scheufele & Tewksbury, 2007; Weaver, 2007). Indeed, in political communication literature, agenda setting, priming and framing are all grouped together in the Limited Effects Approach (Berger et al., 2010).

Summary of Relevant Theories

Cultural Cognition and Identity Theory are two theories that examine motivated reasoning that were developed out of the psychological research on values and cognitive dissonance literature. Along with framing theory, these frameworks provide a “jumping off” point to further research on whether individuals may engage in motivated reasoning about environmental problems. As demonstrated in the literature reviewed, there are numerous cognitions that may motivate individuals to come to specific conclusions about environmental problems depending on how the problems are framed. If individuals are engaging in motivated reasoning about the environment, their opinions and support for environmental policies may be strongly influenced by these cognitions rather than the “facts” of the environmental problem. Therefore, for natural resource managers and policy makers to effectively address environmental problems, it is necessary for them to understand the psychologies, identities, and social affiliations among their constituents as well as the natural relationships within a given ecosystem.
1.3 Applying Motivated Reasoning Theory to Environmental Problems

While some research examining the relationship between motivated reasoning and general political ideology has been completed, little prior work has examined this relationship regarding environmental problems and policies. Previous research indicates that perceptions about the environment and environmental policy are very context dependent (Jones, Fly, & Cordell, 1999; Tremblay & Dunlap, 1978). The specific environmental issue, its geographic location, and the particular community involved are all important in understanding how individuals will form beliefs and attitudes about environmental problems and policies. Additionally, individuals may think about specific, concrete issues, such as Lake Erie’s algal blooms, differently than a broader or more abstract issue, such as climate change or sustainability (Fujita, Trope, Liberman, & Levin-Sagi, 2006; Spence, Poortinga, & Pidgeon, 2012; Trope & Liberman, 2010).

Overall, substantial prior research has found much stronger relationships between cognitive components, like attitudes, when measures are made to specific targets, like specific pro-environmental behavior (Ajzen & Fishbein, 1977; Weigel & Newman, 1976; Wicker, 1969).

Research Gap 1: Media Framing and Agenda-Setting of Lake Erie’s Algal Blooms

As described below, the following chapters address a variety of existing gaps in the literature using a specific environmental problem, Lake Erie’s algal blooms. Such work can relate to other forms of water quality impairment as well as other forms of environmental degradation such as air pollution and climate change. One gap is the role that the media has in framing the issue of climate change and how agenda setting events
influence the way the media frames the problem. The media can be important in framing problems and policies, or influencing how information about environmental issues are interpreted (Boykoff & Boykoff, 2007; Patterson & Donsbagh, 1996; Scheufele & Tewksbury, 2007). A considerable amount of research has assessed how the media portrays climate change and how the media influences public perceptions about climate change (Antilla, 2008; Boykoff & Boykoff, 2004, 2007; Boykoff, 2007).

The way that information is framed appears to have an impact on how individuals interpret the information and their support for policies to address climate change (Maibach, Nisbet, Baldwin, Akerlof, & Diao, 2010; Myers, Nisbet, Maibach, & Leiserowitz, 2012; Nisbet, 2009). Additionally, by covering a catastrophic environmental event, the media can turn such an event into an agenda-setting opportunity to influence the perceptions of the public and policy makers about an issue (Scheufele, 2000; Scheufele & Tewksbury, 2007; Weaver, 2007). An example of such an event occurred in early August 2014 when algae from Lake Erie’s algal blooms entered the drinking water supply of Toledo, Ohio. When examining whether individuals are engaging in motivated reasoning to form perceptions about Lake Erie’s algal bloom problem and policies, it will be necessary to understand how information about the algal blooms is being presented to the public. Therefore, it is important to understand how the media frames the issue and the role that it has in portraying the issue and influencing perceptions.

Research Gap 2: Influences on Public Perceptions of the Algal Blooms

Prior research also lacks clear information about which identities contribute to motivated reasoning about environmental problems and policies. While substantial
research suggests that political ideology influences motivated reasoning, there is little information how other ideologies and affiliations influence reasoning. Since many environmental and natural resource problems are closely related to rural and agricultural issues, motivations to maintain affiliations with rural and agricultural communities may be an important factor in how living in non-urban environments form beliefs and attitudes about environmental problems and policies. Early survey and public opinion polls in the late 1960’s and 1970’s routinely showed that those with high concern about the environment tended to live in urban communities (Arcury & Christianson, 1993; Buttel, Gillespie, Larson, & Harris, 1981; Lowe & Pinhey, 1982). However, later work has not found many consistent, or significant, differences in general environmental concern (e.g., concern about air and water pollution) between urban and rural residents (Arcury & Christianson, 1993; Lowe & Pinhey, 1982). However, these studies focused on quantitative measures of concern about the environment. They did not go into depth about how individuals perceived environmental problems, what is causing the problems, or how the problems should be addressed. Therefore, individuals may share a similar level of concern about environmental problems in general, but differences may exist about specific problems, like algal blooms. Additionally, both urban and rural individuals may have similar levels of concern about algal blooms, but still perceive the problem as stemming from different causes (agricultural vs. urban pollution) or requiring different solutions. Therefore a closer qualitative examination is needed to understand how an individual’s identity with urban or rural communities may motivate them to perceive algal blooms in a certain way.
Research Gap 3: Motivated Reasoning, Identity Theory and Potential Responses to the Blooms

Another gap in the research is how identities influence specific environmental behaviors and policies. Stets and Biga (2003) applied Identity Theory to explain general pro-environmental behavior. Lute, Bump, and Gore (2014) examined how identity predicted attitudes towards hunting wolves. Additionally the Cultural Cognition group has examined identity-protective mechanisms in regards to climate change (Kahan et al., 2007; Kahan, 2010). However, their studies were not targeted to a specific natural resource issue like Lake Erie’s algal blooms. McGuire et al., (2013) applied Identity Theory using a series of identities related to farming to explain water quality management in the Midwest. Applying these identities to Lake Erie’s algal bloom issue can shed more light on how identities explain farmer adoption of best management practices and whether there is evidence that farmers may engage in identity-protective processes and motivated reasoning to maintain these identities.

Overarching Research Questions Examined by this Dissertation

The overarching research questions addressed by this dissertation include: 1) Are the ways in which people perceive environmental problems motivated by their preference for specific policies? And 2) how do identities and affiliations motivate the way individuals view environmental problems and policies? The following chapters address these questions in the context of Lake Erie’s algal bloom issue.

Chapter 2 examines the way in which the media portrays Lake Erie’s algal blooms and the role that framing and agenda setting have on perceptions of the algal
bloom problem. Specifically, it examines whether the media portrays water quality impairment as a conflict between the agricultural and urban community. Chapter 3 examines how agricultural, rural and urban communities living near and distant to Lake Erie conceptualize water quality impairment and potential methods to address problems. Chapter 4 applies Identity Theory to agricultural producers operating in the Lake Erie region and examines the influence of conservationist and productionist identities on the adoption of best management practices and the perceived effectiveness of these practices. Chapter 5 brings the other chapters together and discusses the implications that motivated reasoning may have on participatory decision making in environmental and natural resource policy.

1.4 Conclusion

Human beliefs and behavior can often seem to be irrational or unreasonable. However, the way that individuals define and evaluate policy problems may seem more reasonable once motivations related to values, attitudes, ideologies and identities are taken into account. In the context of environmental and natural resource issues, individuals may perceive and define, policy issues very differently based on their preferred method to address such issues. Motivated reasoning may provide a framework to better incorporate how individuals perceive and respond to environmental and natural resource problems and policies.
References


26


Chapter 2: The Novel, the Drastic and the Personal: The Toledo Water Crisis, Agenda Setting, and Newspaper Coverage of Lake Erie’s Algal Blooms

Abstract

Through framing and agenda setting, the media can have a powerful effect on how individuals perceive an environmental problem. The media is influential in deciding which issues receive public attention, a process referred to as “agenda setting.” Journalistic norms regarding what topics are most important to cover can influence which issues make it onto the public “agenda.” In addition to determining which issues receive the spotlight, the media is also important in determining how a problem is framed. For example, whether the issue of climate change is portrayed as an environmental problem (requiring additional regulation of emissions as pollutants) or as a public health problem (requiring more health resources to address the health concerns of climate change). This project examined how harmful algal blooms in Lake Erie have been covered in local and national media outlets. We found that the “water crisis” in Toledo, OH, in August 2014 served as an agenda setting event that changed how the media covered the algal blooms. The crisis increased coverage of the blooms, and caused newspapers to frame the issue as a health problem rather than an environmental issue.
2.1 Introduction

While substantial scientific research describes significant ongoing environmental change (for example, see Foley et al., [2005] and [IPCC, 2014]), a very limited portion of the U.S. population seeks information directly from these sources. Rather, people are more likely to turn to more routine sources including mass media for information about climate change, (see Leiserowitz, Maibach, Roser-Renouf, & Hmielowski, [2012], Kahlor [2007]). The manner in which these environmental problems and potential solutions are portrayed by the media can influence public views about the seriousness of the problem and whether and what types of actions may be perceived as appropriate (Boykoff & Boykoff, 2007; Scheufele, 2000; Scheufele & Tewksbury, 2007; Weaver, 2007). However, the media does not simply transmit objective information to the public; rather, journalists decide what issues to cover, what components of that issue to emphasize, and how the issue is framed (Boykoff & Boykoff, 2007). Therefore, in examining how individuals perceive Lake Erie’s algal blooms, and the proposed responses to the algal blooms, it is important to examine how the media portrays the problem. It is particularly important to understand how the media frames the problem (for example, as a natural phenomenon, an agricultural issue or urban issue) as these frames may influence how individuals within the watershed perceive the problem, as well as the potential solutions they support.

Newspapers, magazines, television, and the radio inform public perception of issues in a variety of ways. The media can act as an important agent in determining which issues receive public attention (Scheufele, 2000; Scheufele & Tewksbury, 2007; Weaver,
Agenda setting occurs when a notable event raises awareness of an issue or problem among the general public, or policy makers (Scheufele & Tewksbury, 2007). By reporting on an event or problem, media coverage can increase the amount of attention paid to the issue. Often, this can occur when there is a specific event or dramatic example of the issue. I reasoned that the 2014 water crisis in Toledo Ohio, when microcystin, a toxin associated with the algal blooms, was found in the drinking water of the city (resulting in nearly a half of a million people being unable to use their drinking water for 3 days), may have served as an “agenda setting” event for Lake Erie’s algal bloom problem. This issue resulted in substantial media coverage, both among local sources and at the national level. This media coverage may have contributed to an increased awareness of Lake Erie’s algal blooms and other changes in how the public perceived the problem, and may have potentially shifted the way the media characterized algal blooms and potential risks.

The media’s role in agenda setting not only includes decisions about which issues are covered, but also in determining which issues receive no or limited attention. Some issues do not make for interesting, or “sensational” journalism. Among other factors, journalistic norms about what constitutes good journalism guide which stories the media focuses on and how those stories are portrayed (Boykoff & Boykoff, 2007). Climate change provides an example of how journalistic norms and frames can influence how an environmental problem is portrayed (Antilla, 2008; Boykoff & Boykoff, 2004, 2007; Boykoff, 2007; Myers et al., 2012; Nisbet, 2009). Boykoff and Boykoff (2007) reviewed how the journalistic norms that emphasize balance and reporting on “both sides” of an
issue have resulted in the media portraying climate change as a debate (despite the scientific consensus that it is occurring). Journalistic norms also lead journalists to gravitate towards stories that have elements of “personalization, dramatization, and novelty” (Boykoff & Boykoff, 2007). Issues like climate change that occur gradually and over long time periods do not have these elements (although extreme weather events that may be associated with climate change may align with these elements). Others (Myers et al., 2012; Nisbet, 2009) have examined how the frames used to present climate change influence support for potential responses. For example, Myers et al. (2012) suggested that framing climate change as a public health issue may make the issue more salient, and personal, than if it is framed as an environmental concern.

The same journalistic norms (Boykoff & Boykoff, 2007) and agenda-setting and framing processes (Scheufele, 2000; Weaver, 2007) can apply to how environmental policies are portrayed in the media. Individuals may respond and react to the policies in different ways depending on how the media portrays policies. For example, individuals who are concerned about additional taxes and regulation may respond negatively when climate change cap and trade policies are portrayed as a tax to punish carbon emitters versus as an incentive to reduce emissions (Kahan et al., 2007).

Therefore, the media may influence environmental perceptions and reasoning in multiple ways. The media may frame the environmental problem or the policies proposed as solutions in a certain light. A portrayal may be more or less appealing to certain individuals based on their previously held values, identities and affiliations. Chapter 1 discussed how reasoning about environmental problems and policies may be cyclical
where the problem definitions both influences, and is influenced by, support for certain policies. This cyclical model can be adapted to include media framing (Figure 2.1) by examining how the media portrays environmental problems and environmental policies.

![Figure 2.1 Influence of Media Framing on Environmental Problem and Policy Perception](image)

In conveying information, the media also translates and frames issues. In the case of environmental issues, the media may frame environmental problems in a certain light as well as the proposed policies to address the environmental problem. Therefore, the way that the media frames and portrays environmental issues may have an important role in how individuals form perceptions about the issues and reason about the problem.

Lake Erie’s algal blooms are a specific environmental problem where media framing and agenda setting may influence public opinions. Harmful algal blooms are not new in Lake Erie; there were high numbers of algal blooms through the 1970s before the Clean Water Act regulated point-source pollution from water treatment plants (OEPA,
However, while mitigation efforts are still ongoing, harmful algal blooms have returned in recent years (ODA et al., 2013; OEPA, 2010). Lake Erie’s productivity has become increasingly threatened by algal blooms, which deplete oxygen in the lake and produce harmful toxic bacteria (ODA et al., 2013; OEPA, 2010; Paerl & Huisman, 2008). A review of available research suggests that the algal blooms are being caused by nutrient run-off, primarily from agricultural sources within the Maumee River Watershed (ODA et al., 2013; OEPA, 2010). However, non-agricultural sources (like discharges from wastewater treatment and fertilizer run-off from lawns) as well as changes in climate may also be contributing to the problem (ODA et al., 2013; OEPA, 2010; Paerl & Huisman, 2008). Harmful algal blooms may generally be perceived as a distant risk (posing a threat to wildlife, vegetation, or invertebrate species but not to human communities) characterized by uncertain causes, consequences, or potential solutions. As there are multiple potential sources of nutrient pollution, and different potential responses to the blooms, the media can portray the algal blooms in a variety of ways. By portraying the problem in a certain light, the media may influence public support for specific solutions to address the bloom. For example, if the blooms were portrayed as a water quality problem caused by fertilizer use in urban areas, a logical solution would be to reduce application of fertilizer to residential lawns even if such efforts would have a negligible impact on future algal blooms. Additionally, if individuals perceive the issue in a partisan light (based on their ideology or identity as a farmer or urban resident) portraying the issue in a certain way can reinforce these partisanships. For example, individuals living in rural areas that may be concerned about the effect that additional agricultural regulation
would have on their region’s economy may downplay the role of agricultural run-off and attribute the blooms to urban run-off. If the media portrays the algal blooms as the result of agricultural run-off requiring additional agricultural regulations, it may motivate individuals concerned about these regulations to discount the problem.

The 2014 water crisis in Toledo, Ohio may have changed how algal blooms are portrayed by the media and perceived by the public. Rather than being perceived as a distant risk with limited consequences to local communities, the algal bloom was a discrete, dramatic event that affected many people directly. Therefore, the water crisis was aligned with the journalistic norms of dramatization (having a discrete sudden event or crisis as opposed to a slow gradual change in a situation), and novelty (a situation that is new to the public and has not received a lot of prior coverage) (Boykoff & Boykoff, 2007).

In this paper, we examine how newspaper articles have portrayed Lake Erie’s algal blooms from the years 2000-2015. Our primary research objectives were to examine how the media portrays the source of the blooms and examine whether there is any association with how the media portrays the source of the blooms and proposed responses. Examining how the media frames the algal bloom issue is important in understanding how individuals form perceptions and reason about proposed water quality policies, especially if the issue is being portrayed in a political or partisan light. Another objective of the study is to examine the role that the Toledo Water Crisis had on the media coverage of algal blooms and whether it served as an agenda-setting event resulting in a lasting change in how algal blooms were treated by the media. We
hypothesized that there will be a significant association between how the media portrays the causes of algal blooms (agricultural run-off, sewage spills, urban run-off, etc.) and the proposed responses to the algal blooms (more regulation, more studies on the problem, incentives for practices to prevent run-off, etc.). We also hypothesized that media coverage of the algal blooms will have significantly increased after the agenda setting event of the Toledo Water crisis, and that there will be significant differences in the ways that the media treats the proposed sources of run-off, and responses to the blooms, pre and post water crisis.

2.2 Methods

The online resource, LexisNexis Academic, was used to compile a list of newspaper articles published on Lake Erie’s Algal blooms. The search terms used were “Lake Erie AND alga* bloom*”. The “AND” indicated that the article had to contain both the phrases “Lake Erie” and “algal blooms” to be included in the results. The asterisks allowed for slight variants (“algae” for “algal,” as well as “blooming,” and “blooms”) on the search terms. Only newspaper articles and newswire items were included in the search (any newspaper service could have been in the sample, but the search was restricted to exclude articles from trade journals and legal case reviews). Fifteen years, from 2000 to 2015, was chosen to be the time frame for the search. This produced a list of 1,200 articles.

As the search results produced too many results to review all of them, a “constructed week” approach was used to generate a simulated time frame for analysis. In
a constructed week approach, one random day of each day of the week (a random Sunday, a random Monday, a random Tuesday, etc) is selected to form a constructed week for analysis. This approach is more reliable than selecting a random subset of days, as newspaper content varies throughout the week do to the differing amounts of add space (Connolly-Ahern, Ahern, & Bortree, 2009; Evans & Ulasevich, 2005; Hester & Dougall, 2007; Riffe, Aust, & Lacy, 1993).

One issue that complicated the constructed week sampling was that the Toledo Water Crisis occurred in August 2014. Since the crisis occurred in the middle of the year, the constructed weeks for 2014 could include articles from both before the crisis and after. Therefore research was conducted in two phases. In order to isolate the effect of the crisis and examine how it served as an agenda-setting event, it was necessary to assemble additional samples of articles. To compare pre and post crisis articles, a random sample of 75 articles published pre crisis were selected along with a random sample of 75 articles published post crisis. August 1st, 2014 was chosen as the pre-post crisis cut-off date. Unfortunately, there were not enough articles published before the crisis to effectively use a constructed week approach; thus, we decided to draw a random selection of articles for the pre and post comparison. While not as ideal as a constructed week sample, a random sample can provide a representative sample of media content (Connolly-Ahern et al., 2009; Riffe et al., 1993).

Therefore, research was conducted in two phases. Phase 1 of the research used the constructed week sample to identify how the media framed the algal bloom issue. Phase 2 used the two random pre and post crisis samples to examine whether the Toledo water
crisis served as an agenda setting event and resulted in differences in how the media framed the algal bloom issue.

Selected articles were imported into the program MAXQDA for Macintosh for analysis. The articles were read and the major themes in each were identified and coded using an open coding process adapted from qualitative analyses techniques for interviews (Rubin & Rubin, 2005). For example, in coding the causes of the blooms, if an article mentioned that phosphorus or nitrogen run-off was a cause, it would be assigned a “1” under the category of “phosphorus” or “nitrogen” (or both if it mentioned each source). If the article mentioned agriculture as a source of run-off, it was assigned a “1” under the “agricultural cause” theme. If it mentioned sewage contributing to the problem, it was assigned a “1” under the sewage theme. Each time an article suggested a new cause of the algal blooms, a new theme was created and the articles mentioning this cause were assigned a “1.” This process continued for all of the articles.

After being identified and coded, the themes for each of the articles were then compiled, analyzed and compared using summary statistics, independent T-tests, and cross-tabs with Pearson Chi-Squared statistical tests (Hayes, 2005; Howell, 2010).

2.3 Results

Over a thousand results were returned in the LexisNexis search. Most of the articles were published in the years 2014 and 2015. The constructed week sample for Phase 1 of the project was constructed of articles for these two years. The themes relating to the causes of the algal blooms were examined first followed by the frames used to
describe the algal blooms (e.g., as a health problem, economic problem, environmental problem etc.) and proposed responses to the algal blooms. Associations between the themes in the constructed week sample were examined next. Finally, the two random samples (Phase 2) were compared to see how media coverage of the algal blooms changed after the Toledo Water Crisis.

Lake Erie Algal Bloom Newspaper Stories in LexisNexis

The search terms “Lake Erie AND algal blooms” returned 1,282 results using the LexisNexis Academic newspaper catalogue. A wide arrange of sources were included (Table 2.1) such as the locally focused Toledo Blade as well as large national and international newspapers such as the New York Times and Washington Post. However, for this project, we did not look at differences between local and national framing as many local and regional papers draw on national wire services (e.g., the Associated Press) for content. LexisNexis groups many of the small local and regional papers, such as the Toledo Blade, under the McClatchy Tribune Papers. Therefore, many local and regional papers were included in the analysis, even though they do not show up individually in Table 2.1.
Table 2.1: Top 15 Results of LexisNexis Newspaper Articles about Algal Blooms

<table>
<thead>
<tr>
<th>Newspaper</th>
<th># Articles</th>
</tr>
</thead>
<tbody>
<tr>
<td>McClatchy Tribune Papers¹</td>
<td>442</td>
</tr>
<tr>
<td>Dayton Daily News</td>
<td>67</td>
</tr>
<tr>
<td>Windsor Star</td>
<td>67</td>
</tr>
<tr>
<td>The Buffalo News</td>
<td>66</td>
</tr>
<tr>
<td>The Hamilton Spectator</td>
<td>33</td>
</tr>
<tr>
<td>Pittsburgh Post-Gazette</td>
<td>24</td>
</tr>
<tr>
<td>The Toronto Star</td>
<td>17</td>
</tr>
<tr>
<td>The New York Times</td>
<td>13</td>
</tr>
<tr>
<td>The Globe and Mail</td>
<td>12</td>
</tr>
<tr>
<td>The Washington Post</td>
<td>12</td>
</tr>
<tr>
<td>Toronto Star-Metroland Newspapers</td>
<td>11</td>
</tr>
<tr>
<td>The Charleston Gazette</td>
<td>9</td>
</tr>
<tr>
<td>Ottawa Citizen</td>
<td>8</td>
</tr>
<tr>
<td>Waterloo Region Record</td>
<td>7</td>
</tr>
<tr>
<td>The Christian Science Monitor</td>
<td>5</td>
</tr>
</tbody>
</table>

Note: The search terms used to produce the list of the results were “Lake Erie AND alga* bloom*” (the asterisks allow LexisNexis to include variants on the search terms such as “algae” as well as “algal”). The search was confined from the years 2000-2015.

¹The McClatchy Tribune Papers are a collection of smaller newspapers, which include local papers such as the Toledo Blade within the Maumee River Watershed.

The search results were not distributed evenly across the 15 years (Figure 2.2).

There were no articles for the year 2000 and relatively few articles (less than 50 a year) from 2001-2008. The majority of the articles produced by the search results were from the years 2014 and 2015. The increase in articles in 2014 and 2015 coincides with the Toledo Water Crisis in August 2014. Indeed, within 2014, there was a peak in newspaper coverage in the month of August the month that the water crisis occurred (Figure 2.3).
Figure 2.2: Number of Articles about Algal Blooms from 2000-2015

The search terms used to produce the list of the results were “Lake Erie AND alga* bloom*” (the asterisks allow LexisNexis to include variants on the search terms such as “algae” as well as “algal”). The search was confined from the years 2000-2015. The dashed gray line in the year 2014 represents the Toledo Water Crisis when microcystin, a toxin associated with the algal blooms was found in the drinking water of Toledo, OH.
Articles about "Algal Blooms" During 2014

The search terms used to produce the list of the results were “Lake Erie AND alga* bloom*” (the asterisks allow LexisNexis to include variants on the search terms such as “algae” as well as “algal”). The number of articles for each month in 2014 was examined to see how the water crisis, which occurred in August, impacted the newspaper coverage of Lake Erie’s algal blooms.

Frames Present in the Constructed Week Sample

For Phase 1 of the analysis, the constructed week sampling method produced a sample of 81 articles from the years 2014 and 2015. Reading and analyzing (using open coding, see Rubin & Rubin [2005]) the articles for each new idea or concept contained in the article identified 48 themes and subthemes. This paper only examines the themes and subthemes related to the causes and response to the algal blooms.
Framing the Cause of the Blooms

The newspaper articles attributed the algal blooms to a variety of causes (Table 2.2). Two dozen of the 81 articles mentioned that the blooms were caused by excess phosphorus entering the lake. Six of the 81 articles discussed the role that the nutrient nitrogen may play in producing algal blooms, or contributing to the toxicity of algal blooms. In discussing the cause of the blooms, an article could mention a variety of sources (such as agricultural and urban sources of run-off). In these cases, the article was given a code for each source it mentioned.

In discussing the source of nutrients (Table 2.2), four articles mentioned the role that the Maumee River, or Maumee River Watershed, had in transporting the nutrients into Lake Erie. Nineteen articles discussed nutrient run-off from agricultural sources (fertilizer and/or manure) and five of these articles suggested that agriculture was the main source, or main “culprit,” contributing to Lake Erie’s algal blooms. For example, an article from the Windsor Star on August 29th, 2014 said: “…Lake Erie algae blooms have been primarily triggered by excess phosphorus from agricultural fertilizers brought to the lake as rain run-off.” Fourteen articles discussed pollution from urban and municipal sources, such as wastewater treatment, septic systems, lawn fertilizers, lawn waste, detergents, etc. as contributing to the problem. Again, the coding process was not exclusive (in that an article could discuss multiple causes of pollution) and most of these articles discussed agricultural sources of pollution as well as urban sources. For example, an article from the Norwalk Reflector on October 3rd, 2014 said: “[A water quality scientist] told a crowd of farmers and Toledo-area residents that municipal wastewater
treatment systems, aging septic systems and residential lawn care were other areas where phosphorous use should be cut by 40 percent.” Of these 14 articles, eight focused on sewage (wastewater treatment, combined-stream overflows, or septic systems) as the main source of nutrients from urban and municipal sources.

In addition to the source of the nutrients, the articles also mentioned several other climatic and ecological factors that may contribute to the algal blooms (Table 2.2). Five articles mentioned the role, or importance, that rain and precipitation events have on the algal blooms. Four articles discussed how climate change may be contributing to the blooms or exacerbating the problem. For example, The Toledo Blade included a quote from a charter boat captain in an article on December 1st, 2015: “[Climate Change] is the big elephant in the room, because with climate change and those major rain events it brings, there is a close connection with the algae problems we've been facing on Lake Erie.” (Again, as the articles could contain multiple themes, the article from which this quote was taken was coded under both the “climate change” and “impact of rains” themes.) Three articles mentioned that invasive species, primarily invasive mussels, have impacted Lake Erie’s ecosystem, which might be contributing to algal blooms.
Table 2.2: Description of the Cause of the Algal Blooms Present in Newspaper Articles (Phase 1: Constructed Week Sample)

<table>
<thead>
<tr>
<th>Contributor</th>
<th>Present in # Articles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Nutrient</td>
<td></td>
</tr>
<tr>
<td>Phosphorus</td>
<td>24</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>6</td>
</tr>
<tr>
<td>Source of Nutrients</td>
<td></td>
</tr>
<tr>
<td>Agriculture</td>
<td>19</td>
</tr>
<tr>
<td>Agriculture is the main &quot;culprit&quot;</td>
<td>5</td>
</tr>
<tr>
<td>Urban Sources</td>
<td>14</td>
</tr>
<tr>
<td>Sewage/Wastewater Treatment</td>
<td>8</td>
</tr>
<tr>
<td>Maumee River is the source</td>
<td>4</td>
</tr>
<tr>
<td>Other Contributors</td>
<td></td>
</tr>
<tr>
<td>Impact that rains have on blooms</td>
<td>5</td>
</tr>
<tr>
<td>Climate Change</td>
<td>4</td>
</tr>
<tr>
<td>Impact that invasive species have on blooms</td>
<td>3</td>
</tr>
</tbody>
</table>

Note: Articles were selected from the years 2014 and 2015. 4 constructed weeks were analyzed for each year. This produced a sample of 81 total articles. However, not all of the articles attributed the blooms to a specific cause, while other articles attributed the blooms to more than one cause. Therefore, the numbers do not add up to 81.

Framing Concerns about the Blooms and Responses to the Blooms

In addition to attributing the algal blooms to a wide array of sources, the newspapers also discussed concerns about the algal blooms (Table 2.3). The most commonly noted concerns were about how the algae may impact drinking water (50 articles out of 81) followed by more general health concerns about potential risks posed by the algae (28 articles out of 81). These were followed by economic concerns (noted in 11 out of 81 articles) while environmental or ecological concerns were rarely expressed (3 articles out of 81).
The most commonly suggested response to the algal blooms (Table 2.4), present in 22 articles were about the political process (legislation about the blooms or politicians campaigning on the issue) surrounding the blooms. Some of these discussed responses suggested that legislation or other political action is needed to address the blooms. Others discussed the stance that various politicians, both local leaders from within the watershed and state leaders, have taken on water quality legislation, or how politicians were treating the algal blooms as a potential campaign issue.

Eleven of the 81 articles (Table 2.4) suggested that more information about the algal blooms was needed to develop appropriate responses, or that there were efforts underway to study and better understand the problem in order to respond to it. Seven of the articles discussed existing or potential incentives for best management practices (BMPs) to reduce nutrient run-off from agricultural fields, wastewater treatment facilities, or personal residences. Six of the articles indicated that additional agricultural regulation was needed to address the algal blooms while four discussed how farmers

<table>
<thead>
<tr>
<th>Concern about Algal Blooms</th>
<th>Present in # Articles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drinking Water</td>
<td>50</td>
</tr>
<tr>
<td>Toledo Drinking Water</td>
<td>46</td>
</tr>
<tr>
<td>Health Problem</td>
<td>28</td>
</tr>
<tr>
<td>Economic Problem</td>
<td>11</td>
</tr>
<tr>
<td>Ecological Problem</td>
<td>3</td>
</tr>
</tbody>
</table>

Note: Articles were selected from the years 2014 and 2015. 4 constructed weeks were analyzed for each year. This produced a sample of 81 total articles. However, not all of the articles framed the blooms as a specific concern while other articles framed the blooms in more than one way. Therefore, the numbers do not add up to 81.
were already helping to address the algal blooms by adopting BMPs or applying less fertilizer or manure to fields.

Table 2.4: Responses to Algal Blooms Mentioned in Newspaper Articles (Phase 1: Constructed Week Sample)

<table>
<thead>
<tr>
<th>Response to Algal Blooms</th>
<th>Present in # Articles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legislation or Campaign Response to Blooms</td>
<td>22</td>
</tr>
<tr>
<td>More Information/Studies are needed/underway</td>
<td>11</td>
</tr>
<tr>
<td>Incentives for BMPs</td>
<td>7</td>
</tr>
<tr>
<td>Regulation of Agriculture</td>
<td>6</td>
</tr>
<tr>
<td>Farmers are Helping</td>
<td>4</td>
</tr>
</tbody>
</table>

Note: Articles were selected from the years 2014 and 2015. 4 constructed weeks were analyzed for each year. This produced a sample of 81 total articles. However, not all of the suggested a specific response while other articles suggested more than one response. Therefore, the numbers do not add up to 81.

**Associations between Frames in the Constructed Week Sample**

A series of cross-tab analyses were run to examine whether the proposed causes of the algal blooms were associated with potential responses to the blooms in individual articles (Table 2.4). So for example, whether an article that attributed the blooms to “Cause X” also included a reference to “Response Y.” Chi-Square tests showed there was a significant association between the articles that attribute the algal blooms to sewage and discussion of policy responses. In addition, there was a significant association between the articles attributing the blooms to agricultural run-off and non-sewage forms of urban/municipal run-off with discussion of incentives for BMPs. Lastly, there was also a significant association between articles attributing the blooms to non-sewage municipal run-off and discussion of additional regulation of agriculture as well as articles that attributed the blooms to sewage and suggestions that farmers were already taking action to help prevent algal blooms. However, it is important to note that the small sample size
of several of the categories limits the interpretation of the Chi-Square test results. The results are presented here to suggest an overall pattern (to indicate where the distribution of articles might differ from what would be expected randomly) and are not intended to be a rigorous test of statistical significance of the association.

Table 2.5: Cross Tabs of the Responses to Algal Blooms (Phase 1: Constructed Week Sample)

<table>
<thead>
<tr>
<th>Response to Algal Bloom</th>
<th>Attribution of Algal Blooms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ag. Run-off (n = 19)</td>
</tr>
<tr>
<td>Legislation or Campaign Response (n = 22)</td>
<td>4</td>
</tr>
<tr>
<td>More Information/Studies (n = 11)</td>
<td>4</td>
</tr>
<tr>
<td>Incentives for BMPs (n = 7)</td>
<td>5*</td>
</tr>
<tr>
<td>Regulation of Agriculture (n = 6)</td>
<td>3</td>
</tr>
<tr>
<td>Farmers are Helping (n = 4)</td>
<td>1</td>
</tr>
</tbody>
</table>

Note: Articles were selected from the years 2014 and 2015. 4 constructed weeks were analyzed for each year. This produced a sample of 81 total articles. Numbers in the cell indicate the number of articles that attribute the source in the column heading and also discuss the response to the algal blooms given in the row heading. *The Pearson Chi-Square test was significant at an $\alpha < 0.05$ level.

Comparing Frames Before and After the Toledo Water Crisis

Phase 2 of the analysis used two random samples of articles published before and after the Toledo Water Crisis to assess whether the crisis operated as an agenda-setting event. The random selection of 75 articles pre-water crisis (beginning of 2000 until August 2014) was compared with a randomly selected sample of 75 articles from post-water crisis (August 2014 until the end of 2015) (Figure 2.1). Comparison (using independent sample T-tests) of the themes in articles pre and post water crisis showed a significant increase in the number of articles that discussed the role that both phosphorus
and nitrogen have on Lake Erie’s algal blooms after the water crisis (Table 2.6). There were no significant differences in the number of articles that attributed the algal blooms to agricultural or municipal sources of nutrients. Significantly fewer articles after the water crisis attributed the blooms to sewage (16 articles pre-crisis compared to 4 post-crisis). There were no significant differences in how the articles discussed climate change, precipitation, or invasive species.

Table 2.6: Source Attribution Pre and Post Toledo Water Crisis (Phase 2: Pre and Post Crisis Random Samples)

<table>
<thead>
<tr>
<th>Contributor to Algal Blooms</th>
<th>Pre-Water Crisis</th>
<th>Post-Water Crisis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Nutrient</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phosphorus*</td>
<td>23</td>
<td>34</td>
</tr>
<tr>
<td>Nitrogen*</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Source of Nutrients</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maumee River is the Source</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Agriculture</td>
<td>16</td>
<td>21</td>
</tr>
<tr>
<td>Agriculture is the main &quot;culprit&quot;</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Urban Sources</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>Sewage/Wastewater Treatment*</td>
<td>16</td>
<td>4</td>
</tr>
<tr>
<td>Natural Contributors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impact that rains have on blooms</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Climate Change</td>
<td>5</td>
<td>11</td>
</tr>
<tr>
<td>Impact that invasive species have on blooms</td>
<td>7</td>
<td>4</td>
</tr>
</tbody>
</table>

Note: 75 articles were randomly selected pre-Toledo Water Crisis (Jan., 2000-Aug., 2014) and 75 articles were randomly selected post-Toledo Water Crisis (Aug., 2014-Dec., 2015).
* Indicates the p-value from the T Test was Significant at an \( \alpha = 0.05 \) level.

Following the water crisis, there were significantly more articles that discussed health concerns (52 articles compared to 20) and drinking water concerns (48 compared to 6) (Table 2.7). Moreover, significantly fewer articles (8 articles compared to 17
articles) mentioned ecological or environmental impacts of the algal blooms after the crisis.

Table 2.7: Concerns about the Blooms Pre and Post Toledo Water Crisis (Phase 2: Pre and Post Crisis Random Samples)

<table>
<thead>
<tr>
<th>Concerns about Algal Blooms</th>
<th>Pre-Water Crisis</th>
<th>Post-Water Crisis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health Concerns*</td>
<td>20</td>
<td>52</td>
</tr>
<tr>
<td>Drinking Water*</td>
<td>6</td>
<td>48</td>
</tr>
<tr>
<td>Economic Problem</td>
<td>19</td>
<td>12</td>
</tr>
<tr>
<td>Ecological Problem*</td>
<td>17</td>
<td>8</td>
</tr>
</tbody>
</table>

Note: 75 articles were randomly selected pre-Toledo Water Crisis (Jan., 2000-Aug., 2014) and 75 articles were randomly selected post-Toledo Water Crisis (Aug., 2014-Dec., 2015).
* Significantly differ between Pre and Post-Water Crisis (based on T-Test at an $\alpha=0.05$ level).
** Significantly differ between Pre and Post-Water Crisis (based on T-Test at an $\alpha=0.10$ level).

Following the Toledo Water Crisis, significantly more articles (22 compared to 10) discussed the legislative or campaigning responses to algal blooms (Table 2.8). In addition, significantly more (10 articles compared to 4) articles described how the algal blooms are being studied after the crisis. Also, more articles (10 articles compared to 4) discussed incentives for BMPs and the need for additional regulation of agriculture (7 articles compared to 2).
Table 2.8: Responses to the Blooms Pre and Post Toledo Water Crisis (Phase 2: Pre and Post Crisis Random Samples)

<table>
<thead>
<tr>
<th>Concerns about Algal Blooms</th>
<th>Pre-Water Crisis</th>
<th>Post-Water Crisis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legislation or Campaign Response to Blooms *</td>
<td>10</td>
<td>22</td>
</tr>
<tr>
<td>More Information/Studies are needed/underway**</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>Incentives for BMPs**</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>Regulation of Agriculture**</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Farmers are Helping</td>
<td>3</td>
<td>5</td>
</tr>
</tbody>
</table>

Note: 75 articles were randomly selected pre-Toledo Water Crisis (Jan., 2000-Aug., 2014) and 75 articles were randomly selected post-Toledo Water Crisis (Aug., 2014-Dec., 2015).

* Indicates the p-value from the T Test was Significant at an \( \alpha = 0.05 \) level.

** Indicates the p-value from the T Test was Significant at an \( \alpha = 0.10 \) level.

2.4 Discussion

The results from Phase 1 and Phase 2 of the content analysis point to several implications for managers, natural resource professionals, and those interested in communicating about water quality issues. First, the media appears to be increasingly framing the algal blooms as a public health issue. Second, there is evidence the media is portraying the blooms as being caused by both urban and rural sources of run-off, contributing to “false-balance” bias in the media coverage. Third, by discussing the legislative processes or political campaign responses to the algal blooms, rather than other responses to the problem (such as new technology or infrastructure to clean up the water), journalists may inadvertently contribute to polarizing the issue. Fourth, although farmers have expressed concern about being unfairly blamed for the blooms and the potential for future regulations (see Chapters 3 and 5), there does not seem to be a strong association between the articles that cite agriculture as a cause of the blooms with articles
that recommend increased regulation, or political action, to address the blooms. Fifth, it appears that the Toledo Water Crisis acted as an agenda setting event that increased media coverage of the blooms, and shifted media coverage to using a public health frame. While there a several limitations to a content analysis approach, the results from this study suggest that the way that the media frames the algal bloom issue can have implications in how the public discusses the problem, and public support for policies to address the blooms.

**Framing Lake Erie’s Algal Blooms as a Health Issue**

Examining the media coverage of Lake Erie’s algal blooms revealed that the media has framed the problem in several ways. The algal blooms were framed as a drinking water problem, a health issue, an economic issue and an ecological problem. However, the drinking water and health issue frames were the most frequent frames used to portray the issue. This aligns with much of the literature on framing environmental problems. As examined by Boykoff and Boykoff (2007), journalists are challenged to portray an issue in a way that is compelling and interesting to their audience. A health frame corresponds well to these journalistic norms as individuals will understandably be interested in issues that may impact their own health. Accordingly, some climate change communication scholars (see Maibach et al., 2010; Myers et al., 2012) have argued that a similar public health frame be used to discuss climate change as such framing is expected to increase the perceived relevance of the issue and support for proposed responses as public health concerns everyone, whereas only a portion of the public is concerned about the environment. We found that a public health frame is already being used by the media
to talk about algal blooms. Managers and natural resource professionals should consider using a similar frame in discussing the algal bloom issue. Not only is this an effective way to communicate with the public (as it aligns with journalistic norms), but it will also complement the way that the media is covering the problem. Coordinating communication efforts so that they align with the existing media coverage of the event will help managers to more effectively discuss the issue with the public and highlight why individuals should be concerned about algal blooms. Such a response may increase concern about the water quality of Lake Erie. If more residents perceive Lake Erie as a source of drinking water then concern about the health of the lake is expected to increase (as opposed to if residents perceived the lake to be solely a site for recreation).

A False-Balance Bias in Algal Bloom Coverage

Phase 1 of this project also found that the media primarily portrayed the algal blooms as being caused by agricultural and urban run-off. One of the journalistic norms that is especially problematic in portraying climate change is the norm of “false-balance,” or the desire of a journalist to give equal attention to both sides of an issue (Boykoff & Boykoff, 2007). For some issues, giving each perspective equal attention is an important part of portraying an issue without bias. But in other cases, it can cloud the issue and confuse the general public about the true causes of environmental problems. Climate change is a classic example. By giving equal attention to climate change skeptics, the news media may misrepresent the scientific consensus that anthropogenic climate change is occurring (Boykoff & Boykoff, 2007).
Evidence here suggests such a false-balance bias may be occurring in how the media portrays the source of nutrient run-off. Urban run-off was mentioned in the articles as a cause of the blooms nearly as often as agricultural sources of run-off (14 versus 19 articles). However, the Lake Erie Phosphorus Task Force (ODA et al., 2013; OEPA, 2010) has identified agricultural run-off as the primary cause of Lake Erie’s algal blooms. This may lead individuals to perceive the blooms as an “urban” problem as much as an “agricultural” one. This frame can be problematic when trying to raise support for policies to address the problem, as it could create confusion about what is causing the blooms, thereby leading to unhelpful ideas concerning what should be done to address algal blooms. For example, agricultural producers who have to bear the direct costs of responses, might be less likely to support policies to address agricultural run-off if they accept the false-balance bias suggesting that urban run-off is equally responsible as agricultural run-off. Natural resource professionals and communicators may want to discuss urban run-off for other reasons (for example, to address other water quality problems). However, when discussing the algal bloom issue, they should make sure that they clearly attribute agricultural run-off as the primary cause of the blooms. Treating the blooms as an agricultural and urban issue can reinforce the false balance bias and confuse members of the general public.

*Politization of the Algal Blooms*

The articles also portrayed a number of possible responses to Lake Erie’s algal blooms. The most common one mentioned were how politicians were using legislative processes to address the issue, or using the blooms as a campaign issue. This finding
highlights the difficulty of portraying an environmental issue in a politically bi-partisan light. As most of the articles were relatively short, the specific political or policy response was often undeveloped and did not suggest specific policies. Due to the broad nature of the theme, and the lack of discussion of specific policies, it is not evident from this content analysis if readers would view the articles in a partisan light. However, by mentioning the political process in general, or the actions of specific politicians, the articles may activate a reader’s political identity and associate the issue as a “political” problem rather than an environmental or health one. While the politics involved may be newsworthy in and of themselves, there can be consequences of including such frames. Considering that individuals have strong, often negative, associations with politics and the legislative process [the current disapproval rating of congress is above 80% (Gallup, 2016)] even associating an issue with politics may trigger negative associations for many individuals causing them to perceive it negatively.

Lack of Association between Agriculture as Cause and Proposed Regulation

One concern (discussed further in Chapter 3) raised by farmers and those in the agricultural community concerned about increased regulations is that agriculture is being unfairly blamed for the algal bloom issue. These individuals are often concerned that the media is portraying the algal blooms as an “agricultural problem” to garner support for increased regulation of agriculture. Our content analysis did not suggest that there were strong associations between attributing the blooms to agricultural run-off and proposed responses to the bloom. In other words, the articles that attributed the blooms to agriculture were not more likely to suggest a political response to the blooms, a need to
further study the blooms, or a need for additional regulation of agriculture than articles that attributed the blooms to urban run-off. Again, if we had found such associations, it could have implications on how individuals, particularly those associated with agriculture, perceive the blooms and support for policy. However, the only response to algal blooms that was significantly associated with articles that attributed the blooms to agriculture was an increased need for incentives to reduce run-off. If anything, this suggests that journalists are calling for more resources to support farmer efforts to address the problem as opposed to suggesting an increased regulatory burden on farmers was required.

*The Toledo Water Crisis as an Agenda Setting Event*

In Phase 2 of the analysis we examined to see if the Toledo Water Crisis served as an agenda-setting event. Anecdotally, the frequency of articles spiked in 2014 (Figure 2.2) when the bloom occurred. This spike was maintained throughout 2015. This suggests that media coverage of the algal blooms increased both during and continued for the year after the crisis.

When the two random samples of pre and post crisis articles were examined there were few significant differences in proposed causes of the algal blooms pre and post crisis but nearly all of the responses were discussed more frequently after the crisis. However, more newspaper articles did frame the algal blooms as a public health issue after the crisis while fewer articles framed it as an environmental or ecological concern. This suggests that the crisis may have served as an agenda-setting event in increasing
awareness of the blooms through increased coverage and shifting the articles to portray
the blooms using a public health frame.

Prior to the crisis, the articles discussed the health impacts of the blooms. But
much of this coverage focused on encountering toxins in Lake Erie while recreating.
After the toxins entered Toledo’s drinking water, the media coverage switched to
discussing the impacts that the algal blooms could have on human health through the
drinking water infrastructure. Such a portrayal may enhance the effectiveness of framing
the blooms as a health issue. Prior to the crisis, the media treated the algae as a health
hazard to only those who recreated in Lake Erie. Only a fraction of the public recreates in
Lake Erie at any given time; however, a ban on drinking water broadly impacts the health
of anyone drinking water from Lake Erie. Using a public health/drinking water frame
portrays the blooms as an issue of concern to everyone in the region, not just those who
live near, or visit, Lake Erie. This makes the problem more salient, concrete, and
psychologically near (Spence et al., 2012; Trope & Liberman, 2010) to individuals who
would otherwise be uninterested or uninvolved in Lake Erie. Individuals will then be
more likely to be concerned about the issue and support policies to mitigate the blooms.

Limitations to a Content Analysis Approach

One limitation to this study was that we only examined how the media portrayed
the algal bloom issue, we did not examine how individuals used media to make decisions
about the algal bloom issue, or how reading articles influenced their perceptions of the
issue. For example, while the content analysis included articles from both national and
regional papers, we did not examine whether there was a differential level of influence
between national and regional papers. For example, do individuals living in the Maumee River Watershed assign greater weight, or trust, to information they read in their local papers or national papers? We examine how papers frame the algal bloom issue, but did not account for the readership of the papers. It could be that one or two papers frame the issue very differently than the rest of the papers, but enjoy a wider circulation, or are more influential, among readers. Future research is needed to examine where individuals in the Maumee River Watershed get their information, and which media sources they most trust.

A related limitation is that a content review only examines how information is portrayed in the media. It does not examine how individuals interpret that information, or whether they use it to form decisions about behavior or policies to support. For example, we found that the newspaper articles often framed the blooms as a public health concern. However, we did not test to see whether this led readers to view the issue as a health problem. Understanding how people use media and how media stories impact perceptions would be the next logical step to testing the model displayed in Figure 2.1. This can be tested experimentally by presenting individuals with information framed in a certain way and seeing how the different frames influence the individual’s perception about the issue. The Cultural Cognition group has done similar experiments with communication framing around different risk perceptions (Kahan et al., 2007). These experiments provide information about climate change using a range of frames and sources (for example, an article from an environmental group, another article from a conservative think-tank, another article from a university professor, etc.). They then examined how the source and
frame of the article influenced the way the reader perceived climate change as well as the reader’s trust of the information provided in the article. They found that individual’s tended to rate the articles from the sources that aligned to his or her cultural worldview as being trustworthy. Other experimental communication work has examined wildlife management and perceptions about prescribed wildfire (Rose, 2014; Slagle, Zajac, Bruskotter, Wilson, & Prange, 2013). Future work could use similar experiments to assess how changing the frames used to communicate regarding algal booms influences the way individuals perceive the issue. For example, do people express greater concern about algal blooms and are they more likely to support actions if the issue is framed as a health versus an environmental concern, or a recreational versus drinking water focused health frame.

2.5 Conclusion

The media can be a powerful influence in forming perceptions about environmental problems. Agenda-setting and journalistic norms can determine how much attention an issue receives and whether it is perceived as an issue requiring attention. Lake Erie’s algal blooms provide a good test case for the limited effects communication model (focused on framing and agenda setting) and theory about journalistic norms. The blooms provided a real life case example of how such theory can explain news coverage of an environmental problem. Moreover, framing can influence the perceived relevance of the problem among the target population. While algal blooms occurred repeatedly in recent years, with the one occurring in 2015 breaking the previous record set in the summer of 2011 (Liberatore, 2015), the Toledo Water Crisis in August 2014 appeared to
shift coverage of the event at least in the near-term both in terms of amount of coverage as well as the way the algal blooms are presented. Following this event algal blooms were more likely to be discussed as potentially posing a substantial risk to local populations (e.g., to the readers themselves or people similar to them). The coverage following the crisis included a greater emphasis on potential approaches to address the blooms to reduce their future impact. Whether this agenda-setting shift endures over time or changes the tenor of the discussion regarding potential political or behavioral responses remains to be seen.

References


doi:10.1177/107769909307000115

Rose, K. (2014). The influence of communication for perceptions of smoke emissions and prescribed fires in fire dependent areas. The Ohio State University.


Chapter 3: Public(s) Perception of Water Quality: A Qualitative Analysis of the Water Quality Perceptions among Residents in the Maumee River Watershed

Abstract

Natural resource managers and policy makers are often interested in how “public opinion” shapes environmental policy. However, different segments of the public may view environmental problems in different ways. In such cases, there is no single “public opinion” but rather multiple “publics” with potentially differing opinions.” To create socially acceptable policies to address environmental problems, managers and policy makers have to understand how these different publics perceive the problem. Lake Erie’s algal blooms are one example of an environmental problem that involves several different segments of the public. Individuals living in rural, agricultural-based communities upstream from the Lake may be motivated to perceive the sources of the algal blooms as less related to agricultural run-off and more related to pollution from urban areas given the resulting locus of responsibility for potential responses. On the other hand, individuals living in urban communities near Lake Erie may be motivated to perceive the blooms as being caused primarily by agricultural run-off from upstream farms. These differing beliefs regarding the source of the pollution will have implications for policies aiming to address Lake Erie’s algal blooms. We conducted a series of focus groups to explore how different publics in the Maumee River Watershed understand water quality throughout the watershed and impacts to Lake Erie. We find that while there are several
similarities between the different publics included here, there are also subtle but
important differences in their beliefs about the causes and potential solutions to Lake
Erie’s algal blooms.

3.1 Introduction

A content analysis of newspaper articles on Lake Erie’s algal blooms (Chapter 2)
examined how the media treated nutrient pollution and water quality in the Maumee River
Watershed. However, while an environmental problem may be portrayed in a particular
way in the media, the public may not necessarily perceive the problem accordingly. This
may especially apply to situations in which different segments of the public have
motivations to perceive an issue in a certain light. In such cases, “public opinion” is often
a muddied concept as there is not necessarily a single “public” but multiple “publics”
with a stake (often different stakes) in the issue. These “publics” may conceptualize and
perceive the problem or proposed policies or other responses differently. These different
conceptualizations of the problem can lead to substantially different beliefs about
whether action is needed to address the problem and, if so, what types of action the public
is likely to support.

This chapter examines how different “publics” perceive a specific environmental
problem, water quality in the Maumee River Watershed and Lake Erie’s algal blooms.
We examined how rural and urban communities, as well as communities near and distant
to Lake Erie, perceived and discussed algal blooms using a series of focus groups.
Specifically, we wanted to learn how people think about the blooms and their beliefs
about the cause of the blooms. We were also interested in learning about how different segments of the public (such as urban residents, rural residents, residents near Lake Erie and residents distant from Lake Erie) perceived proposed methods and policies to address the blooms. Finally, we examine the relationship between the conceptualizations of the algal blooms held by different publics and how they perceived potential responses.

This analysis extends understanding of the potential differences in policy preferences of urban and rural populations as well as individuals living near and distant from a particular environmental problem. Moreover, findings reported here can help environmental managers and policy makers effectively communicate about algal blooms by considering how to develop, or frame, different approaches to address the problem based on how individuals perceive the issue. A deeper understanding of how different publics perceive environmental problems and policies can contribute to more effective collaboration between different stakeholders, managers, and policy makers to address environmental and natural resource problems.

Lake Erie is the most productive fishery of the Great Lakes and contributes over $12 billion dollars to Ohio’s Economy (OEC, 2014). However, Lake Erie’s productivity has become increasingly threatened by algal blooms, which deplete oxygen in the lake and produce harmful toxic bacteria (ODA et al., 2013; OEPA, 2010; Paerl & Huisman, 2008). A review of available research suggests that the algal blooms are caused by nutrient run-off, primarily from agricultural sources within the Maumee River Watershed (ODA et al., 2013; OEPA, 2010). However, non-agricultural sources, such as discharges from wastewater treatment and fertilizer run-off from lawns as well as ongoing climatic
changes may also contribute to the problem (ODA et al., 2013; OEPA, 2010; Paerl & Huisman, 2008).

Since the source of the algal blooms has implications for how to address the problem, and who will bear the costs of doing so, different publics may be motivated to emphasize different causes of the blooms. For example, individuals living in rural areas—particularly agricultural producers—may be concerned about potential effects of the effect that additional agricultural regulation on their region’s economy may be motivated to downplay the role of agricultural run-off and attribute the blooms to urban run-off. Likewise, with the threat of higher utility rates to cover improvements to wastewater treatment, urban residents may be motivated to place the blame on agricultural production.

The tension between agricultural and environmental interests is a common theme in natural resource management (Bogner & Wiseman, 1997; Buttel & Flinn, 1978; Buttel et al., 1981; Lowe & Pinhey, 1982; Tremblay & Dunlap, 1978). Accordingly substantial natural resource and environmental sociology literature has explored whether urban and rural residents differ in their views of natural resource issues and concern for the environment (Bogner & Wiseman, 1997; Buttel & Flinn, 1978; Buttel et al., 1981; Lowe & Pinhey, 1982; Tremblay & Dunlap, 1978). Early research using polling data suggested that urban residents were more concerned about the environment than rural residents (Bogner & Wiseman, 1997; Buttel & Flinn, 1978; Buttel et al., 1981; Lowe & Pinhey, 1982; Tremblay & Dunlap, 1978). A review by Tremblay and Dunlap (1978) hypothesized that these differences may be driven by a greater dependence on natural
resource extraction among rural residents as well as greater exposure to non-developed natural areas leading them to undervalue environmental degradation relative to urban residents exposed to developed urban cityscapes with associated degradation.

Lowe and Pinhey (1982) tested this and several other hypotheses identified in the literature. Their first hypothesis was that environmental concern is related to the amount of pollution and degradation that one observes. Therefore, residents of urban areas may be more concerned about the environment as pollution, urban sprawl, and large-scale changes to the environment are more common in urban areas. Their second hypothesis was that rural residents are more likely to be employed in extractive or nature-exploitation occupations that may conflict with concern for the environment. Third, rural areas tend to have higher rates of poverty and therefore these communities may have more concern about economic growth than the environment. The fourth hypothesis was that urban residents might be more attentive to the ways that humans can modify the environment as they live in areas with more intense human development. Lowe and Pinhey (1982) found no evidence for the first three hypotheses and only slight support for the fourth hypothesis. Overall they found that the rural-urban divide and other socio-demographic variables were relatively poor predictors of environmental concern (Lowe & Pinhey, 1982).

Later work failed to find support for differences environmental concern between urban and rural individuals. Freudenburg (1991) found that farmers actually had higher environmental concern than many other social groups. Additional research found differences in knowledge about the environment between urban and rural residents but
not concern (Arcury & Christianson, 1993). Several studies have failed to find a clear pattern of any differences between urban and rural residents in general environmental concern about air and water pollution (Alm & Witt, 1995; Emmet Jones, Mark Fly, Talley, & Ken Cordell, 2003; Foster & McBeth, 1996; Jones et al., 1999).

Several authors have attempted to explain why continued work in this area failed to identify differences between urban and rural residents found in prior research. Jones et al., (1999 and 2003) hypothesized that as rural populations gained access to technologies like recycling, and have experienced demographic changes, such as an influx of urban “migrants,” they have become more environmentally conscientious. Others have examined the methodologies used by studies to consider whether the study designs influenced the results; Tremblay and Dunlap (1978) pointed out that results based on polling data and surveys are sensitive to the way survey questions are asked. Others, argued that socio-demographic factors, like the rural or urban divide, are too simplistic to yield results and that more complex social-psychological conceptualizations of identities are needed (Stets & Biga, 2003).

Another limitation of using survey and polling data to look for differences between urban and rural residents is that such studies are not able to probe qualitative differences in environmental beliefs and attitudes. Individuals living in urban and rural areas may have similar concern for environmental problems, but attribute the problems to different sources. Moreover, limitations in the number and type of questions that can be asked can make it challenging to probe all questions of interest or to better understand participant beliefs about potentially sensitive topics a priori. For example, survey items
probing participant beliefs about the causes of harmful algal blooms would present participants with a list of potential causes and ask them to rate each one. For example, items may ask respondents to indicate his or her level of concern about algal blooms or if he or she thinks they will have a negative impact on water quality. However, it is difficult to identify the degree to which participant responses were held prior to the survey or are influenced by the provided list of potential causes. Moreover, it may not be clear how much participants have thought about these issues prior to completing the survey or how such topics are discussed within their community. Although having their own limitations, a qualitative research design, such as those utilizing in-depth interviews or focus groups, can allow participants to share their initial thoughts without being influenced by the research instrument and provide an opportunity for follow up questions and active discussion to gain greater insight into how rural and urban communities view environmental problems.

In addition to whether a community is urban or rural, perceptions about environmental problems may also be influenced by the relevance of the problem to the community. Psychological distance examines how relevant, or salient, an issue is to an individual (Spence et al., 2012; Trope & Liberman, 2010). In the psychological literature, “distance” may refer to spatial distance as well as “temporal distance” (how soon an event or issue will occur) or “social distance” (who is likely to be affected by an issue and how similar those affected will be to one’s self).

Based on psychological distance, algal blooms may be more salient and visible to communities the nearer they are to Lake Erie. These communities may perceive the algal
bloom issue differently than individuals living in communities more distant from the lake who are only indirectly, if at all, impacted by conditions on Lake Erie. Therefore, we hypothesize that Lake Erie’s algal blooms will be more salient to those living in close proximity to Lake Erie (such as residents of Toledo, Ohio) relative to those living further from the lake (such as residents living in Ft. Wayne, Indiana). Based on the role of agriculture in rural communities, we also hypothesize that rural communities will be motivated to downplay agricultural run-off while urban residents will be motivated to focus the blame on agriculture to avoid higher utility rates to improve sewer infrastructure.

3.2 Methods

Focus groups are a qualitative method that brings together a group of individuals to discuss a particular topic. Krueger and Casey (2009) describe focus groups as “a way to better understand how people feel or think about an issue, product or service.” They are a useful tool for gathering information about differences in perspectives, factors that influence opinions, pilot-testing ideas or language or capturing a range of ideas or feelings (Krueger & Casey, 2009). While focus groups do not result in quantitative information about a representative sample, they are effective at uncovering a range of different thoughts, ideas and opinions that exist within a population. In a focus group, participants can build upon the thoughts of one another and researchers can examine how people discuss an issue in a social context.
The research team conducted thirteen focus groups throughout the Maumee River Watershed region (Figure 4.1). The Maumee River Watershed follows the Maumee River, which begins in Ft. Wayne Indiana, runs through northwestern Ohio and empties into Lake Erie in downtown Toledo, Ohio. By area, rural and agricultural acres make up the majority of the Maumee River Watershed, which also includes a significant urban population primarily in Ft. Wayne, IN and Toledo, OH – two moderately sized urban centers (according to the 2010 Census estimates, Fort Wayne has a population of 253,691 while Toledo has a population of 287,208). Six focus groups were conducted in rural areas (in the Ohio cities of Perrysburg, Ada, Defiance and Paulding) and seven were conducted in urban areas (Toledo, Ohio and Ft. Wayne, Indiana). The geographic location of the focus groups also allows for comparisons of responses from those near (Perrysburg and Toledo) and far from Lake Erie (Ada, Defiance, Paulding and Ft. Wayne). To allow for the planting and harvesting schedules of farmers, focus groups were conducted in two rounds (summer 2012 and fall 2013).
Figure 3.1: The Maumee River Watershed and Focus Group Locations

The Maumee River Watershed contains the Maumee River and its tributaries. The Maumee River begins near the city of Fort Wayne, Indiana. It flows northeast where it drains into Lake Erie in the city of Toledo, Ohio. The watershed is located mostly in northwest Ohio, but contains portions of northeast Indiana and southern Michigan. The above map is from the Ohio Department of Natural Resources’ Office of Coastal Management (ODNR, 2012). The red stars indicate where focus groups were held. One focus group was held in Ada, Ohio, which is outside the area of this map.

To improve our ability to recruit participation by farmers, one focus group was held at the Conservation Tillage and Technology Conference. Participants in this focus group came from across northwest Ohio and not just the Maumee River Watershed; however, Lake Erie’s water quality was a major component of the conference and a topic...
of ongoing discussion among those in attendance. Additionally, all the members of this focus group were farmers or fertilizer retailers living distant from Lake Erie. Therefore, they matched the participants of the other expert rural focus groups that were also composed of farmers. Therefore, even though Ada itself is outside the watershed, responses from this focus group were relevant to our questions and are included here.

Due to sampling strategies, the results of focus groups, like other qualitative data, are not intended to be extrapolated to the general population (Glaser & Strauss, 1967; Krueger & Casey, 2009; Rubin & Rubin, 2005). Rather, they are a type of methodology used to elicit a range of thoughts and ideas present in a community through a group discussion (Krueger & Casey, 2009). Therefore, it is not necessary for participants to be drawn from random samples, or to necessarily be representative of the general population in terms of demographics such as age, class or gender. Instead, it is more important to assemble a group of individuals who share a characteristic (such as concern about water quality, or members of the local community) who can engage comfortably in a group conversation (Krueger & Casey, 2009). A variety of techniques were used to recruit focus group participants for this study. Recruitment procedures were approved under The Ohio State’s Institutional Review Board (Protocol 2013E0357).

To maximize the variability of opinions, we recruited individuals from both the general public, and the attentive public (or individuals that have been involved in water quality issues). For the general public focus groups, the research team contracted with the Cornell University Survey Research Institute to call a random sample of residents residing in zip code areas surrounding each focus group location and invite them to
participate. For the attentive public groups, we used a modified snowball sampling method and asked university extension services, Soil and Water Conservation offices, Natural Resource Conservation Service (NRCS) offices, environmental organizations, and relevant personnel from local municipalities if they would be willing to participate, and to help us identify other knowledgeable participants. For the rural focus groups, we particularly emphasized recruitment of farmers to gain perspectives of those in the agricultural community. Focus group participants were offered light refreshments and a small financial incentive to compensate them for their time and travel.

A question guide, consisting primarily of open-ended questions, was constructed to facilitate the group discussions (see Appendix for the question guide). Within qualitative interviewing methodology, is common practice to revise and alter interview scripts as research progresses (Glaser & Strauss, 1967; Marshall & Rossman, 2010; Rubin & Rubin, 2005). The purpose of the guide was to generate a discussion about water quality conditions in the Maumee River Watershed. Therefore, while some of the wording and probes in the guide changed throughout the project, the focus of the conversation and topics remained the same. Each focus group began with brief introductions, and then included questions to discuss participants’ connection and awareness of water quality and water resources, thoughts about water quality in their area, what factors contribute to the quality, how any existing negative water quality issues can be addressed, and then expectations for future water quality conditions (including climate change) in their area.
All focus groups were audio recorded and transcribed. The transcripts of the focus groups were coded to identify the major themes and ideas that emerged during each discussion. Analysis followed the Responsive Interviewing Model described by Rubin and Rubin (2005) for in-depth interviews with some minor modifications to apply to focus group data. Focus groups were then compared to assess whether any patterns emerged in themes discussed in the different focus groups. Coding and comparison of the focus groups was performed using MAXQDA 11 for Macintosh.

3.3 Results

Approximately 200 different themes and sub-themes were identified during the focus group analysis. Only a subset of these results is presented in this paper. A full summary of the results, the coding and focus group instrument is available in a technical report from the People, Climate Change and Lake Erie project (http://ohioseagrant.osu.edu/archive/maumeebay/). To introduce the participants to the topic and to begin the discussion each focus group began by asking the participants to describe the current state of water quality within the watershed. In all but two focus groups, participants raised the issue of algal blooms on their own during this initial discussion of water quality; in those final two groups, the research team specifically asked about the topic of the algal blooms after a more general discussion of water quality. Additional questions probed participant beliefs about what was contributing to water quality problems and the algal blooms.
Municipal sewage and agriculture were the most often cited cause for water quality problems in the watershed cited by participants in 11 and 10 focus groups respectively (Table 3.1). References to agriculture generally referred to crop production as they often addressed fertilizer and pesticide run-off from fields although some did discuss livestock operations and the resulting manure as well.

In addition to municipal sewer systems, sewer and septic systems were also commonly cited as sources of pollution contributing to algal blooms and other water quality problems. Many individuals mentioned that their municipality used a Combined Stream Overflow (CSO) sewer system. Therefore, they were concerned that sewage may be entering the waterways during strong precipitation events when the volume of run off exceeded the capacity of their water treatment infrastructure and was diverted directly to local rivers and streams. Other individuals were concerned that septic systems may be leaking into the watershed even without storm events.

As nearly all of the focus groups mentioned sewer systems or rural septic systems contributing to water quality problems there were not many patterns to observe between different types of focus groups. All of the urban focus groups mentioned sewer systems while 4 out of the 6 rural focus groups mentioned them. All of the focus groups near Lake Erie mentioned sewer systems contributing to water quality while 6 out of the 8 focus groups distant from Lake Erie mentioned them as a problem. Participants in 4 focus groups (3 of which were in urban focus groups) commented that residential septic systems in rural areas may be failing and leaking into the waterways. Several participants
mentioned that they had heard, or believed, that some older homes did not have septic systems and discharged their sewage directly into the waterways.

Table 3.1: Comparisons of Themes Regarding the Causes of Problems in the Maumee River Watershed

<table>
<thead>
<tr>
<th>Sources of Nutrient Pollution</th>
<th>All (n=13)</th>
<th>Rural (n=6)</th>
<th>Urban (n=7)</th>
<th>Distant (n=8)</th>
<th>Near (n=5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Municipal Sewage</td>
<td>11</td>
<td>4</td>
<td>7</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Agricultural Pollution</td>
<td>10</td>
<td>4</td>
<td>6</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Residential Septic</td>
<td>4</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Industrial Pollution</td>
<td>9</td>
<td>3</td>
<td>6</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Residential Pollution</td>
<td>7</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Societal Contributors to the Problem</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of Awareness</td>
<td>11</td>
<td>4</td>
<td>7</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Lack of Information</td>
<td>11</td>
<td>5</td>
<td>6</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>Lack of Funding Opportunities</td>
<td>10</td>
<td>4</td>
<td>6</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Env. Improvement is too Costly</td>
<td>9</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Water Quality is too Controversial</td>
<td>8</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Lack of Leadership</td>
<td>7</td>
<td>1</td>
<td>6</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Problems are too Big for Individuals</td>
<td>6</td>
<td>1</td>
<td>5</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Lack of Solutions</td>
<td>4</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>

The second most commonly cited cause of water quality problems was pollution from agriculture. Interestingly, while many participants cited agriculture as a source of water quality problems, at other points in the discussion several participants mentioned that farmers, and others in the agricultural industry, have done a lot to address water quality concerns. Participants in 8 different focus groups explicitly mentioned that farmers are helping to improve water quality in the region. As one participant said: “Farmers have done a lot to cut down on some of this runoff too.” These comments occurred in more urban focus groups (5 out of 7) than rural focus groups (3 out of 6).
They occurred in a similar proportion of groups held near (3 out of 5 groups) and more distant from Lake Erie (5 out of 8 groups).

The next most common cause of pollution cited by participants was industrial pollution. While many of these remarks referred to pollution that occurred in the past, participants in 9 of the focus groups commented on industrial pollution that may be contributing to current conditions. Half of the rural focus groups (3 out of 6 groups) brought up industrial pollution while all but one (6 out of 7 groups) of the urban focus groups brought up industrial pollution. Over half (5 out of 8) of the focus groups distant from Lake Erie while only 2 out of 5 focus groups held near the lake brought up industrial pollution.

Participants in 7 focus groups also mentioned that residential pollution in urban areas might be contributing to water quality issues in the watershed. Fertilizer run-off from lawns was often the most cited cause of urban residential pollution. One participant said: “I think city people have to bear our share, we use it to fertilize lawns. And that’s not an economic necessity.” A similar number of urban focus groups (4 out of 7 groups) and rural focus groups (3 out of 6 groups) identified residential pollution as a source of water quality problems. A higher proportion of focus groups held distant from Lake Erie (5 out of 8 focus groups) brought up urban or residential sources than those held near Lake Erie (2 out of 5 focus groups).

In addition to the above, participants also mentioned a range of other societal trends that may be contributing to water quality problems (Table 9). Participants in 11 focus groups appeared to correlate a lack of awareness among the general public with a
lack of concern about water quality issues. Many also suggested that greater interest among the public was needed to resolve water quality issues. One participant said: “I think the critical thing for really getting people is that we need to get people invested once again in feeling some kind of connection to water.”

Similarly, participants in 11 focus groups commented that there was a lack of quality information about water quality issues. Another limitation commonly mentioned (in 10 of the 13 focus groups) was lack of funding to address environmental problems. Lack of funding was brought up in more urban (6 groups out of 7) than rural (4 groups out of 6) focus groups. It was brought up in all 5 of the focus groups held near Lake Erie and in 5 out of 8 focus groups held further away from the lake. In general, participants were quite pessimistic, or cynical, that water quality conditions would improve because it the costs of doing so were perceived as too high. This concern was brought up in a similar number of urban (5 out of 7 groups) and rural focus groups (4 out of 6); however, it was mentioned in a higher proportion of groups near Lake Erie (4 out of 5) than more distant from the lake (5 out of 8). Similarly to a lack of funding, other focus groups (9 out of 13 groups) thought that problems were too costly to address. This is different than the theme about lack of funding. Whereas lack of funding focused on whether there where governmental or instrumental sources of money to address problems, the theme that environmental problems were too costly focuses on an inherent attribute of the problem itself, rather than institutional mechanisms to address it.

Participants in 8 of the 13 focus groups thought that water quality issues were overly controversial and that politics interfered in addressing problems. This concern was
brought up in an equal number of urban and rural focus groups (4 groups each) but in a higher proportion of groups near Lake Erie (4 out of 5 groups) than groups distant from Lake Erie (4 out of 8 groups).

Others (in 7 of the 13 focus groups) were frustrated that there was no leadership or initiative to address these issues. One participant said: “without the lead of decent leaders in Washington, [water quality is] going to be neglected.” Only one rural focus group mentioned this concern while 6 out of 7 of the urban focus groups mentioned it. Lack of initiative and leadership was brought up in similar proportions of groups near (3 out of 5 groups) and distant (4 out of 8 groups) to Lake Erie.

Many participants seemed to lack self-efficacy, emphasizing a belief of a lack of individual ability to address water quality problems. Participants in 6 of the 13 focus groups said that they felt that there was little they could do to address water quality problems. Only one rural focus group mentioned this concern while 5 out of 7 of the urban focus groups mentioned it. This concern was brought up in similar proportions of groups near (3 out of 5 groups) and distant (3 out of 8 groups) to Lake Erie.

A related theme, a belief that there were no viable or practical solutions to water quality problems was expressed in 3 of the 7 urban focus groups and 1 of the 6 rural focus groups. This theme differed from beliefs about self efficacy as comments within this theme focused on whether it was even possible to address the problem at any level, individual or societal. It was also mentioned more often in groups distant from Lake Erie (3 out of 8 groups) than near Lake Erie (1 out of 5 groups). As one individual said: “There are problems that nobody seems to know the answers to.”
A second objective of the study was to examine whether perceived solutions to water quality problems differed across different publics. Government regulation was discussed at length in the focus groups and participants had a variety of views on whether or not regulation is needed as well as some of the limitations to enacting regulations (Table 3.2). The focus groups were conducted before new legislation was enacted by the Ohio state legislature to address water quality; the resulting legislation is designed to effect fertilizer use on agricultural lands by requiring applicators of fertilizer (for fields over 50 acres) to be certified much like applicators of pesticide are required to be trained and certified (see description here: https://www.legislature.ohio.gov/legislation/legislation-summary?id=GA131-SB-1).

Table 3.2: Summary and Comparison of Themes to Regarding Regulation to Address Water Quality Problems

<table>
<thead>
<tr>
<th></th>
<th>All (n=13)</th>
<th>Rural (n=6)</th>
<th>Urban (n=7)</th>
<th>Distant (n=8)</th>
<th>Near (n=5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>More Regulation is Needed</td>
<td>9</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Limitations to Regulations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regulations are too Costly</td>
<td>7</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>People Do Not Like Regulation</td>
<td>6</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Resistance to Gov. Interference</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Prefer Market Place Solutions</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Lack of Enforcement</td>
<td>4</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>People Go Around Regulations</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Regulations are Corrupt</td>
<td>4</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Regulations are too General</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Unintended Consequences</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Too Much Paperwork</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>
Participants in the focus groups often did not agree on how the government should be involved in water quality issues. Participants in 9 of the 13 focus groups believed that government action, primarily through restricting excessive application of fertilizers, was necessary to protect water quality or to respond to environmental issues. In 6 of the 13 focus groups there was discussion from participants who did not believe more government action or regulation was necessary. Some of these participants stated that they did not like government interference or regulation in general and did not want to see more of it; many also commented on how many individuals in their community oppose regulations and the government. In 2 rural groups distant from the lake and 1 urban location near the lake some indicated they would prefer to see market-based policies to address problems. In 3 focus groups distant from Lake Erie, participants discussed how individuals in their community might see regulations as an invasion of privacy or be resistant to government interference in their personal affairs.

In addition to discussing whether more or less government intervention is necessary, participants also discussed problems that they have observed with current attempts to address water quality pollution. Participants in 4 of the 13 focus groups commented that while regulations may exist currently, they are not being enforced properly. A perceived lack of enforcement was more common in urban focus groups (3 out of 7 groups) than rural focus groups (1 out of 6 groups) and in groups near the lake (3 out of 5 groups) than groups more distant from the lake (1 out of 8 groups). Another concern expressed in 4 focus groups (3 urban groups and 3 near Lake Erie) was that existing corruption weakened the regulation of water quality problems. In 3 rural focus
groups participants said that regulations are not effective as it is part of human nature to find “loopholes” and ways around regulations, many farmers would be able to avoid or ignore regulations even if policies were in place and officials attempted to successfully implement the regulations. Participants in 3 of the focus groups held distant from Lake Erie commented that the existing regulations are too broad or general and not relevant to his or her area. There was some concern that different agencies or local governments are interpreting regulations in different ways. Participants in 2 of the focus groups in rural areas remarked that regulations can often have unintended consequences making them ineffective or detrimental at improving water quality.

3.4 Discussion

Participants attributed water quality problems to a variety of sources. Overall, there were many more similarities than differences both in urban and rural responses as well as participants near and those distant from the lake. Sewage wastewater and agriculture were mentioned as the biggest contributors to water quality problems. This corresponds to the findings from Chapter 2 that suggested that the media has over emphasized the role that sewage has in creating algal blooms. More urban than rural focus groups were concerned about industrial pollution and septic systems leaking. The different focus groups also expressed similar opinions about the way to address water quality problems. However, more urban than rural focus groups discussed a lack of leadership and that problems were too big for individuals to address effectively, more
urban than rural focus groups indicated the environment can clean itself, and more rural
than urban focus groups thought people found ways to work around regulations.

The fact that individuals from both urban and rural focus groups perceived the
sources of water quality problems similarly aligns with substantial literature (Alm &
Witt, 1995; Arcury & Christianson, 1993; Jones et al., 2003; Foster & McBeth, 1996;
Freudenburg, 1991; Jones et al., 1999; Lowe & Pinhey, 1982) that has failed to identify
significant differences between urban and rural perceptions of environmental problems.
We hypothesized that rural individuals, living in agriculturally based economies, would
be motivated to perceive the algal blooms as being caused by urban run-off as opposed to
farm run-off. We also hypothesized that rural individuals would be less supportive of
regulations due to the economic burden that such regulations would place on farming.
However, we did not find that rural focus groups were any less likely to attribute the algal
blooms to agriculture than urban focus groups. We also did not find that rural focus
groups were less supportive of environmental regulation than the urban focus groups.
Such work corresponds to the findings in Chapter 2 that did not find any clear
associations between how articles framed the source of the algal blooms with suggested
responses to the blooms.

While one of the hypotheses in the literature suggests that those in rural areas in
particular will be less concerned about environmental problems due to the fact that their
livelihoods depend on extracting resources from the land (Bogner & Wiseman, 1997;
Lowe & Pinhey, 1982; Tremblay & Dunlap, 1978), others have suggested that
environmental concern is more dependent on class and economic characteristics (e.g.,
participation in natural resource extraction industries) than whether they live in a rural area. Indeed, Buttel et al., (1981) argued that the variability in environmental perceptions was more varied between farmers and other farmers than previous studies suggested. Our results offer support to this idea. Overall, we found that our focus group discussions conducted with farmers and rural residents were very similar to focus groups held in urban locations.

While our results found both urban and rural groups perceived the algal blooms similarly, we found subtle differences in their views on appropriate responses. Urban groups were more likely to perceive a lack of leadership in addressing water quality problems. This suggests that urban residents believe that society has a greater role in addressing the algal blooms. They look to society, namely the government, for leadership and guidance in addressing the blooms. While this is does not necessarily mean that urban participants would be more supportive of additional regulations to address the blooms, it does indicate that they would be supportive of the government being involved in addressing the blooms. In their test of hypotheses about why rural residents may be less concerned about the environment, Lowe and Pinhey (1982) only found support for the hypothesis that urban individuals are more inclined to support social solutions to environmental problems. Results highlighting a concern about a lack of governmental initiative to address the problem among our urban focus groups are consistent with this finding.

The above result is further supported by the finding that rural focus groups seemed to be more likely to believe that regulations would be ineffective. This suggests
that urban and rural publics have different perspectives on how effective regulations will be. Urban focus groups discussed the need of leadership and initiative in organizing society to address water quality problems while rural focus groups discussed how such regulations would not be effective if individuals act in their own self-interest and go around the regulations. This could be for a variety of reasons. Rural individuals would likely bear the costs of additional agricultural regulation. Therefore, they may be motivated to not see a need for initiative to address the problem. Another explanation is that urban residents, living in more densely inhabited areas, are raised to look for “social solutions,” requiring leadership and policy, to address societal problems. This socialization is one of the hypotheses given to explain why rural residents may be less concerned about environmental problems and was the only hypothesis supported by Lowe and Pinhey’s review (1982).

Likewise, we hypothesized that individuals living upstream in the Maumee River Watershed would feel more psychologically “distant” from Lake Erie than individuals living near the lake and that this might impact the way that the different groups would perceive the algal bloom problem. This hypothesis was based on the psychological distance literature and construal theory (Spence et al., 2012; Trope & Liberman, 2010) that suggests that individuals who feel psychologically near to the problem will construe and discuss issues differently those who feel distanced from the problem. We found that a higher proportion of focus groups distant to Lake Erie indicated there was a lack of information about water quality than those groups held near Lake Erie. This suggests that the local media may not be covering the algal blooms in locales upstream
from the lake. Even though these communities are within the Maumee River Watershed, they, and the media, may not see the connection between their community and Lake Erie’s problems. If this connection were being made, one would expect the participants in focus groups distant from the lake to have an easier time finding information about the algal blooms.

A higher proportion of focus groups near to Lake Erie expressed concern about a lack of enforcement of regulations than groups held more distant from Lake Erie. This corresponds well to the psychological distance literature. Individuals living near Lake Erie are more likely to bear the costs of algal blooms in the form of impaired drinking water and recreation opportunities. Therefore, being psychologically “nearer” to the problem would be expected to result in increased concern about regulations not being enforced. Individuals living upstream, and who are more psychologically distant, from Lake Erie are less likely to bear the direct costs of the algal blooms and would be less likely to be concerned about whether regulations were being enforced.

However, we found that individuals living both near and distant to the lake attributed the algal blooms to similar sources of nutrient pollution. While communities physically and psychologically near the lake tended to be more concerned about the enforcement of regulations and felt they had more access to information, it seems that they still perceived the problem similarly to those more distant from the problem. In other words, while the near and distant focus groups may differ in how closely they felt the problem would impact them, it seems that they are still largely seeing the “same” problem being caused by the same set of issues.
Our findings, that the publics within the Maumee River Watershed largely view Lake Erie’s algal blooms similarly, have implications for how communicators and policy makers present the issue to the public. From our results, there appears to be relatively consistent beliefs about the causes of harmful algal blooms and potential solutions. In particular, it does not appear that rural individuals oppose increased regulation any more than urban individuals. We did not find that rural focus groups were “anti-regulation” and urban focus groups were “pro-regulation.” Rather, participants in both types of focus groups discussed the role that agriculture plays in creating algal blooms and had more nuanced views of the issue and different concerns regarding additional regulations. However, we did not present the participants with alternatives, rather just asked them to talk about the issue. Our result could be very different if we had asked them to rank different alternative policies. Therefore in communicating about the problem and policies to address the problem, policy makers and natural resource professionals may want to avoid using simple “anti-regulation” or “pro-regulation” frames. Rather, these messages and communication efforts should be framed to address the concerns that local communities have about how new policies will be implemented, how regulations will be enforced and where they can get more information about the issue and proposed policies. Additionally, some communities have had more experience with the blooms, or bear the direct costs of the blooms. Communication efforts should reflect this. For example, we found that participants living distant from Lake Erie felt that they lacked general information about the blooms while those near to the Lake were concerned about regulations not being enforced. Communicators and professionals in communities
upstream from Lake Erie could focus on educating people on the blooms and where they could find additional information. Natural resource professionals in communities near Lake Erie may not need to educate people about what the blooms are, as these individuals are likely already familiar with the problem. Rather they could focus their efforts on communicating about how policies are implemented and how regulations are being enforced. Similarly, many of our participants in urban groups expressed that they felt there was a lack of leadership in addressing the blooms. Natural resource managers in these communities could help members of the public, or local government, become more involved in the issue. However, government leadership and motivation was not noted as a strong need in the rural focus groups. Therefore, it may not make sense for managers in these communities to try to address a need for leadership. Rather they may wish to focus on the technical side of implementing best management practices and the effectiveness of such practices.

Therefore, while communicators may not need to frame communication differently between groups living near and distant from the lake, they may need to spend extra effort in producing and providing information for residents upstream within the Maumee River Watershed.

3.5 Conclusion

Algal blooms threaten Lake Erie’s productivity. They have also raised general concerns about the region’s water quality and environmental health. Public opinion and perception is an important consideration when crafting communication campaigns or
public policy to address water quality issues. However, public perception is a difficult concept as there are often numerous different “publics” within any one area. Therefore, understanding how different groups view and discuss an issue can be important when attempting to find a socially acceptable (or supportable) solution to an environmental problem.

Within the Maumee River Watershed, individuals participating in a series of focus group discussions held a variety of different views and opinions about water quality. Many expressed concerns with the water in the streams and Lakes as well as concerns about their drinking water quality. Agriculture was seen as the primary contributor to the problem, however, participants also talked about how wastewater treatment and run-off from residential lawns and urban areas also contributed to water quality issues.

Understanding how the public (or different publics) views environmental problems and the proposed solutions to these problems can help advise natural resource managers and policy makers about which solutions might receive the most public support. Often, managers and conservationist speak in terms of a singular “public” (for example, “public opinion” or “public support”). However, there are many different segments of the public that can act as individual “publics.” Communication efforts will be more effective if they are framed to correspond to the concerns and needs of these different “publics.” For example, we found that those living in urban areas felt a need for more leadership and government involvement in addressing water quality problems. However, those in rural areas tended to be less concerned about government provided leadership and more concerned about individuals circumventing existing regulations.
Natural resource professionals will have a more successful time in communicating with these groups if they are able to address these concerns directly, rather than treating the whole watershed as a uniform population with the same views and concerns.

Our results indicate that when it comes to water quality, there are nuanced differences in the ways different groups view policies to address the algal blooms. While they saw a similar set of issues (wastewater, agriculture, urban run-off, etc) contributing to the problem, there were subtle differences in how they viewed the role of government in addressing and providing initiatives to address the blooms. Therefore, an understanding of the different expectations of different publics and perceptions of the role of government and management may help agencies and managers better address the needs and expectations of different constituent groups.

References


Abstract

How an individual perceives him or herself may influence the way that they perceive a wide variety of social issues. Substantial literature in social and cognitive psychology examines how values and identity influence how an individual makes decisions about engaging in a particular behavior. Identity Theory examines how a set of Identity Standards, or norms, related to a specific identity influence an individual’s decision to adopt a behavior or practice. Here, we apply Identity Theory to farmers in the Maumee River Watershed to see if a conservationist farmer identity explains whether individuals are willing to support or adopt conservation behaviors, or Best Management Practices (BMPs) to reduce nutrient run-off from their fields. The results of our Structural Equation Model indicate that a farmer’s identity was a significant predictor of whether a farmer adopts a BMP, as well their beliefs about the efficacy of such behaviors. It appears that identity is a significant component that motivates the way individual farmers think about BMPs as well as whether they choose to adopt such practices.

4.1 Introduction

During the Dust Bowl of the 1930’s, farmers and conservationists worked together to develop best management practices (BMPs) to reduce soil erosion. This interest in promoting such best management practices has continued to this day and has
been broadened to address additional issues including prevention of non-point source pollution of waterways (Ice, 2004). Such is the case for agricultural communities in northwest Ohio, southern Michigan and northern Indiana that form the Maumee River Watershed, the largest contributing watershed to Lake Erie. Lake Erie is the most biologically and economically productive of the Great Lakes; however, this productivity is increasingly threatened by Harmful Algal Blooms (HABs) caused by phosphorus run-off from agricultural fields (ODA et al., 2013; OEC, 2014; OEPA, 2010). The toxicity of HABs not only poses health risks to those recreating in the lake, but also to large urban centers, such as Toledo, Ohio, as demonstrated by the Toledo Water Crisis in early August 2014 when the HABs impacted the drinking water of half a million people. Additionally, eutrophication and algae also pose a threat to the region’s multi-billion dollar sport fishing and tourism economy (OEC, 2014).

In the case of the farmers in the Maumee River watershed, farmers may bear significant costs in adopting BMPs designed to reduce erosion and nutrient pollution. However, unless a critical mass of others also adopt BMPs, the benefits are likely to be negligible. Moreover, many of the ultimate benefits of the BMPs (such as improved water quality) would likely accrue to others such as those who live downstream (in the case of the Maumee River Watershed, urban residents of Toledo), other farmers regardless of whether they have adopted the BMPs, or others with important connections to the lake. This raises the question of why individual farmers should voluntarily adopt costly practices when the benefits of such work will accrue to others who may not incur the costs of adopting these practices?
Any campaign to address Lake Erie’s Algal blooms through voluntary adoption of BMPs must confront this question. Addressing this question requires a full understanding of how farmers perceive the costs and benefits of adopting BMPs. Many of the financial costs and benefits of BMP adoption (like cost of equipment and investment of time and land) can be assessed through economic variables. However, there are also psychological and cognitive costs and benefits that may motivate farmer decision-making that need to be assessed as well.

One of these psychological motivations is a desire to reduce cognitive dissonance and ensure one’s behavior is consistent with his or her identity. The desire to reduce cognitive dissonance is one of the strongest psychological motivations (Axsom & Cooper, 1985; Balcetis & Dunning, 2007; Egan et al., 2007; Festinger, 1962; Gawronski & Strack, 2004; Thøgersen, 2004). I hypothesize that individual farmers will have a desire to make management decisions that align with his or her beliefs about what constitutes a “good farmer” (McGuire et al., 2013). Thus, to reduce cognitive dissonance between a farmer’s identity and his or her beliefs about BMPs, a farmer will be motivated to select behaviors that are consistent with his or her identity as a good farmer. Therefore, a farmer’s motivation to adopt BMPs can be influenced by the physical and practical costs of adopting a BMP (the cost, time, effort or land needed to implement the practice) as well as by the desire to avoid dissonance between his or her past and future behavior and his or her identity of what constitutes a good farmer. Factoring in this psychological and cognitive motivation will provide a more complete perspective of a farmer’s willingness to adopt BMPs.
Identity Theory provides a framework for examining how individuals reduce cognitive dissonance between their behavior and identity in decision-making. It is one of several theories that posits that identity, or how an individual perceives him or herself, can be an important influence on beliefs and behavior (Stets & Biga, 2003; Stets & Burke, 2000; Stryker & Burke, 2000). Essentially, Identity Theory hypothesizes that an individual has a number of salient roles and identities at any given moment. Each of these identities has an “identity standard” or a collection of norms that are related or tied into the identity (Stets & Biga, 2003). This identity standard is used to help an individual to guide his or her behavior. In the case of farmers, Identity Theory posits that individual farmers will have a set of norms, or expectations, about what constitutes a “good farmer” (McGuire et al., 2013). This set of norms serves as the identity standard. When making decisions about conservation practices, a farmer will use this standard to guide his or her behavior. For example, if preserving soil and land health is part of one’s “good farmer” identity standard, he or she will be more likely to adopt conservation practices than if conservation was not part of his or her identity.

Identity Theory has been applied to environmental issues by Stets & Biga (2003) to examine how an individual’s identity with his or her gender predicts environmental behavior. Identity Theory has also been used to examine conservation identities among farmers in Iowa and how these identities translate into water quality and nutrient management behaviors (Arbuckle & McGuire, 2014; Burton, 2004; McGuire et al., 2013). McGuire et al. (2012) used surveys and interviews to examine whether Identity Theory provides a model for examining farmers’ support for agricultural BMPs. They
developed a set of “Good Farmer” identity scales that measure an individual’s perception of various components of what constitutes a good farmer. Essentially, borrowing from Identity Theory, this scale measures various identity standards that farmers may hold about how a farmer ought to do, or his or her expectations of what a good farmer believes and how he or she behaves. Two identities identified by McGuire et al. (2013) that are presumed to be salient to farmers as well as to mitigating HABs are the “productionist” and “conservationist” identities. Rather than being exact measurements of an individual farmer’s behavior, the productionist and conservationist identity scales attempt to measure what broad and general goals and priorities different types of farmers believe are consistent with being a “good” farmer. Therefore, the scales measure social perceptions (or “norms”) of what a farmer “ought” to do, or what type of behavior is “expected” of a good farmer (rather than what type of behavior do they actually engage in). Farmers identifying with the productionist standard tend to be primarily concerned with producing a high yield from their fields. Farmers identifying with the conservationist standard have a strong concern with maintaining the land and preserving soil and water quality.

We hypothesize that the “good farmer” identities will be influential in explaining how individuals perceive BMPs and their support for adopting BMPs. We expect a significant positive relationship between the conservationist identity scale and whether farmers perceive BMPs to be effective at reducing run-off. We are interested in effectiveness due to prior literature that suggests that an individual’s perception of a practice’s effectiveness is an important predictor of whether he or she adopts the practice (Wilson, Howard, & Burnett, 2014). We also expect a strong positive relationship
between the conservationist identity scale and farmers’ willingness to adopt BMPs. We do not expect a significant relationship between willingness to adopt BMPs or farmers’ perceptions of BMP effectiveness for the productionist identity scale, as BMPs promoting conservation should be less salient to individuals strongly identifying as productionists as these individuals should be more focused on yields than on conservation.

The above hypotheses (summarized in Figure 4.1) examine the role that identity plays in how farmers perceive BMPs. As a farmer may perceive BMPs to be effective at reducing run-off, but might not be willing to adopt the practices for other factors (such as cost or whether it is practical to implement the practice in a given field), we also examine perceptions about how effective BMPs are at reducing run-off. This allows us to examine whether farmers believe these practices have the potential to address nutrient pollution. In this model, productionist and conservationist identity standards predict a farmer’s perception of how effective BMPs are at reducing phosphorus run-off and how willing a farmer is to adopt BMPs (controlling for a range of socio-demographic variables including age, education and experience as well as farm characteristics like the number of acres and type of crops. We test this model using Structural Equation Modeling (SEM) with data collected from farmers in the Maumee River Watershed.
Figure 4.1: “Good Farmer” Identities and Motivated Reasoning of Best Management Practices

Our hypothesized model of identity driven socially motivated reasoning among farmers. Conceptually, we hypothesized that conservationist and productionist identities explain farmers’ beliefs in the effectiveness of BMPs (how effective practices are at reducing phosphorus run-off) and willingness to adopt BMPs. The conceptual model was tested using SEM (Figure 4.2).

4.2 Methods

The Maumee River Watershed was chosen as the study area as the Maumee River is the main source of phosphorus coming into the western Lake Erie basin (phosphorous from agricultural fertilizers has been identified as the primary contributor to HABs in Lake Erie) (ODA et al., 2013; OEPA, 2010). Contact information for 7,500 farmers living in the Maumee River Watershed was purchased from a private vendor (Farm Market ID). Additionally, we set a threshold of 50 acres to be the minimum farm size to be included in the sample. Survey design and data collection followed the Tailored Design Method described by (Dillman, Smyth, & Christian, 2009). An incentive of $1
was mailed with the surveys. More information on the survey can be found in the project’s technical report (Wilson, Burnett, Ritter, Roe, & Howard, 2013).

Farmers were asked to indicate their likelihood of adopting a set of BMPs recommended by state agencies working to reduce nutrient run-off (see: ODA et al., 2013; OEPA, 2010). These BMPs were further refined through expert review by agronomists, state extension specialists, and a series of focus groups on water quality in the watershed (from the focus groups discussed in Chapter 3). We attempted to match the wording of our BMP items with the way that they are being discussed by the literature. To get this level of specificity, some of the wording for our BMP items might be less clear to a lay audience; however, given their first-hand experience and the prevalence of these practices within the region, farmers were familiar with these practices. Given this approach, the results from our items can be easily applied to specific BMPs being discussed by agencies and managers in the region. The full set of items, along with a brief description is presented Table 4.1.

Table 4.1 Description of BMPs

<table>
<thead>
<tr>
<th>BMP (As Presented to the Respondent)</th>
<th>Description (Not Presented to Respondent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid soil sampling with variable rate application</td>
<td>Some equipment allows farmers to vary the amount of fertilizer applied. This allows farmers to apply fertilizer where needed rather than applying at the same rate for an entire field.</td>
</tr>
<tr>
<td>Planting cover crops after fall harvest</td>
<td>Cover crops help hold the soil in place and prevent erosion and run-off. They can also incorporate excess nutrients (as tissue matter) left over after the fall harvest.</td>
</tr>
<tr>
<td>Delaying broadcasting when the forecast predicts a 50% or more chance of at least 1 inch of total rainfall in the next 12 hours</td>
<td>Avoiding applying fertilizer when prior to a rain event prevents the rain from washing nutrients off of the field.</td>
</tr>
</tbody>
</table>

Continued
Table 4.1 Description of BMPs (Continued)

<table>
<thead>
<tr>
<th>BMP (As Presented to the Respondent)</th>
<th>Description (Not Presented to Respondent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Managing field water levels with drainage management systems</td>
<td>A farmer can manage the amount of water (and the associated run-off) leaving a field by using a drainage management system, such as tile drainage.</td>
</tr>
<tr>
<td>Avoiding winter or frozen ground surface application of phosphorus</td>
<td>After harvest, fields are often exposed during the fall and winter. Precipitation, or snowmelt, can wash exposed soil and nutrients into the watershed.</td>
</tr>
<tr>
<td>Avoiding fall application of phosphorus</td>
<td>Regular soil testing can inform a farmer about how much fertilizer he or she needs to apply. This prevents excess from being added.</td>
</tr>
<tr>
<td>Determining rates based on regular soil testing once within the rotation (or every 3 years)</td>
<td>Incorporation, or injection of the fertilizer below the surface of the soil, prevents it from being washed off a field during a rain event.</td>
</tr>
<tr>
<td>Placement of fertilizer at least 2-3 inches below the soil surface</td>
<td>Regular soil testing can inform a farmer about how much fertilizer he or she needs to apply. This prevents excess from being added.</td>
</tr>
<tr>
<td>Following soil test trends to maintain the agronomic range for phosphorus in the soil (15 to 30 ppm)</td>
<td>Having a trained professional apply fertilizer can ensure that the proper amount of nutrients is applied in the correct places, which can prevent nutrients from accumulating and washing off into the watershed.</td>
</tr>
<tr>
<td>Requiring a 4-R certification program for private applicators</td>
<td></td>
</tr>
</tbody>
</table>

Farmers were asked whether they had already adopted the BMPs, or if they would be willing to do so in the future (measured on a scale of 0 “will never adopt” to 3 “definitely will adopt”, with farmers who have already adopted the BMP assigned a score of 4). These responses were used to assess a farmer’s support for BMPs.

Farmers were also asked to rate how effective they believed each BMP would be at reducing nutrient run-off. Response options ranged from 0 (“not at all” effective) to 4 (effective “to a great extent”). These responses were used to assess a farmer’s belief about the effectiveness of BMPs.
Respondents were presented with a series of 12 items (see Table 4.3) assessing the “Good Farmer” identities developed by researchers at Iowa State University (Arbuckle & McGuire, 2014; Burton, 2004; McGuire et al., 2013). These items assess what a good farmer “ought” to do, and effectively measure the strength of different identity standards that contribute to an individual’s identity as a good farmer. Five items are standards associated with a “productionist” identity where a “good” farmer is concerned with food production and profitability while seven of the items are associated with a “conservationist” identity where a “good” farmer is concerned with protecting the environment. In our study, we used these items to form two different scales, one for a productionist identity and another for a conservationist identity. Used this way, the identities are not mutually exclusive; therefore, a farmer could score highly on both the conservationist scale and the productionist scale. Assigning farmers a score for both identity scales avoids the problem of having to arbitrarily assign a farmer to one or the other identity as well as allowing for including both the productionist and conservationist identity latent variables in the SEM analysis.

In addition to the above measures, farmers were also asked a series of socio-demographic questions as well as a set of items inquiring about characteristics of their farm as controls such as number of acres in production, age of farmer, farm income and off-farm income. Risk tolerance (labeled: risk), which we assessed by averaging how willing they are to take day-to-day risks, risks with their investments and risks in their occupation as a farmer, where 0 indicated he or she was not willing to take risks and 10 indicated that he or she was very willing to take risks.
Data was analyzed using IBM SPSS Version 22 for Macintosh and the Statistical Package R. We calculated standard descriptive statistics (e.g., means, standard deviations etc.) (Hayes, 2005; Howell, 2010). Confirmatory Factor Analysis (CFA) and Structural Equation Modeling (SEM) were used to examine the relationships between variables and to test our stated hypotheses. CFA and SEM use factor analysis and multiple regression to test hypotheses about the relationships between different variables; however, CFA and SEM offer advantages beyond traditional multiple regression as they allow for the analysis of more complex relationships between multiple dependent as well as independent variables. Additionally, CFA and SEM allow for the use of latent variables, derived from factor analysis of observed variables, in the structural model. A latent variable is a variable that cannot be directly measured or observed, such as a psychological concept like identity. Instead, responses to survey items are used to generate an estimation of the variable. CFA is one method of estimating a latent variable from individual survey items. The CFA model assumes that there is an underlying latent variable (or multiple underlying variables) that is responsible for the variance in a set of closely related items. It uses matrix algebra and regression to estimate this latent variable based on the shared variance between the individual items. This is superior to assessing a latent variable by averaging the items as it allows researchers to partition shared variance due to the errors for individual items (when averaging the items, each item contributes the same amount to the group average; however, in factor analysis, the contribution of each item is adjusted based on how well it predicts the latent variable.) While a CFA can serve of an analysis in and of itself, for this study, it was used to generate measures of the
latent variables for the two farmer identities, beliefs about the efficacy of BMPs and willingness to adopt BMPs. SEM, a form of regression based on a set of matrices of covariance between items, was used to examine the relationships between the latent variables assessed by CFA. CFA and SEM methodology followed standard accepted practices discussed in Schuacker & Lomax (2010) and were completed using the R package LAVAAN.

4.3 Results

Over 2,000 farmers completed and returned the survey. The CFA analyses produced latent variable measures for the four latent variables (willingness to adopt BMPs, beliefs about the effectiveness of BMPs, and the two farmer identities) with acceptable fit indices. The SEM analyses revealed a significant relationship between the two conversation identities and beliefs about the effectiveness of BMPs and a significant relationship between the conservationist identity and support for adoption of BMPs.

Survey Response and Demographics

Out of the 7,500 surveys sent to farmers, 2,019 usable surveys were returned for an adjusted return rate of 27%. The sample was almost entirely male (97.8%) with a mean age of 59 years old. Farm sizes were at least 50 acres in size and ranged from 0 to 7,000 acres planted with corn (median of 100 acres) and 0 to 5,000 acres planted with soybeans (median of 120 acres). Regarding income, 16.7% of the respondents reported earning less than $50,000; 20.5% reported earning $50,000 to $99,999; 27.8% reported earning $100,000 to $249,999; 15.9% reported earning $250,000 to $499,999; and 19.2%
reported earning over $500,000. On the 1 to 10 scale of risk tolerance, the average response was near the midpoint at 5.12 (with a standard deviation of 2.15) indicating that farmers, on average, were not eager to take risks, but also not risk averse. Comparison of our sample data with the agricultural census data for the region (USDA, 2012) indicated that our sample overrepresented farmers whose annual income exceeded $500,000 as well as males. Therefore, while the results of the survey can be used to examine the relationships between the identity constructs and beliefs about BMPs, care should be taken in generalizing the results to small farms.

*CFA of Support for BMP Adoption Latent Variable*

The second phase of the analysis examined how identity predicted perceptions of BMPs. Items measuring whether an individual was willing to adopt the different BMPs were combined with self-reported adoption of BMPs (Table 4.2), where 0 = will never adopt, 1 = unlikely to adopt, 2 = likely to adopt, 3 = definitely will adopt, and 4 = already adopted the behavior. Incorporating fertilizer (injecting fertilizer into the soil so it can not be washed off the surface by precipitation) was the BMP with the highest average score (mean = 3.63) while the BMP associated with requiring a 4-R certification program for private applicators had the lowest average score (mean = 1.82). However, it is important to point out that these items were assessed before legislation was passed in the state of Ohio, (where most of the watershed is located) requiring such certification processes, therefore the average for this particular item has likely increased.

The primary objective of the CFA was to examine whether the items provided an acceptable measure of the latent variable for a farmer’s adoption of BMPs. The factor
loadings for all the items were significant in the CFA analysis to estimate the latent variable for BMP adoption (Table 4.2). This indicates that all of the items tested are acceptable to include in the measure of the latent variable. The fit indices were within, or very near to, acceptable (Schuacker & Lomax, 2010) thresholds (CFI = 0.86; GFI; 0.94; RMSEA = 0.09; SRMR = 0.05) and allowing the error measures for different items to correlate with one another further improved the model fit (CFI = 0.99; GFI; 0.99; RMSEA = 0.04; SRMR = 0.02). The default in SEM modeling assumes that the items being used to assess a latent variable are independent and unrelated. However this is often not the case as the items are often very similar and one would expect that they would overlap and be subject to similar errors. Allowing the errors to correlate is a common practice of SEM modeling (Schuacker & Lomax, 2010) and allows the resulting SEM model to reflect the expected overlap and generally improves the fit of the model. The software package LAVAAN is not able to handle missing data. Therefore, due to incomplete surveys (a farmer not answering all of the BMP questions) the program removed about 600 observations from the analysis through list-wise deletion. Future analyses could use data imputation to address missing data. However, we did not use imputation for this analysis, as the sample size was quite large even with the missing data.
Table 4.2: Descriptive Statistics and Confirmatory Factor Analysis of Willingness to Adopt BMPs

<table>
<thead>
<tr>
<th>Behavior Description</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Factor Loading</th>
<th>Std. Error</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid soil sampling with variable rate application</td>
<td>2.483</td>
<td>1.137</td>
<td>1.000</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Planting cover crops after fall harvest</td>
<td>1.959</td>
<td>1.148</td>
<td>1.134</td>
<td>0.117</td>
<td>p &lt; 0.001</td>
</tr>
<tr>
<td>Delaying broadcasting when the forecast predicts a 50% or more chance of at least 1 inch of total rainfall in the next 12 hours</td>
<td>2.752</td>
<td>1.151</td>
<td>1.457</td>
<td>0.113</td>
<td>p &lt; 0.001</td>
</tr>
<tr>
<td>Managing field water levels with drainage management systems</td>
<td>1.915</td>
<td>1.277</td>
<td>0.827</td>
<td>0.083</td>
<td>p &lt; 0.001</td>
</tr>
<tr>
<td>Avoiding winter or frozen ground surface application of phosphorus</td>
<td>3.144</td>
<td>1.107</td>
<td>1.886</td>
<td>0.141</td>
<td>p &lt; 0.001</td>
</tr>
<tr>
<td>Avoiding fall application of phosphorus</td>
<td>2.433</td>
<td>1.308</td>
<td>1.501</td>
<td>0.128</td>
<td>p &lt; 0.001</td>
</tr>
<tr>
<td>Determining rates based on regular soil testing once within the rotation (or every 3 years)</td>
<td>3.230</td>
<td>1.057</td>
<td>1.382</td>
<td>0.095</td>
<td>p &lt; 0.001</td>
</tr>
<tr>
<td>Placement of fertilizer at least 2-3 inches below the soil surface</td>
<td>3.632</td>
<td>1.246</td>
<td>1.217</td>
<td>0.104</td>
<td>p &lt; 0.001</td>
</tr>
<tr>
<td>Following soil test trends to maintain the agronomic range for phosphorus in the soil (15 to 30 ppm)</td>
<td>2.973</td>
<td>1.099</td>
<td>1.107</td>
<td>0.091</td>
<td>p &lt; 0.001</td>
</tr>
<tr>
<td>Requiring a 4-R certification program for private applicators</td>
<td>1.821</td>
<td>1.245</td>
<td>1.314</td>
<td>0.095</td>
<td>p &lt; 0.001</td>
</tr>
</tbody>
</table>

Notes: CFI = 0.985; GFI = 0.992; RMSEA = 0.044; SRMR = 0.021
Behavior was rated on a scale of "0" (will never adopt), "1" (unlikely to adopt), "2" (likely to adopt), "3" (definitely will adopt), "4" (have already adopted).
Due to missing data, 2142 out of the total of 2764 observations were used.
Error Correlations for several items were correlated.
* Item was fixed to 1.00 to anchor latent variables.
CFA of Farmers’ Beliefs about the Efficacy of BMPs

The average of all the BMP efficacy belief items, except one, were between 2 and 3 on a scale of 0 to 4 where 0 indicated the practices were not effective and 4 indicates that the practice was very effective (Table 4.4). The one exception was requiring a “4-R” certification program for private applicators which had an average rating of 1.4 on the scale of 0 to 4, indicating, on average, respondents thought this BMP would be “a little” to “somewhat” effective. The primary objective of the CFA was to examine whether the items provided an acceptable measure of the latent variable measuring beliefs about the effectiveness of BMPs. The factor loadings for all the items were significant in the CFA analysis to estimate the latent variable for BMP Beliefs (Table 4.3). This indicates that all of the items tested are acceptable to include in the measure of the latent variable. The fit indices were within, or very near to, acceptable thresholds (CFI = 0.91; GFI; 0.94; RMSEA = 0.09; SRMR = 0.05) and allowing the error measures for different items to correlate with one another further improved the model fit (CFI = 0.99; GFI; 0.99; RMSEA = 0.02; SRMR = 0.01).
Table 4.3: Descriptive Statistics and Confirmatory Factor Analysis of Beliefs about BMP Efficacy

<table>
<thead>
<tr>
<th>Practice</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Factor Loading</th>
<th>Std. Error</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid soil sampling with variable rate application</td>
<td>2.310</td>
<td>1.019</td>
<td>1.00*</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Planting cover crops after fall harvest</td>
<td>2.528</td>
<td>1.033</td>
<td>1.033</td>
<td>0.049</td>
<td>p &lt; 0.001</td>
</tr>
<tr>
<td>Delaying broadcasting when the forecast predicts a 50% or more chance of</td>
<td>2.642</td>
<td>0.997</td>
<td>0.991</td>
<td>0.045</td>
<td>p &lt; 0.001</td>
</tr>
<tr>
<td>1 inch of total rainfall in the next 12 hours</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Managing field water levels with drainage management systems</td>
<td>2.219</td>
<td>1.001</td>
<td>1.077</td>
<td>0.049</td>
<td>p &lt; 0.001</td>
</tr>
<tr>
<td>Avoiding winter or frozen ground surface application of phosphorus</td>
<td>2.971</td>
<td>1.007</td>
<td>1.072</td>
<td>0.047</td>
<td>p &lt; 0.001</td>
</tr>
<tr>
<td>Avoiding fall application of phosphorus</td>
<td>2.215</td>
<td>1.131</td>
<td>1.067</td>
<td>0.052</td>
<td>p &lt; 0.001</td>
</tr>
<tr>
<td>Determining rates based on regular soil testing once within the rotation (or every 3 years)</td>
<td>2.770</td>
<td>0.935</td>
<td>1.031</td>
<td>0.048</td>
<td>p &lt; 0.001</td>
</tr>
<tr>
<td>Placement of fertilizer at least 2-3 inches below the soil surface</td>
<td>2.561</td>
<td>0.981</td>
<td>1.050</td>
<td>0.050</td>
<td>p &lt; 0.001</td>
</tr>
<tr>
<td>Following soil test trends to maintain the agronomic range for phosphorus in the soil (15 to 30 ppm)</td>
<td>2.663</td>
<td>0.908</td>
<td>1.026</td>
<td>0.046</td>
<td>p &lt; 0.001</td>
</tr>
<tr>
<td>Requiring a 4-R certification program for private applicators</td>
<td>1.438</td>
<td>1.166</td>
<td>0.960</td>
<td>0.049</td>
<td>p &lt; 0.001</td>
</tr>
</tbody>
</table>

Notes: CFI = 0.997; GFI = 0.997; RMSEA = 0.021; SRMR = 0.011
Due to missing data, 2514 out of the total of 2764 observations were used
Error Correlations for several items were correlated
* Item was fixed to 1.00 to anchor latent variables
CFAs of the Good Farmer Identities

On average, respondents rated three items on the productionist identity scale as being somewhat important or important while they rated two items of the scale as being less than “slightly important” (Table 4.4). All of the items in the conservationist identity scale had average ratings above the “somewhat important” threshold and most had average ratings of “important” (Table 4.4). Overall, respondents tended to score higher on the conservation good farmer identity scale than the productionist good farmer identity. The primary objective of the CFA was to examine whether the items provided an acceptable measure of the latent variable measuring beliefs about the effectiveness of BMPs. The factor loading for the Confirmatory Factor Analysis estimating the latent variables for productionist identity and conservationist identity were all statistically significant. This indicates that all of the items tested are acceptable to include in the measure of the two latent variables. The fit indices for the CFA were all within acceptable ranges (CFI = 0.92; GFI; 0.92; RMSEA = 0.09; SRMR = 0.06) and allowing the errors of the items to correlate with one another improved the fit of the model to acceptable levels (CFI = 0.97; GFI; 0.97; RMSEA = 0.06; SRMR = 0.04).
Table 4.3: Descriptive Statistics and Confirmatory Factor Analysis of “Good Farmer” Identity

<table>
<thead>
<tr>
<th>Item</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Factor Loading</th>
<th>Std. Error</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Productionist Identity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A good farmer is one who has the highest yields per acre</td>
<td>2.046</td>
<td>1.068</td>
<td>1.00*</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>A good farmer is one who gets their crops planted first</td>
<td>0.898</td>
<td>0.981</td>
<td>1.306</td>
<td>0.200</td>
<td>p &lt; 0.001</td>
</tr>
<tr>
<td>A good farmer is one who has the highest profit per acre</td>
<td>2.423</td>
<td>1.102</td>
<td>2.180</td>
<td>0.324</td>
<td>p &lt; 0.001</td>
</tr>
<tr>
<td>A good farmer is one who has the most up-to-date equipment</td>
<td>0.977</td>
<td>0.938</td>
<td>1.619</td>
<td>0.248</td>
<td>p &lt; 0.001</td>
</tr>
<tr>
<td>A good farmer is one who uses the latest seed and chemical technology</td>
<td>2.298</td>
<td>1.051</td>
<td>2.631</td>
<td>0.402</td>
<td>p &lt; 0.001</td>
</tr>
<tr>
<td><strong>Conservationist Identity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A good farmer is one who considers the health of waterways that run through or along their land to be their responsibility</td>
<td>2.921</td>
<td>0.803</td>
<td>1.00*</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>A good farmer is one who minimizes soil erosion</td>
<td>3.140</td>
<td>0.721</td>
<td>0.992</td>
<td>0.029</td>
<td>p &lt; 0.001</td>
</tr>
<tr>
<td>A good farmer is one who minimizes nutrient runoff into waterways</td>
<td>3.023</td>
<td>0.779</td>
<td>1.095</td>
<td>0.031</td>
<td>p &lt; 0.001</td>
</tr>
<tr>
<td>A good farmer is one who thinks beyond their own farm to the social and ecological health of their watershed</td>
<td>2.854</td>
<td>0.855</td>
<td>1.433</td>
<td>0.047</td>
<td>p &lt; 0.001</td>
</tr>
<tr>
<td>A good farmer is one who maintains or increases soil organic matter</td>
<td>3.030</td>
<td>0.798</td>
<td>1.197</td>
<td>0.039</td>
<td>p &lt; 0.001</td>
</tr>
<tr>
<td>A good farmer is one who manages for both profitability and minimization of environmental impact</td>
<td>3.093</td>
<td>0.767</td>
<td>1.960</td>
<td>0.039</td>
<td>p &lt; 0.001</td>
</tr>
<tr>
<td>A good farmer is one who puts long-term conservation of farm resources before short-term profits</td>
<td>2.906</td>
<td>0.828</td>
<td>1.105</td>
<td>0.036</td>
<td>p &lt; 0.001</td>
</tr>
</tbody>
</table>

Notes: CFI = 0.966; GFI = 0.971; RMSEA = 0.056; SRMR = 0.038
Response options were "0" (not important at all), "1" (slightly important), "2" (somewhat important), "3" (important), and "4" (very important)." Due to missing data, 2269 out of the total of 2764 observations were used. Error Correlations for several items were correlated.
* Item was fixed to 1.00 to anchor latent variables.
Structural Equation Model Results

A structural equation model (SEM) was used to examine whether the “Good Farmer” productionist and conservationist identities explained variance in the beliefs about the efficacy of BMPs and support for the adoption of BMPS (Figure 4.2). Several of the fit indices for the initial model were outside of acceptable ranges (CFI = 0.80; GFI = 0.84; RMSEA = 0.07; SRMR = 0.06). Allowing the errors to correlate, a common acceptable practice in SEM to account for overlapping measures (Schuacker & Lomax, 2010), improved the fit indices to acceptable thresholds (CFI = 0.95; GFI = 0.95; RMSEA = 0.04; SRMR = 0.04). SEM uses a series of covariance matrices to predict the model the user specifies using the measures from the independent variables in the dataset. It then compares the output of this model with the matrices and dependent variable measures from the actual dataset. The fit indices compare how closely the model “fits” the actual data. If the fit indices are acceptable, it indicates that the proposed model specified is an acceptable representation of the data.

In the SEM model, both productionist identity (β = 0.16; std. error = 0.05; t-value = 3.54; p-value < 0.01) and conservationist identity (β = 0.64; std. error = 0.04; t-value = 17.80; p-value < 0.01) explained a significant amount of variance in an individual’s beliefs about the efficacy of a BMP. The latent variable measuring beliefs about the efficacy of the BMPs had an $R^2$ of 0.419 indicating that approximately 42% of the variance in beliefs in the model was accounted for by the two identity measures (Figure 4.2).
The conceptual model (Figure 6.1) was tested using SEM. Coefficients and p-values from the SEM analysis are displayed. The final fit indices of the SEM model were within acceptable ranges (CFI = 0.95; GFI = 0.95; RMSEA = 0.04; SRMR = 0.04).

For the latent variable measuring adoption of BMP behaviors, conservationist identity explained a significant amount of variance ($\beta = 0.46$; std. error = 0.04; t-value = 12.12; p-value < 0.01) but productionist identity was not a significant predictor ($\beta = 0.03$; std. error = 0.04; t-value = 0.70; p-value = 0.48) of BMP adoption in the model (Table 17). The model explained approximately 22% ($R^2 = 0.215$) of the variance in the latent variable measuring the willingness to adopt BMPs (Figure 4.2).

Several controls (age of farmer, farm income, number of acres planted in corn and number of acres planted in soy) and a measure assessing how much tolerance for risk a
farmer had were added as controls to the same SEM model described above (Figure 4.2). Farm income ($\beta = 0.03; \text{std. error} = 0.01; t$-value $= 3.66; p$-value $< 0.01$), age of the farmer ($\beta = 0.01; \text{std. error} < 0.01; t$-value $= 3.73; p$-value $< 0.01$) and tolerance for risk ($\beta = 0.03; \text{std. error} = 0.01; t$-value $= 4.12; p$-value $< 0.01$) were significant predictors for the productionist identity. Farm income ($\beta = 0.02; \text{std. error} = 0.01; t$-value $= 2.47; p$-value $= 0.01$), age of the farmer ($\beta = 0.01; \text{std. error} < 0.01; t$-value $= 4.43; p$-value $< 0.01$) and tolerance for risk ($\beta = 0.06; \text{std. error} = 0.01; t$-value $= 9.00; p$-value $< 0.01$) were also significant predictors for the conservationist identity. Together, these variables explained 10.6% of the variance in the productionist identity variable and 6.7% of the variance in the conservationist identity variable. When included, the fit indices of the SEM model remained within acceptable thresholds (CFI = 0.92; 0.93; 0.04; 0.06). However, adding these variables lowered the amount of variance explained in the variable measuring a farmer’s belief of the efficacy of BMPs and the variable measuring a farmer’s adoption of BMPs. The $R^2$ of the belief variable dropped to 0.382 from 0.419 while the $R^2$ of the adoption variable dropped to 0.198 from 0.215. Additionally, due to missing data, the number of observations in the model dropped to 1,793 with the inclusion of these variables.

4.4 Discussion

Our SEM model tested the conceptual model of the Good Farmer Identities and Motivated Reasoning of BMPs (Figure 4.1) and resulted in several interesting points. First, we discuss the relationship between the farmer identities and farmer beliefs about
the efficacy of BMPs. Second, we discuss the relationship between the farmer identities and farmer support for the adoption of BMPs. Third, we discuss the implications of our model for communication efforts aimed at promoting BMPs. Fourth, the limitations to using a motivated reasoning model are discussed.

Relationship of Identities to Beliefs of BMP Efficacy

Based on the results of the structural equation model, farmer identity, as assessed by the “Good Farmer” scales, does explain a significant amount of variance in farmer’s beliefs and behaviors or behavioral intentions associated with nutrient management BMPs. As hypothesized, there was a significant positive relationship between the conservationist identity scale and BMP efficacy beliefs. Contrary to our hypothesis, the productionist identity also had a significant positive relationship with BMP efficacy beliefs. One possible explanation for this is that several of the items used to assess the productionist identity scale could also overlap with the conservation behavior. For example, the items “A good farmer is one who has the most up-to-date equipment,” and “A good farmer is one who uses the latest seed and chemical technology” were included in the productionist identity scale. Both of these items are focused on a farmer’s willingness to adopt new technologies to increase yields and efficiency. However, in addition to being more efficient and increasing production, this technology can also help reduce the environmental impact of farming. Many of the BMPs we examined require the use of new technology to reduce run-off. These items in the productionist scale assessed the willingness of a “good farmer” to adopt recent technology, but they did not preclude use of this technology to reduce nutrient run-off. Therefore, to the extent that views about
the adoption of technology are embedded in the productionist scale, this may explain why the productionist scale explained variance in beliefs about how effective the BMPs were.

The fact that both identities were significant predictors of BMP efficacy beliefs indicates that the social norms associated with these identities influence not only whether farmers are willing to adopt such practices but even their perceptions about the effectiveness of such practices, independent of whether or not they intend to adopt the practice. The fact that norms and identity influenced perceptions about the efficacy of practices suggests that farmers may be engaging in a form of “socially motivated reasoning” about how effective the BMPs are based on how strongly they identify as conservationists. However, the fact that productionists also predicted some of the beliefs about the BMPs is surprising. More research needs to be done to examine how conservation practices and beliefs are considered by farmers who identify as productionists.

While both identities were predictive of farmer’s beliefs in the efficacy of BMPs, the coefficient of the relationship between the conservationist identity scale and BMP efficacy beliefs was much greater than the coefficient of the relationship between the productionist identity and beliefs about the efficacy of the BMPs. Therefore, even though both identities were significant predictors, it appears the conservationist identity has the greater impact on efficacy beliefs.

*Relationship of Identities to Support for BMP Adoption*

We found that only the conservationist identity was significant in predicting whether farmers are willing to adopt BMPs. This supports our hypothesis that individuals
who identify themselves as a good farmer, and identify a good farmer as being a conservationist, are more likely to support the adoption of BMPs.

We found that the two identity scales explained over 40% of the variance of a farmer’s belief in the effectiveness of BMPs but only 20% of his or her willingness to adopt the BMPs. How a farmer identifies as a productionist or conservationist is a significant, but only partial, predictor of how he or she views adoption of BMPs. Other cognitive factors such as political ideology may explain more variance in adoption of BMPs. However, non-identity based cognitions are likely to be important as well, such as a farmer’s experience with the practices (or related practices) and his or her view of new technologies. Finally, practical concerns such as cost and feasibility will also play an important role in deciding whether or not to adopt a behavior.

Implications for BMP Communication and Promotion Campaigns

Our results have implications for those who are interested in promoting BMPs among farmers. Information may fall on “deaf ears” if it is not framed in a way that aligns with an individual’s identity. A commonly held assumption is that individuals will adopt a behavior and behave in a conservation minded, or socially desirably, way if they had more information about an issue and behavior (Hansen, Holm, Frewer, Robinson, & Sandøe, 2003; Sturgis & Allum, 2004). In this case, the assumption would be that farmers would adopt BMPs if they are provided information that describe water quality problems and BMPs. The assumption that farmers, or individuals in general, will change their behavior if they “only knew better” has been encapsulated in the Knowledge Deficit Model (Ajzen, Joyce, Sheikh, & Cote, 2011; Hansen et al., 2003; Heeren et al., n.d.;
Sturgis & Allum, 2004). However, this model has been increasingly criticized for not incorporating existing social psychological research examining the relationship between knowledge and behavior (Hansen et al., 2003). These critiques argue that those who wish to educate the public about environmental issues and to promote conservation behaviors need to incorporate psychology to frame these issues in a way that aligns with their audience’s values, attitudes, and affiliations. Our study adds to the data that suggests that knowledge alone is often insufficient to influence behaviors as the concept of “identity” strongly influenced beliefs about and willingness to adopt nutrient management BMPs. When making decisions about their behavior, farmers are likely not only assessing how a potential BMP may fit into the physical and financial structure of their farm, but also how the practice will fit into the social and cognitive structure of what they believe constitutes “good” farming behavior. Therefore, individuals who desire to promote BMPs in the Maumee River Watershed would benefit from acknowledging that the adoption of BMPs is partly a social, cognitive process. In other words, simply providing information about BMPs may not be the most effective way to promote practices. Instead, to address the normative influence on BMP adoption, this information should be embedded in a narrative that corresponds to an individuals’ identity. Managers and conservationists can highlight how an individual’s neighbors and other “good farmers” in the region are adopting these practices. Additionally, this information should come from trusted sources within the community. Groups in the Maumee River Watershed region, such as The Fertilizer Institute (see: https://www.tfi.org/) and The Ohio State University’s Field to Faucet program (http://field2faucet.osu.edu/reduce-nutrient-runoff), have already adopted
some of these communication strategies in the brochures and pamphlets promoting responsible fertilizer use.

Another implication from the results is that the different identities had different effects on the efficacy beliefs and willingness to adopt these BMPs. For example, we found that both identity scales were associated with a positive increase in the beliefs about how effective BMPs are. However, only the conservationist scale had a significant impact on the actual adoption of BMPs. This suggests that information reinforcing either type of farmer norms may be effective at changing the perceptions of BMPs in terms of effectiveness; however, making the conservationist identity norm salient would likely be more effective at increasing adoption of these BMPs irrespective of perceived efficacy. If the goals of communicators are to change the perceptions about a certain practice, it may be possible to do this by framing a message in a way that appeals to a wide variety of farming identities. However, if the goal is to actually change behavior, communicators may have to emphasize on a particular identity focusing on conservation, and the importance of acting on such an identity.

Limitations to Our Model

Our model has several limitations. First of all, we had to use a combined measure of willingness to adopt BMPs and self-reported adoption of BMPs. This was done to create a continuous scale for inclusion in the structural equation model. However, it does introduce some error into the measure because it does not include the extent of adoptions of BMPs. For example, we did not differentiate between farmers who adopted the BMP on one field versus farmers who adopted the BMP across their whole farm. While our
survey did ask farmers to estimate the number of acres that they conducted the BMP on, these items had very high levels of non-response and therefore had to be dropped from analysis. Future research may benefit from a more sophisticated measure of behavior or willingness to adopt BMPs, or measures that do not rely on self-reports.

Another limitation is the representativeness of our sample. Farmers in the Maumee River Watershed may have a different perception of water quality and phosphorus run-off due to the many problems with algae in local water bodies as well as Lake Erie. BMPs and related policies have been strongly promoted in the Maumee River Watershed due to concerns about the algal blooms in Lake Erie. Therefore, water quality and conservation may be more salient topics to farmers in our study than in other watersheds. A conservationist identity may be more prevalent in our sample than in other areas. The fact that our sample rated the conservationist identity items fairly highly relevant to productionist identity items supports this observation as other studies have found that the productionist identity is often stronger than the conservationist identity in found by McGuire et al. (2014) among Iowa farmers. Therefore, it could be that the relationship between the conservationist identity and beliefs about BMPs we observed in the Maumee River Watershed are stronger than would be observed in other areas.

Another area for future research is the concept of “identity salience,” or how strongly an individual identifies with a specific identity (Stets & Biga, 2003; Stets & Burke, 2000). In our study, our goal was to test the relationships between Good Farmer Identities and perceptions about BMPs and adoption of BMPs. We did not test how salient farmer identities were to individual farmers relevant to other identities. Like any
individual, farmers belong to many different types of social groups (political, religious, family, community organizations, sports team allegiances etc.) with which they identify. It would be interesting to examine how an individual’s identity as a “good farmer” compares with the other ways he or she may identify themselves. It would also be interesting to examine how competing or overlapping identities, and the norms associated with these identities, influence behavior.

While more research remains, our analysis provides preliminary evidence to support the hypotheses that farmer identities influence perceptions and behaviors associated with conserving soil and water quality. As algal blooms and other concerns related to non-point source water pollution are increasingly becoming more of an issue across the globe, the Maumee River Watershed may serve as a good model for future conditions in other communities.

4.5 Conclusion

In deciding whether to voluntarily adopt a BMP, a farmer has to weigh the costs and benefits of adopting the practice. Some of these costs and benefits are psychological; a farmer may be motivated to adopt a practice to reduce the cognitive dissonance between his and her behavior and his or her identity as a good farmer. We found evidence that farmers may be engaging in socially motivated reasoning where social identity explained a significant amount of the variance in both behavior and beliefs about the efficacy of BMPs. A conservationist identity was significantly related to willingness to adopt BMPs while both a productionist and conservationist identity was significantly related to an
individual’s beliefs about how effective BMPs were at reducing phosphorus. These findings highlight the importance of understanding the role that social psychology can play in addressing conservation, natural resource and agricultural issues. Such work will advance theoretical research into the role that cognitive processes, such as identity and motivated reasoning, have on behavior as well as develop the link between agricultural science and social psychology. In addition to theoretical advancement, such research also provides valuable lessons that can be applied to conservation and the promotion of best management practices. Promoters of BMPs may benefit from an increased understanding of how individuals engage in motivated reasoning by making sure their messages and communication campaigns correspond to farmers’ identities. It appears that the social psychological research lends more credence to the popular phrase of “it’s not what you say, it’s how you say it.”

References


Chapter 5: Identity Politics and Implications for Environmental and Natural Resource Decision-Making and Communication

5.1 Summary

Lake Erie’s algal blooms present many problems that natural resource managers will need to address to ensure safe water for drinking and recreation. In addition to dealing with the physical and ecological problems posed by algae, natural resource managers and policy makers also need to consider the social problems associated with the blooms. Namely, they will have to navigate the many different perceptions about the problem and policies to address the blooms that are held by various stakeholders and members of the public.

Public perception and support for environmental policies is complicated by the fact that individuals are motivated to perceive environmental problems in a way that aligns with pre-existing cognitions such as values and identity. The way that the public perceives an issue can also be influenced by their support for policies to address that issue as well as how the media frames problems and policies.

In the case of Lake Erie’s algal blooms, we examined how individuals living in the Maumee River Watershed perceived and reasoned about water quality. In Chapter 2, we examined how the media framed Lake Erie’s algal blooms, and how the Toledo Water Crisis acted as an agenda-setting event. This assessment revealed that the media has framed algal blooms as primarily a drinking water problem and a health issue. This aligns
with the findings from climate change communication scientists (see Maibach et al., 2010; Myers et al., 2012) who have argued that people demonstrate more concern and interest in environmental problems when they are portrayed as a health issue.

Our analysis also indicated that the media primarily portrayed the algal blooms as being caused by agricultural and urban run-off. However, the Lake Erie Phosphorus Task Force (ODA et al., 2013; OEPA, 2010) has identified agricultural run-off as the primary cause of Lake Erie’s algal blooms. Therefore, there is evidence that the “false-balance” phenomenon is occurring in the media coverage of Lake Erie’s algal blooms. This “false-balance” portrayal may lead individuals to perceive the algal blooms as being an “urban” problem as much as an “agricultural” one. This can be problematic when trying to raise support for policies to address the problem and who should bear the costs for addressing the blooms.

The articles also portrayed a number of possible responses to Lake Erie’s algal blooms. The most common one mentioned was some sort of policy, legislative process or political campaign response to the blooms. By discussing these responses to the algal blooms, these articles emphasize the political and policy context of the blooms potentially associating the issue with partisan political beliefs and biases and increasing the difficulty of reaching consensus on a path forward. Even a bi-partisanship approach may alienate the public, many of which are apathetic or distrustful of politics in general. Considering that the disapproval rating of the U.S. Congress is above 80% (Gallup, 2016) even associating an issue with any type of partisan politics may lead individuals to perceive it negatively.
One limitation with the study was that as a media content analysis, we only examined how the media framed and portrayed the issue. We did not examine how media coverage of the blooms influenced public perception. However, the focus group study presented in Chapter 3 provided an assessment of the way different publics perceived and discussed the algal bloom issue. Future research could examine how the themes present in the media coverage are reflected in the focus group discussions. Overall, there were many more similarities than differences both in urban and rural responses as well as those from participants near and those distant from the lake. Sewage wastewater and agriculture were mentioned as the biggest contributors to water quality problems. The fact that individuals from both urban and rural focus groups perceived the sources of water quality problems similarly supports the more recent literature (Alm & Witt, 1995; Arcury & Christianson, 1993; Jones et al., 2003; Foster & McBeth, 1996; Freudenburg, 1991; Jones et al., 1999; Lowe & Pinhey, 1982) that there are not significant differences between urban and rural perceptions of environmental problems.

We did find subtle differences in how they viewed society’s response to the problem. For example, urban residents were more likely to perceive a lack of leadership in addressing water quality problems. We also found that rural focus groups discussed how individuals would “go around” or not follow regulations. Urban individuals discussed the need for leadership and initiative in organizing society to address water quality problems. However, rural focus groups discussed how such regulations would not be effective if individuals act in their own self-interest and go around the regulations. Such results correspond to Lowe and Pinhey’s (1982) findings that urban residents may
be conditioned to look for “social” solutions to environmental problems while rural
individuals may be conditioned to focus on individual responses.

Likewise, we hypothesized, based on the psychological distance literature and
construal theory (Spence et al., 2012; Trope & Liberman, 2010), that individuals living
upstream in the Maumee River Watershed would feel more psychologically “distant”
from Lake Erie than individuals living near the lake and that this might impact the way
that the different groups perceived the algal bloom problem. We found that a higher
proportion of focus groups distant to Lake Erie indicated there was a lack of information
about water quality than groups held near Lake Erie, and a higher proportion of focus
groups near to the lake were concerned about a lack of regulatory enforcement than
groups held more distant from Lake Erie.

Chapter 4 looked at how one of sector of the public, farmers and agricultural
producers, specifically viewed Best Management Practices (BMPs) designed to curb
nutrient run-off. We specifically examined how different farming identities, one based on
conservation and the other on production, explained variance in farmers’ beliefs about the
efficacy of BMPs and his or her willingness to adopt BMPs. While both the productionist
and conservationist identities were predictive of farmer’s beliefs in the efficacy of BMPs,
the conservation identity was a much stronger predictor of BMP efficacy beliefs than the
productionist identity. As expected, there was no significant relationship between the
productionist identity scale and the farmers’ adoption of BMPs.

These findings indicate that the social norms serving as identity standards for
farming identities influence not only whether farmers are willing to adopt such practices,
but even their perceptions about how effective such practices are, independent of whether or not they intend to adopt the practice. Additionally, communication will be more effective if the information comes from a source that aligns with the target audience’s identity.

5.2 Conclusions and Implications

Understanding how different individuals and sectors of the public conceptualize Lake Erie’s algal blooms can help natural resource managers and policy-makers craft socially acceptable policies to address the problem. The three studies presented here have several implications for water quality policies in the Maumee River Watershed. Additionally, the results also contribute to the research on motivated reasoning and decision making in regards to environmental and natural resource policy. First, in discussing the issue, many individuals have portrayed the algal bloom issue as a case where farmers feel blamed for the issue and are against regulations to address the problem. We did not find evidence to support this. Rather, we found in our focus groups and survey that many farmers were supportive of environmental policies and practices to address the algal blooms. Second, our findings suggest it will be very difficult to portray the algal blooms in an apolitical light. When discussing the algal bloom issue, those interested in communicating about the problem, or promoting BMPs, should be prepared to discuss the politics surrounding the problem. Finally, the differences in the way individuals perceive the problem will have important implications in including the public in natural resource management. Each of these implications is discussed further below.
Communicating about Farmer’s Role in Addressing the Algal Blooms

Many people in the Maumee River Watershed have expressed concerns that the media and policy-makers have unfairly targeted farmers and blamed them for the algal blooms. For example, in a recent survey among farmers on their views of the limitations to adopting BMPs several farmers wrote such concerns in the comment section of the survey (Wilson, Roe, Zubko, Heeren, in preparation):

“What is the city of Toledo going to do to clean up their sewage issues? This is not just an agriculture issue, they also contributed to the problem, probably more than was given in the media coverage.”

“Really feel that there are other sources of this problem...other than just farmers. We feel unfairly targeted sometimes!!”

“Now we [farmers] are being asked to ""clean"" up lake Erie when we are not even sure we are causing the problems.”

“Look at other sources of your problem in Lake Erie like the city of Toledo dumping their human [waste] down to the Lake before you blame the farmers for everything…Don't blame the farmer for everything.”

“Awareness is a great asset to the situation however we need to look at the whole picture and not blame just the farmer when every individual is the cause of the problem.”

However, the results from the three studies present a different picture. We did not find any evidence that the media was framing the blooms as a problem requiring additional regulation of agriculture. If anything, there may have been a false-balance bias in the media that overemphasized the role of urban pollution and run-off. In the second study, we did not find that rural groups were “anti” regulation and urban groups “pro” regulation. Rather, we found that participants in both urban and rural focus groups discussed many of the same causes of algal blooms. They had slightly differing views
and concerns about the ways to address the blooms, but these views were more nuanced than being “anti” or “pro” regulation. Finally, in the third study, we found that multiple identities associated with farming and agriculture were actually positively related to beliefs about the efficacy of BMPs, while a conservationist identity was held strongly among the farming population and was positive related to adoption of BMPs.

Based on these results, the perception that farmer’s are being blamed, or targeted, by policy-makers and the media is not an accurate picture of the views of many of the individuals living in the Maumee River Watershed (although the above survey comments show that this idea is strongly held by some within the watershed). This has several implications for those communicating about the issue.

First of all, in discussing their work, or when being interviewed by journalists, managers and policy makers should be less concerned about “blaming” agriculture and resist the urge to attribute the blooms to both agriculture and urban run-off. As discussed in Chapter 2, this can contribute to a false-balance bias. It also promotes the belief that agriculture is being unfairly blamed.

Second, when discussing BMPs with farmers, the results from Chapter 2 and 3 indicate that communicators can focus on the specific concerns farmers have about how regulations will be enforced and how policies will be implemented. Discussions about the specific concerns about regulations and enforcement will be more productive and effective than more general discussions about the need for regulations and government involvement. The focus groups and SEM model indicate that many farmers are supportive of new regulations. Additionally, most of the farmers who are not supportive
seem to object to regulations because they are concerned about whether regulations will be effective in solving the problem, not because they object to government intervention to address water quality problems.

*Portraying the Blooms as a Political Issue*

Natural resource professionals and communicators often strive to portray environmental problems in a non-partisan, or apolitical, light. This is done to try to avoid bias or the environmental problem becoming politically charged. However, it does not appear that such an approach is practical for Lake Erie’s algal blooms. Rather than attempting to downplay the politics and partisanship of the issue, managers and communicators should manage the politics of the issue and make sure that the issue is salient to as many audiences as possible within the watershed.

Therefore, it may not be practical for managers and communicators to downplay the political significance of the blooms, or attempt to “defuse” the situation. It seems individuals and the media already perceive the problem in a political light. Instead of trying to remove politics from the issue, managers and communicators will have to learn how to manage different political and social identities and affiliations. On a local level, this can be done by ensuring that communication and outreach methods are framed to address the concerns, and identities, of local farmers and residents. For example, when talking with residents of Toledo, communicators could focus on how policies will be enforced as this was a concern brought up often in the city’s focus groups. This will be more difficult on a regional or national scale, as messages have to appeal to a wide variety of audiences. In such cases, messages can perhaps be framed so that they are
relevant and salient to a wide array of audiences with different identities and different values. The public health frame discussed in Chapter 2 is one such frame that may be useful in communicating about the need to address nutrient run-off and algal blooms.

**Implications for Involving the Public in Decision Making**

In the later half of the twentieth century, natural resource policy-makers began to emphasize public participation in environmental and natural resource management (Fiorino, 1989; Kennedy & Thomas, 1995; Tipple & Wellman, 1989). This was in response to a “crisis of public confidence” regarding public institutions (Fiorino, 1989) as well as legislation requiring government institutions to better incorporate the public into decisions (Chess, 2000). However, the scientific and technical complexity of environmental problems often makes it difficult for the public and non-experts to be involved in natural resource management. Managers and policy makers are often challenged to include the public, who are largely uninformed about the scientific and technical aspects of natural resource and environmental problems, in natural resource management and environmental policy (DeLeon, 1995; Fiorino, 1989; Parkins & Mitchell, 2005). Not having the expertise and scientific knowledge about these issues, the public is motivated to make decisions about which policies to support based not on the problem itself, but on how the issue and policies are framed and how this framing aligns with their social and cognitive needs (diagramed in Figure 1.1 and Figure 1.2). Therefore, involving the public in natural resource decision-making requires the management of these different social and cognitive elements, such as values and identity as well as a wide array of social affiliations.
Social science on how different individuals perceive and reason about environmental issues can help managers and natural resource professionals more effectively include the public in managing environmental and natural resource problems. For example, content analyses, like the one in Chapter 2, can identify what information is available to the public, and how the information is being framed. Understanding what information the public has, and what perspective they are bringing to the table will help improve discussions between professionals and members of the public.

Focus groups, such as those discussed in Chapter 3, can identify differences in opinions about the problems and policy among different segments of the public. Such work provides a qualitative perspective of public opinion that is not gained from surveys or polls. Focus groups can not only identify different concerns the public might have about an issue or policy, but can also reveal concerns or issues that experts or professionals might not be aware of beforehand.

Finally, survey and modeling, like that in Chapter 4, can help identify the role that cognitive concepts and psychological needs have in decision-making about an issue. For example, the work in Chapter 4 suggests that an individual’s identity of what makes a good farmer can be predictive of whether he or she will adopt BMPs. Such identities may also lead an individual to become involved in conservation and natural resource issues. A farmer who believes that conservation is an important part of his or her identity may be motivated to join a conservation group or work with the soil and water district to address concerns. Understanding these cognitive and psychological needs provides a fuller
explanation of behavior than just examining the economic costs and benefits of adopting BMPs.

Overall, understanding how individuals form perceptions about environmental problems, such as Lake Erie’s algal blooms, will be important in predicting how they will reason about the policies to address such problems. As noted as far back as Alexander Hamilton’s time, motivated reasoning has had an important role in the policy evaluation process. In the case of Lake Erie’s algal blooms, it appears that individuals largely have a nuanced view of the policies to address the blooms. Natural resource and environmental professionals will be better able to include individuals in the decision-making process, and communicate with the public more effectively, if they take into account how individuals reason and perceive environmental problems and policy.

References


140

Wilson, Roe, Zubko, Heeren. (In preparation) 4R Nutrient Survey Technical Report. The Ohio State University, School of Environment and Natural Resources.
Dissertation References


64(3), 482–499.


Rose, K. (2014). The influence of communication for perceptions of smoke emissions and prescribed fires in fire dependent areas. The Ohio State University.


Wilson, Roe, Zubko, Heeren. (In preparation) 4R Nutrient Survey Technical Report. The Ohio State University, School of Environment and Natural Resources.
Appendix: Focus Group Guide

Thank you for participating in this project. This project is designed to develop a better understanding of public views of agriculture, water, and environmental conditions in the Maumee River Watershed. There are no right or wrong answers; I am interested in your ideas.

Each of you has valuable information to share and we appreciate your participation with us today. What we hope to accomplish today is to have a discussion about regional water quality issues. I have a series of open-ended questions that I will ask to help guide the discussion. While you are welcome to respond to one another, please remember to be respectful in your interactions.

If you agree to participate further, please indicate that you understand the purpose of this research and that you are a willing participant by answering “yes”. In order to have a record of this discussion to accompany my notes, I would like to audiotape this discussion. We will remove any personal or identifying information from any transcripts that we produce. However, as we cannot control what other participants may repeat, we cannot guarantee confidentiality and ask that you do not say anything sensitive or reveal any information that you are uncomfortable revealing. Is it okay if I audiotape our discussion? If so, please indicate consent by answering “yes” and signing your name to the consent form (Give time for individual consent).

For questions about the intent of the research and how information gathered today will be used please contact Eric Toman at (614) 292-7313. For questions about your rights as a participant in this study or to discuss other study-related concerns or complaints with someone who is not part of the research team, you may contact Ms. Sandra Meadows in the Office of Responsible Research Practices at 1-800-678-6251.

Introduction
1. Let’s go around the table and introduce everyone. Could you say your first name or nickname and give a brief introduction including a general description of where you live and what you do for a living?

General Water Quality Conditions and Watershed Functions
2. Water bodies like rivers, streams, and lakes may provide different benefits or services to residents. What would you say are the main benefits provided by rivers and streams to you or your community?
3. How would you describe current conditions in nearby rivers and streams?
3. How would you describe current conditions in Lake Erie?
4. How much had you previously thought about issues regarding water quality in nearby rivers? How about for Lake Erie?
6. Scientists often use the term “watershed” when discussing water issues. What does the term watershed mean to you?
7. Where does the water in the nearby rivers/streams go (e.g., where do these rivers/streams go from here? Where do they end)?
   7A. Are the conditions we discussed earlier pretty similar upstream and downstream from here or do they change throughout the length of the river/stream?

**Specific Water Quality Issues**
6. Are there any other water quality issues in your region that you, or others in your community, have noticed?
   6A. What do you think contributes to these issues?

7. If they don’t mention HAB’s: One issue that has been in the news over the last couple of years is Harmful Algal Blooms in Lake Erie. Have you heard about Harmful Algal Blooms?
   7A. What do you know about Harmful Algal Blooms?
   7B. How concerned are you about Harmful Algal Blooms in Lake Erie?
   7C. How much do you think agriculture is contributing to these issues? What practices or aspects of agriculture, if any, do you think are contributing?
   7D. How much do you think cities, or city residents, are contributing to these issues? What aspects of cities or suburbs, if any, do you think are contributing?

**Practices and policies**
8. Are current policies or practices enough to maintain good water quality / protect the benefits you receive from water bodies in your area?

9. What do you think could be done to improve conditions?
   9A. What are some actions that could be taken by society as a whole, or your local government, to improve water quality?
   9B. What are some actions that could be taken by farmers to improve water quality?

10. What are some of the limitations or difficulties of these types of actions?

11. Are you aware of any ongoing programs in your area to encourage these types of actions?
    11A. Do these programs work well? What would make them more effective?

12. Would you support policies that required farmers to adopt practices to reduce their water quality impacts?
    12A. What if these actions would cause the price of food to increase? Would this influence your support?
13. Would you support policies that required municipal areas to improve their water quality over current levels?
   13A. What if these actions would cause the cost of drinking water to increase? Would this influence your support?

Climate Change and Future Conditions
14. Our last set of questions focuses on future conditions in the area. Have you noticed any changes in weather patterns in the region over the last few years?
   14A. What do you think is causing such changes?
   14B. Do you think these changes have any influence on the water quality issues we’ve been discussing today?

15. What do you expect to happen in the future regarding weather patterns?

16. One issue that has been in the news quite a bit is global warming. We are curious about what people living in the area think about this topic. How would you characterize the local sentiment regarding the issue of global warming? Is there general agreement on whether it’s occurring or not?
   16A. How do you think it will affect your area?
   16B. For many people, global warming is a controversial or troubling topic. Why do you think this topic is upsetting to many people?

Conclusion
17. Thank you for your time and thoughts. Before ending is there anything else that people would like to talk about or say that we have not covered yet?