

MANAGING WETLANDS: A COMMUNITY PERSPECTIVE

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ABSTRACT

Increased residential and commercial development threatens wetland functions, particularly near urban centers. This research explores the values and attitudes of residents concerning wetlands, wetland restoration, and development near Fort Wayne and Huntington, Indiana, the location of a large wetland restoration project. Key Informant interviews were conducted to contextualize issues on wetlands, stormwater management, development, and community involvement. Interviews results were used to generate a random sample, multi-county mail survey. Results show that residents find protecting groundwater, green space, and access to clean drinking water very important. Environmental concern is high regarding flooding, development, and water quality. KI's underestimate resident's awareness of water quality issues. A proposed model of significant factors in explaining resident's attitudes towards wetlands includes whether or not they are a farmer, wetland knowledge, well-being, and positive attitudes towards green space and development. This research is unique because the respondents have exposure to wetland areas on a regular basis. Wetlands are highly appreciated and are an important part of the community. There is a fine balance of property rights and pro-conservation attitudes among residents. Future research can explore what conservation specifically means to people and how their views on property rights shape that meaning. Results from this research can aid management decisions that can be either beneficial or detrimental to the wetland and those who depend on it for a variety of needs.

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CHAPTER I. INTRODUCTION

Wetlands provide essential functions related to human and ecological well-being, such as: stormwater runoff storage, water quality improvement, biological activity and wildlife habitat (EPA, 2001). However, increased residential and commercial development, as well as production agriculture on or near land that has historically been compromised through previous ditching and draining efforts, threatens these functions, particularly in wetlands near urban centers (Barnes, Morgan, Roberge & Lowe, 2001). Nearly 85 percent of Indiana's wetlands have been drained or filled in the past century to increase acreage for intensive crop production, as well as, residential and commercial development (Indiana Department of Environmental Management, 2008). Indiana ranks fourth in the proportion of wetland acreage lost among the 50 states (tied with Missouri) (Dahl, 1990). Currently, there are a variety of ways wetlands are being impacted including agricultural activities, residential and commercial development, road building, and water pollution. Due to increased urban sprawl, more wetlands have been lost to urban development between 1998-2004 than any other land use nationally (Dahl, 2006).

A large urban wetland in Fort Wayne, IN is the focus of a community restoration project begun by the Little River Wetlands Project (www.lrwp.org). Competing interests and ideas about land use (e.g., agriculture, development, restored wetland) has created tension within the communities surrounding the Great Marsh. Increased development in Allen County (Fort Wayne) has put more and more reliance on the Great Marsh to handle runoff and provide flood protection. The wetland receives too much water to store and drain it all and is overburdened,

resulting in significant amounts of water being pushed downstream to the city of Huntington and Huntington County (B. Yankowiak, personal communication, Sept 22, 2011). Wetland stakeholders (e.g., farmers, urban/suburban residents in Allen and Huntington counties, conservationists, land developers) struggle to find ways to work collaboratively to maintain the wetlands ecological functions, while also providing for the needs of multiple human interests. This research is intended to provide a better understanding of stakeholder needs and interests concerning the wetland. In addition, this research is intended to initiate a dialogue among stakeholders concerning regional and local approaches to wetland management for maximum human and ecosystem benefit.

This research addresses several research questions:

- How do people define wetlands/value wetlands/understand wetland function?
- Are people who live and work near the Little River valley concerned with any of the following: flooding, storm water management, and/or wetland management and if they are how does that influence their values and attitudes concerning wetlands?
- Do farmers have different attitudes and values toward wetlands than non-farmers?
- What influence does distance from the Little River valley have on attitudes and values towards wetlands?

Through the use of KI interviews and a mail survey of the valley region, the objectives of this research were to: (1) identify flooding, storm water management, wetland management, development, and/or land use/management issues associated with the Great Marsh; (2) better understand the perceptions, attitudes, and beliefs of people living and working in areas

proximate to the Great Marsh; (3) better understand attitudinal and value differences that potentially exist between farmers and non-farmers, Allen and Huntington County residents, and other stakeholders within the Litter River watershed concerning land use in areas within and proximate to the Great Marsh.

CHAPTER II. BACKGROUND AND LITERATURE REVIEW

There are many areas in Indiana that have lost wetlands. A large valley running through parts of Indiana and Illinois, the Wabash Valley, is named for the Wabash River (Figure 2.1). The Wabash Valley was once an important trade route and provided game for Native Americans and European Explorers. The Little River, a smaller valley that lies within the Wabash Valley, runs from Fort Wayne, IN to Huntington, IN. The Little River valley was widely utilized by the Miami Nation for fish, game and travel. The marshy expanse of the Little River valley was broken only by a few small islands. This wetland later became known as the "Great Marsh." In the 1870's, when Fort Wayne had grown from a small outpost to a town with a population of over 50,000 people, efforts began to drain the Great Marsh. The rich bottom land was highly desirable for agriculture. The 25,000 acre wetland stretching from Fort Wayne, Indiana to Huntington, was ditched and drained by 1888. Currently, "the Little River valley is primarily a agricultural area, flooding often and bearing little resemblance to the wetland prairie teeming with wildlife that was left by the glacier many years before" (Little River Wetlands Project 2012).

Farming and development throughout the wetland valley, between Fort Wayne and Huntington, has significantly reduced the size of the wetland, further compromising its ability to provide flood protection and handle stormwater runoff. In addition, the population in Allen County has increased 18 percent since 1990 (U.S. Census Bureau, 2010). As a result, stormwater runoff has significantly increased, overburdening the drained wetland's water storage

capabilities and leading to excessive runoff in downstream communities (EPA, 2001; B.

Yankowiak, personal communication, Sept 22, 2011). In 2005, the Little River Wetlands Project,

a local conservation group recently began purchasing land within the watershed with the goal of

restoring it to its original ecological function (Figure 2.2).



Figure 2.1 The location of the Wabash River in Indiana and Illinois, USA. The Little River is located just SW of Fort Wayne, connected to the Wabash River. (Musser, 2008)

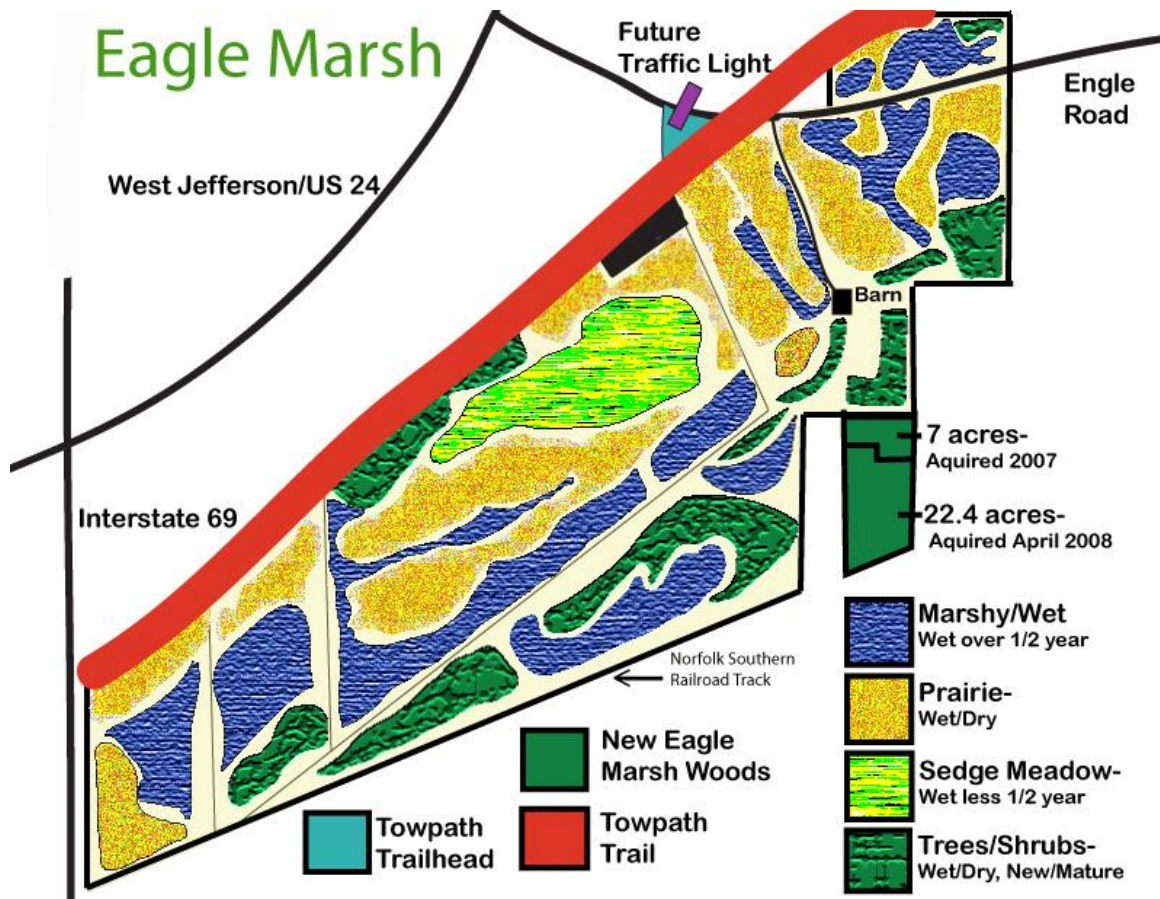


Figure 2.2. Eagle Marsh, a 716 acre wetland preserve within the Great Marsh valley, restored by the Little River Wetlands Project. (Little River Wetlands Project, 2013)

In addition to these structural challenges, the literature identifies a wide spectrum of values and attitudes that community members attach to wetlands and wetland management in general, for example as a rare and treasured ecosystem (Davenport et al., 2010; Kaplowitz & Kerr, 2003; Johnson & Pflugh, 2008). Values and attitudes about land management inform stakeholder's behavior, often resulting in a patchwork of management strategies that lack organization (Wondolleck & Jaffe, 2000). For example, some residents view wetlands as a scourge, promoting breeding of disease-bearing mosquitoes. For others, wetlands provide excellent recreational opportunities (e.g., birding and hiking) and with that, increased property values due to proximity to a natural area. From the agricultural spectrum, farmer's attitudes

toward wetlands depend on income from their land, the size of their farm, the economic incentives to conserve, and their educational background (Jones, Cocklin & Cutting, 1995; Kabii & Horwitz, 2006; Kruetiwiser & Pietraszko, 1986; Yu & Belcher, 2011; Lynne, Shonkwiler & Rola, 1988). What was once a wetland teeming with wildlife and providing essential ecosystem services (e.g., increased capacity for water storage and increased water quality) for human communities is now a hodgepodge of assorted land-uses (e.g., housing developments, row crop agriculture, industrial development) lacking ecological organization. Improved organization of the valley land and its use could increase the area's benefit to residents, surrounding communities, and the ecosystem.

The published literature provides some perspective on local citizen attitudes, farmers' behaviors, and challenges for urban areas with regard to wetlands. There are many studies that focus on the biophysical attributes of wetlands, wetland restoration, and monitoring, but a dearth in studies that focus on the human dimensions of wetlands (i.e., perceptual and attitudinal studies). This literature review will focus on wetland hydrology, farmer behavior, local and urban wetland attitudes, critical analysis and comparison, identifying the significant findings as they relate to this proposed research. Former legislation that permitted the ditching and draining of wetlands will also be discussed along with current Indiana protection practices. The literature introduced here demonstrates the range of stakeholder attitudes and behaviors, which will shed light on stakeholder perspectives on wetlands and wetland management in areas proximate to the Great Marsh. Efforts to restore the hydrologic functions of the Great Marsh will also be reviewed.

2.1 *Legislation Related to Wetlands*

From 1950 to 1970 the Farm Bill included the Agriculture Conservation Program which recognized open ditch drainage as a conservation practice (Hayden, 1990). Increased population and for-profit farming led to the conversion of wetlands to farm land. Once drained, these areas provided productive agricultural lands for growing cash crops. This contributed to a yearly national loss of 550,000 acres of wetlands (U.S.). Essential wetland protection legislation began in 1972 with the passage of the Clean Water Act (Yaich, 2011). The Clean Water Act regulated the dredging and filling of waters of the United States, including wetlands. The 1985 Farm Bill also included conservation programs aimed to slow wetland loss to agricultural conversion (Hayden, 1990).

A national policy of “no-net loss of wetlands” was implemented in 1989 by President George H. W. Bush. With this policy each newly impacted wetland has to be replaced with a wetland of the same size and with similar wetland functions and values. While a positive movement against wetland loss, critics argue that simple ratios of area do not indicate equivalent replacement of functions based on different types of mitigation (creation, restoration, enhancement, or preservation). Each different mitigation type yields different degrees of function and wetland functions expressed by each site can vary greatly (Turner, Redmond, & Zedler, 2001).

In 1990 the Wetlands Reserve Program was created in the federal Farm Bill. This incentive based program offered three options to landowners through the Natural Resource Conservation Service: 1) permanent easement; 2) 30 year easement; or 3) 10 year restoration cost-share agreement (NRCS, 2008). For a permanent easement, USDA pays 100 percent of the easement value and up to 100 percent of the restoration costs. For an easement that expires

after 30 years, USDA pays up to 75 percent of the easement value and up to 75 percent of the restoration cost. USDA pays up to 75 percent of the restoration costs of a cost share agreement, without placing an easement on enrolled acres (NRCS, 2008). In 2011, the USDA signed contracts for 708 permanent easements (140,000 acres), 414 thirty-year easements (59,000 acres) and 16 restoration cost share agreements (963 acres) (NEST, 2011). Indiana specifically has a Wetland Conservation Plan that was adopted in 1996. This plan includes a wetlands definition, goal, guiding principles, conservation priorities and success stories. Its sections cover wetland status, setting direction, the Hoosier Wetlands Conservation Initiative and monitoring and evaluation. As of 2008, the Indiana Department of Environmental Management reported only 3.5 percent of the state's wetlands remain, a mere 15 percent of the state's original wetlands (IDEM, 2008). Indiana is one of seven states that has lost over 80 percent of their original wetlands (Illinois, Missouri, Kentucky, Iowa, California, and Ohio) and 22 states have lost at least 50 percent (Dahl, 1990).

2.2 *Wetland Hydrology*

Successful restoration of the valley running from Fort Wayne to Huntington aims to emulate the original bottomland communities of the marsh. This is done while also adapting to a condition of relative water scarcity. One of the challenges from a lack of a regular source of water flowing into the marsh is that the ditching and channelization has prevented the streams from interacting hydraulically with the surrounding valley bottom (Fleming, 2012). In order to keep water within the marsh, heavy precipitation needs to fall directly on to it. The water that falls directly on the marsh is retained and does not cause flooding problems downstream.

The amount of time a particular part of the marsh remains inundated with water during the course of the year is based on hydraulic properties that are difficult to identify and predict.

Since wetlands allow inundation, various sizes and at different places can complement each other in moderating or preventing floods. Smaller wetlands high in a watershed can temporarily store water to delay or reduce flood peaks. The ability of wetlands to abate flooding depends on several factors: the amount of storage relative to the volume of floodwater, wetland's capacity for evapotranspiration (loss of water by evaporation, and infiltration (absorption of water) (Zedler, 2003). This uncertainty is being addressed by incorporating extensive prairie areas in the former marsh landscape. These plant species are well adapted to large changes in moisture availability. There is a larger proportion of wet prairie in the restored marsh out of hydrologic necessity. Highly diverse mixes of plants are also used to improve success with hydrologic variability. Restoring wetlands is a newer activity, as at one time wetlands were taken for granted and filled without ecological concern.

2.3 Farmer Behavior and Wetlands

The Wetlands Reserve Program promotes the conservation and restoration of wetlands in each state. Landowners tend not to consider WRP funds to be the most important part of their decision to conserve wetlands. According to a study on public attitudes of wetland preservation, the mere presence of a wetland on someone's property was the most important part of their conservation decision (BenDor, Brozovic & Pallathucheril, 2008; Larson, Stevens & Benin, 1996). Conversely, economic incentives, like WRP payments, can be affective by increasing landowner's conservation efforts (Lynne, Shonkwiler & Rola, 1988). In terms of easements, cropland generates the largest easement payment offered on a per acre basis from the Wetland Reserve Program (Shultz, 2005).

Farmers have been draining and ditching wetlands to increase crop production for years. In contrast, as wetland conservation became more popular, so have farmers' willingness

to adopt a conservation program. Reasons that farmers choose to enroll in the Wetlands Reserve Program (WRP) vary. According to Forshay, Morzairia-Luna, Hale, and Predick (2005), the primary reasons farmers chose to enroll in WRP were to protect the environment, economic incentives, and recreation opportunities. The literature suggests that farm size is related to willingness to adopt a conservation program. Farmers with smaller than average farms (less than 250 acres) were thirteen percent more willing to adopt a wetland conservation program than those on larger than average farms (Yu & Belcher, 2011; Raymond & Brown, 2011; Curtis et al., 2000). Land holdings can relate to different socioeconomic variables as well. Research has found that younger, better educated farmers are more likely to notice detrimental environmental effects and are more willing to adopt new techniques that reduce impacts on the environment (Jacobson, Sieving, Jones, & Van Doorn, 2003). Farmers that reported membership in an environmental organization were more likely to adopt conservation practices (Jacobson, Sieving, Jones, & Van Doorn, 2003).

Farmers' conservation attitudes toward wetlands also depend on the income generated from their property. Landowners who obtained 95 percent or more of their income from their landholding were more prone to agree with the statement "Conservation should not limit agricultural activities on private land" (Jones, Cocklin & Cutting, 1995). The amount of income received is a variable as well; studies have found that farmers with a higher income also may show increased adoption of conservation techniques due to greater financial stability (Jacobson, Sieving, Jones, & Van Doorn, 2003). Farmers with a higher proportion of off-farm income are more likely to be highly engaged in conservation practices (Raymond & Brown, 2011). Activities such as grazing, haying, or timbering can be carried out as limited economic uses of wetlands (Lant, Kraft & Gilman, 1995). Similarly, farmers with less than 10 percent of their total property

in wetlands appreciated the water quality functions of wetlands more than landowners with a greater proportion of wetlands (Kreutzwiser & Pietraszko, 1986). The amount of land being conserved is important since farmers are using their land for profit unlike other local residents. Land tenure is also an important factor in farmers' decisions to adopt conservation practices (Soule, Tegene, & Wiebe, 2000). Cash renters are less likely than owner-operators to consider conservation practices such as conservation tillage (Soule, Tegene, & Wiebe, 2000). Share renters tend to behave much like owner operators in adopting conservation practices. The timing of benefits from conservation practices affects decisions about their adoption; delayed benefits make it difficult for landowners to require tenants to adopt practices.

Restoration efforts can be viewed equally negative to farmers. Unlike conservation, restoration changes the existing land use and can be more controversial. Some farmers believe that restoration is designed to impede other land uses in order to financially force them out of the region by making their land and operations unprofitable (Buckley & Crone, 2008). Neighbors to restoration causes tend to think of the worst intentions rather than the best because of uncertainty, high personal consequences, and unfamiliarity with other parties (Buckley & Crone, 2008). Some restoration projects do negatively affect surrounding landowners which creates social constraints to restoration success. Those landholders that are moderately engaged hold seven times the farm area and are more accepting of conservation practices on their farm compared to disengaged landholders (Raymond & Brown, 2011). However, conservation practices need to be presented as benefits to primary production because moderately engaged landholders identify with farming occupation, earn the majority of their income on farm, and believe that conservation programs are incompatible with farm management plans (Raymond & Brown, 2011).

Indiana farmers are of particular importance for this research. A study looking at environmental attitudes was conducted by interviewing 32 central Indiana farmers (Reimer, Thompson, & Prokopy, 2012). A few farmers were more motivated by economics and profits than any type of desire to protect natural resources. Many farmers have implemented conservation practices because it benefits production, and not necessarily out of concern for the environment. Others stated that the only way they would implement certain conservation practices was if the government payments made it worth it. Direct monetary gains or losses were not the only economic factor, but the idea that time is money was most important. The costs of labor and time management associated with various practices were stated in a negative light by farmers focusing the notion of time is money. However, the farmers interviewed felt as though they needed to protect the land that has provided for them. It is important for government agencies, non-profits and other stakeholder to be aware of the different farmers in their area in order to best handle these challenges.

2.4 Local Citizens and Wetlands

Non-farmers hold different values concerning wetlands on their property or within their community. A case study of the Cache River Wetlands in Southern Illinois found that wetlands hold diverse and significant meanings to community members including: a rare and treasured ecosystem, a revered historic and contemporary cultural landscape, and a resource of local economic revitalization (Davenport et al., 2010). All of these things hold importance but can vary in degree to different community members. Connection to the landscape can spark involvement with wetland projects within the community.

In terms of restoration projects, community members' criteria for success may vary from those identified by the project managers (Davenport et al., 2010). Community members

would like project managers to seek their input on all phases of the project. Balancing the influence and input from non-local stakeholders and special interest groups was also important to community members (Davenport et al., 2010). Community members are people not necessarily directly involved in the planning project, but have a local stake in the projects outcome, for example increased flood protection and aesthetic improvements from landscape changes. Through integrating diverse perspectives into the planning process, planners can become more aware of the importance community members play. Community members, in the same respect, can become more aware of the complex trade-offs and decisions that planners have to consider to optimize benefits (Balram & Dragicevic, 2005). Citizen concerns can be addressed early in the process. It is expected that more collaborative participation will occur once residents become aware that conservation spaces can help with citizen well-being and health (Balram & Dragicevic, 2005). Community member satisfaction has a large impact on the continued success of a long term restoration project. This important distinction shows the need for both project managers and community members' ideas to be incorporated into the land management plans.

To better plan freshwater wetland management while incorporating community ideas, community members in New Jersey were surveyed to compare their views on wetlands to local environmental commissioners and officials (Johnson and Pflugh, 2008). While local officials were found to be more knowledgeable about wetlands, local citizens strongly supported preservation. This contradicts a survey of Georgia residents that showed that over 25 percent of residents perceived that the impact of wetlands on nearby property values was negative (Meindl, 2004). Education has also been shown to be an influencing factor in conservation practices. Stakeholders with a higher level of education (high school, college, etc.) valued wetlands more

than those with less education (Kreutzwiser & Pietraszko, 1986). While some perceive negative impacts from nearby wetlands, there are people that overlook economic benefits and support wetland preservation because they believe it is personally important (Johnson and Pflugh, 2008).

Personal importance to individual community members can lead to more communication and discussion about wetland's planning. Community involvement and public participation within projects increases project success (Schindler & Neburka, 1997). With future planning and decision making, the more public participation there is within the community, the more ownership that the public has invested in the project. Increased ownership has the potential to increase project success (Schindler & Neburka, 1997). Community member's ownership can begin with assigning intrinsic value to a restored area.

Winter (2005) suggested that intrinsic value (the value of an existent thing manifested by virtue of its very existence) is an important factor in the way that people conceive natural areas. Intrinsic value can also help explain people's decisions regarding natural areas (Winter, 2005). Conversely, extrinsic value is the value something has only to the extent that it is conducive for something else. Sites perceived to be well-cared for and as a good place to enjoy nature are seen as more attractive to community members (Nassauer, 2004). Attraction to natural sites can increase tourism and interest in the area which can, in turn translate to increased stewardship. In particular, wetland restorations were found to have more success in communities when they are flowery, colorful and able to bring people to areas of open water (Nassauer, 2004).

2.5 *Urban Areas and Wetlands*

Attractive wetlands in urban areas are not as common and overall perceptions of wetlands in urban areas are underrepresented in the literature. In recent decades urban development has been a major threat to wetlands (Weibe, Tegen & Kuhn, 1995). A 1997 USDA survey found that urbanization is partly responsible for wetland loss in nearly all surveyed watersheds and may account for as much as 58 percent of the total wetland loss nationally (Opheim, 1997). Despite these losses and a perceived lack of environmental activities in urban areas, residents have environmental concerns and a strong desire to interact with nature (Kempton, Boster & Hartley, 1995). The restoration of wetlands near urban areas allows for a variety of educational benefits for example, improve public understanding and concern for natural areas (Ehrenfeld, 2000). In urban areas with large population centers, wetlands are likely to receive more visitors than isolated or rural wetlands (Callaway & Zedler, 2004).

A study of wetland owners showed that owners residing in cities of more than 10,000 people are more likely to offer participation in the Wetland Reserve Program than individuals residing in smaller towns (Luzar & Diagne, 1999). Urban residents can be more eager to become involved in restoration activities if the wetland is near where they live and they see it enough to see the results of their efforts (Callaway & Zedler, 2004). Another conservation behavior study showed that stronger attitudes favoring conservation raise the levels of effort towards conservation meaning that the more in favor of conservation someone is the more effort they put into conservation. This suggests stronger attitudes could lessen the dependence on incentive based programs like the WRP (Lynne, Shonkwiler & Rola, 1988). The WRP is helpful for individual involvement, but not as applicable in large community restoration projects. Urban

community restoration projects require a greater effort. Things such as funding, volunteers and overall goals can be managed from multiple sources in an urban restoration project.

Goals in urban wetland restoration often are unrealistic because they do not consider ongoing and large scale human disturbances (Grayson, Chapman & Underwood, 1999). Urban wetlands are particularly susceptible to impacts from adjacent lands because the intensity of land use impact in high density areas is high (Callaway & Zedler, 2004). Another important factor contributing to the challenges of evaluating restoration is the issue of setting appropriate standards where success can be measured (Sudling, 2011). Wetland restoration goals are typically focused on fulfilling specific functions (e.g., provide wildlife habitat and flood protection). Along with the functional components of wetlands there are structural measures such as size, space, and location based on physical attributes.

Wetlands are typically restored to improve their functionality, though often urban wetland restoration success is typically measured structurally (e.g., increased size) (Grayson, Chapman & Underwood, 1999). Structure, as opposed to function, is easier to measure because it only requires a description of what is present at the time. It is assumed that if the system looks “natural” then it will function “naturally.” Although, functional measures require the following of the processes as they occur through time and can take several years to track, for example; hosting interacting populations of wildlife (Grayson, Chapman & Underwood, 1999). It is also difficult to evaluate the success of restoration projects in part because there is usually limited information available. There are few projects that predetermine what will be success criteria and even fewer that quantitatively monitor the outcomes (Sudling, 2011). For this reason wetland restorations require attention long after they are in place and can require community involvement to monitor if the wetland is functioning as desired.

These studies provide insight on landowner and other stakeholders' perceptions and attitudes towards wetlands in urban settings. Stakeholder's behaviors can be compared to their attitudes to see if environmental behavior is an indicator to a positive environmental attitude. The grouping of subjects (environmentalists, farmers, politicians, etc.) is a good way to compare attitudes, but also limits generalizing as individuals can fall into more than one, if not many groups. In order to encourage wetland restoration and land management that benefits multiple stakeholders we need to understand who the Great Marsh stakeholders are and identify their needs. We need more place based research to be conducted in urban/rural communities near wetlands. This research identifies these needs and will add greatly to literature on wetlands in urban and rural locations.

CHAPTER III. METHODS

This was a mixed methods study incorporating both qualitative and quantitative methods. This methodology (i.e., interviews followed by a survey) is used regularly in mixed methods studies and has a proven track record in the natural resources field in identifying salient issues concerning communities and land management/natural resource issues (Flint, 2006; Creswell, 1994; Tashakkori & Teddlie, 2003). The interviews are a qualitative method in this case, allowing open ended questions and the freedom for the interviewer to probe for more clarity. The interviews were helpful to gain an understanding of the most relevant and pertinent issues in the specific communities that would later be addressed in the survey. The survey was a quantitative instrument composed mostly of closed-ended questions with set choices of answers. This method allows for statistical comparisons among respondents. There are limitations with every method of data collection and the use of multiple methods can help neutralize the disadvantages of each method, while promoting their strengths.

3.1 Interviews

Key informant (KI) interviews were conducted with stakeholders including: residents, conservation organizations, surveyors, planners, extension officers and local politicians, in Allen and Huntington Counties in Spring and Summer 2012 (Table 3.1). Key informants were people living and working in and around the Great Marsh and southern Fort Wayne, who possessed a familiarity with the community and have a depth of knowledge about the area's natural assets

and community issues (Elmendorf & Luloff, 2001; Elmendorf & Luloff, 2006). Informants were identified through county and city government websites to initiate contact. Additional informants were identified through a snowball sampling process – KIs nominated others who they believed were knowledgeable about issues surrounding the Fort Wayne to Huntington valley region (Elmendorf & Luloff, 2006). Key Informant interviews are different from random interviews as participants are chosen purposefully. Key informants are identified on the basis of their organization and community positions, and their knowledge of the issue (Bailey, 1994). These interviews are not meant to be statistically sufficient, but are done rather to gather in-depth information about the study topic from people with knowledge about a specific place and the issues involved in that place (Luloff, 1999).

Table 3.1 Summary of Interview Participants

Interviews	Allen County	Huntington County
Geologist	x	x
Land Surveyor	x	x
Environmental Organizations	x	
County Planner	x	x
Stormwater Management	x	
Purdue Extension Office	x	x
Commissioner		x
NRCS Representative	x	x
County Water Resources	x	
Resident	x	

Seventeen key informant interviews were conducted. More interviews were conducted in Allen County. This was due to the city of Fort Wayne, Indiana’s second largest, having more government officials (combined Allen County and Fort Wayne government) and being the home of many environmental organizations. The interviews provided rich data and helped contextualize and identify conflicts and points of agreement related to the wetland through firsthand knowledge (Elmendorf & Luloff, 2001). KIs were conducted until redundant

information was collected and saturation was reached. Related studies using identical methods have identified 15-20 KI interviews per study region is enough to capture a comprehensive perspective (Luloff et al., 2011). Interviews were conducted at key informants places of employment or a public meeting area after contact and setting up via phone with a phone script (Appendix A). Before beginning, interviewees were asked to sign a consent form for their voluntary participation as well as to either allow or not allow recording the interview and if they could be quoted. An interview guide was used with sixteen questions being asked to every interviewee, along with additional follow-up questions if necessary (Appendix B). All questions were open ended and the interviewer was free to probe with more questions to gain clarity. The average interview time was 35 minutes with the shortest being 15 minutes and the longest 60 minutes. Interviews were digitally recorded and transcribed verbatim. Content analysis identified individual units of meaning across the raw data. This allowed for the identification of common themes, values, and issues among the two counties. Common themes were identified based on responses to questions and are supported by quotes.

3.2 *Mail Survey*

The survey was created after carefully looking over the identified themes of the interviews. The survey allowed for broader community input to further explore issues related to the wetlands, for example, land-use, stormwater management, and collaborative land management within the survey target area. The random sample survey was conducted in eight townships (four townships within each county) surrounding the Fort Wayne to Huntington valley region (Allen County - Aboite, Pleasant, Wayne, Lafayette Townships; Huntington County – Huntington, Union, Clear Creek, Jackson Townships) (Figure 3.1). These townships were chosen because the little river watershed is contained within these eight townships and all of the

townships are connected to one another. The residents of these townships live within the closest distance to the large valley area and the largest wetland in the area, Eagle Marsh.

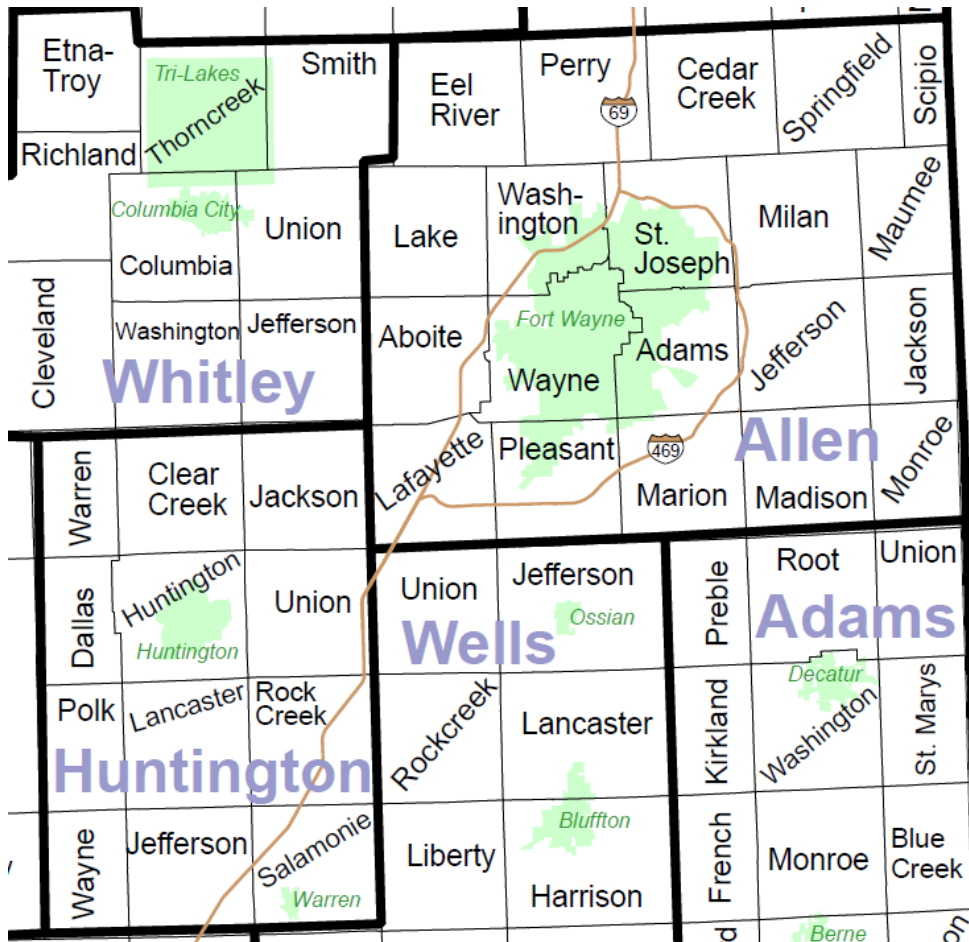


Figure 3.1 Townships in Allen and Huntington Counties (Indiana Business Research Center)

Once the survey was developed, we conducted a pilot test with fifteen citizens who were not included in our sample population. Surveys were distributed to pilot test participants and their opinions solicited concerning survey question wording, survey organization, flow, grammar, and how much time is involved in taking the survey. This pilot test was conducted in November 2012 and helped us identify survey issues and things that could cause confusion for the participants. The corrections and adjustments to the survey based on the pilot test were

addressed and discussed before sending out the first wave of mailings to the actual study population.

3.2.1 Study Participants and Survey Distribution

The survey sample population was generated from GIS data from the eight townships in both counties. Huntington County data was publically available through the county website. Allen County data was only available upon request from the Allen County Assessor's Office Data Administrator. This information provided names and addresses for all township heads of households. The township addresses were combined so that a random sample could be drawn from the entire eight township population. From this population 1900 households were randomly selected using a random number generator in Microsoft Excel. This number was obtained by anticipating a conservative response rate of approximately 20 percent, which is typical in social science research (Dillman, Smyth, & Christian, 2009). We estimated a 15 percent response rate from the first mailing and a 10 percent response rate from the second mailing. These response rates are consistent with the survey literature, specifically surveys with the general public, landowners, and that highlight natural resource related issues (Metcalf et al. 2010; Longmire et al. 2010; Dillman, Smyth, & Christian, 2009).

The population within the eight counties was approximately 166,000, we will need 384 survey responses to say with 95 percent confidence that our sample represents the general population among the eight townships, within +/- 5 percent confidence interval (U.S. Census, 2010; Dillman, Smyth, and Christian, 2009). This is also taking into account an effect size of .5, the most conservative estimate of effects. For example, if 65 percent of the sample population agrees with the statement that more agricultural land should be restored to wetlands, we can say with 95 percent confidence that 60-70 percent of people within the eight townships would

say the same thing. 384 responses divided by our anticipated response rate of 20 percent gives us a sample population of 1,920, which was rounded down to an even 1900 for this survey.

Survey distribution followed a modified Tailored Design Method, developed by Don Dillman and generally regarded as the standard for mail surveys methodology (Dillman, Smyth & Christian, 2009). This method included sending out a questionnaire with an introductory letter followed by a second wave of replacement questionnaires a few weeks later. This was then followed by a postcard. The postcard thanked participants who had responded and asked again for a response from those who had not. The first mailing was sent out to households on Jan 14, 2013. The second mailing was sent out on February 8, 2013. The postcards were sent out on February 18, 2013. The ten page survey (Appendix C) consisted of 22 questions; some consisting of a set of statements to be answered using a 5-point Likert scale. The survey also included a letter which introduced the survey, research goals, and participation information (Appendix D). Included in with the letter and survey booklet was a business reply envelope to mail back the completed survey. There was an initial mailing to the entire sample pool, 1900 households. This was followed by a second mailing with a replacement questionnaire three weeks later to only non-respondents (Appendix E). The postcard was sent to everyone in the sample pool (Appendix F).

3.2.2 Operationalization of Variables

The following is a brief explanation of the questions that help us measure the variables. Socio-demographic variables like education, age, and income have all been shown to hold significance in previous attitudinal studies (Kreutzwiser & Pietraszko, 1986; Jacobson, Sieving, Jones, & Van Doorn, 2003; Jones, Cocklin & Cutting, 1995). We are specifically interested in wetland knowledge as it relates to wetland attitudes. Environmental behavior and well-being

variables are also important to overall environmental attitudes (Lynne, Shonkwiler & Rola, 1988; Balram & Dragicevic, 2005). Lastly, conservation, green space, and development attitudes are important for the context of the study's location. The specific questions used to collect the data are found in Appendix C.

1) Socio-demographic Variables

- Gender in this research is a dichotomous variable: male and female
- Education is measured by highest degree attained beginning with "None" through "Graduate/Professional Degree."
- Age of respondents is measured in years
- Income is measured by total income of respondent's household last year beginning with "Less than \$15,000" to "\$150,000 or more"
- Time in the community measured in years

2) Wetland knowledge

- Respondents familiarity of the major functions of a wetland including wildlife habitat, protecting water quality, reducing flooding, and educational purposes
- Whether respondent believes they know what a wetland is

3) Wetland Attitudes (pro-wetland attitudes)

- Concern about wetland loss in Indiana
- Their community benefits from wetlands
- The visual appeal of wetlands
- The intrinsic value of wetlands
- Wetland areas and farm operations compatibility
- Mosquitoes not increased due to nearby wetlands
- Increased property values related to nearby wetlands

4) Conservation Attitudes (pro-conservation attitudes)

- Land conservation compatibility with agriculture
- Voluntary versus forced conservation
- Wetland areas need conservation or they would be developed
- Whether they benefit from conservation
- Individual property rights and conservation balance

- 5) Development Attitudes (anti-development attitudes)
 - Development puts pressure on sanitation and storm water utilities
 - Development increases community traffic
 - Development increases community noise
 - Development increases hard surface runoff

- 6) Green Space Attitudes (pro-green space areas)
 - More natural resources like Eagle Marsh
 - Green spaces should be added with new developments
 - Views of wildlife and wild areas
 - Importance of visual landscapes

- 7) Well-being from wetlands
 - Wetlands to provide solitude, recreation, birding opportunities, water quality protection, a sense of community, and walking/hiking opportunities

- 8) Environmental Behaviors (pro-environmental behavior)
 - Reduced use of lawn/garden chemicals
 - Watched a show/read a magazine on the environment
 - Stopped by a product because it caused environmental problems
 - Attended a public hearing or meeting about the environment
 - Voted for or against a political candidate, in part, due to their position on the environment

- 9) Importance of Life Issues
 - Low unemployment
 - Affordable college tuition
 - Protecting recreation
 - Quality of life
 - Cost of living
 - Crime prevention
 - Access to clean drinking water
 - Retirement security

3.2.3 *Survey Analysis and Data Preparation*

Survey data was entered into statistical package system SPSS 20.0. Responses were entered into one SPSS file as they were returned. The following are changes to the original data that were necessary in order to conduct the analysis. The ages of respondents were calculated

from their reported year born. In the survey, Question 5 relates to resident's attitudes and knowledge concerning wetlands and reflected both positive and negative tendencies. The negative attitude concepts within this question block were reverse coded so that positive responses were scored higher. This was done on question 5 – B, C, J, L, N, and O. Question 10 relates to resident's attitudes concerning conservation and reflected both positive and negative tendencies. Statements B, F, G, H, I, and N reflected negative tendencies and were also reverse coded so that a positive response elicited a higher score. Lastly, Question 14 relates to attitudes about the landscape of the community reflecting both positive and negative thoughts. Statement E reflected a negative tendency and was reverse coded as well.

CHAPTER IV. RESULTS

4.1 Interview Results

Key informants varied in education level with 11 bachelors, five masters and one high school degree. The oldest key informant was 62 years old, the youngest 36 years old, with an average of 50 years old. Political affiliation was two democrats, six republicans, four independents, and five who chose not to comment.

Ten themes were identified across the interviews following content analysis. These themes are supported with a selected set of quotes from key informants regarding each theme. The key informants had many common statements stating the importance of storm water management and the importance Eagle Marsh for recreational use. The values of the key informants were identified and showed a balance of priorities between storm water management and wetlands; and consistent residential and commercial development and property rights. The themes and interview information informed the creation of the mail survey to 1900 households within eight townships between Allen and Huntington Counties that contain the Fort Wayne to Huntington valley region.

4.2 Interview Themes

Theme 1- Natural Resource Professionals talk about the Great Marsh

KI's were generally aware of the Great Marsh valley. This theme emerged from the opening question of "Do people in the community talk about the Great Marsh?" The area is

popular within the environmental field and has been discussed by county officials for development planning purposes but not discussed outside of that. The idea that people are aware of the valley because of the flood zone area in Roanoke was reiterated by many. A lot of community members do not know what it is or are aware of it at all. It was found immediately that the term “Great Marsh” was not something KI’s were familiar with but rather having to state the valley area that runs from Fort Wayne to Huntington. There is a 600 acre restored area of wetlands called Eagle Marsh and that name was familiar to all of the KI’s.

“It’s not like something that comes up when you’re just talking to people who are not associated with one of the environmental organizations or who don’t live in the valley.”(Geologist)

“I’d say from the general public perspective there’s probably not a lot of discussion about it....I’d say the city and county know a great deal about it and talk about it.” (County Planner)

“The only ones that are really aware of that are the people that are in the flood zone basically up around the Roanoke area...” (Commissioner)

Theme 2- Eagle Marsh is viewed positively for wildlife, water, and aesthetics

While the area is not discussed much in the community, KI’s describe that Eagle Marsh is viewed very positively most notably for birding, hiking, and recreational value. There has been a lot of positive feedback regarding the area views of wildlife and accessibility of trails and no negative comments were reported when asked about the community’s views. Eagle Marsh was also described as the gateway to Fort Wayne for its exposure, presence and the views of it right off of I-69 which runs up to Fort Wayne. It was also noted that a lot of the farmers like seeing the wildlife and trails as well even though wetlands can go against their livelihoods. The value of Eagle Marsh is not looked at positively specifically for being a wetland, but more so the wildlife and nature aspect that it has brought to the community. Aside from the wildlife and the views

which the community has a strong recreational relationship with, it was also noted that Eagle Marsh has been helpful in reducing flooding.

“They [residents] appreciate it cause of the view, and I know someone who’s really excited about the eagles... and so is very appreciative that that’s there now for the eagles and other birds.” (Resident)

“A lot of farmers like to see stuff like that [wildlife] too but for the most part farmers, wetlands kind of go counter to what their trying to farm and make a living.” (NRCS Allen County)

“A lot of times it’s not about the wetland itself but it’s the fact they can hike through there so kind of recreational value of it and even the birds are more of a recreation. It may not be tied to the environmental reasons, but people are kind of in general they are positive that it’s there for recreational and the whole feel good thing.” (Environmental Organization)

“There are number of comments like Eagle Marsh has saved a lot of basements in Roanoke. I think too, most people perceive Eagle Marsh as a real positive sort of gateway to Fort Wayne. It’s what you see on 69 when you leave the metro area...” (Geologist)

Theme 3- Preservation and expansion of Eagle Marsh and valley supported for flood control and to connect small wetland patches, but lack of funding

KI’s overwhelmingly stated that they wanted preservation of the valley and expansion of the already preserved areas. The reasons for that expansion and preservation were varied. Flood control was a main reason while returning the land back to its original historical state was another. Allowing the wetlands that are already present to be connected was another major point in order to create one large wetland instead of several small patches. Expansion was brought up with that challenges that it faces with financial support but if that support is available and there is an opportunity, expansion was favored. There is a lack of funding from the county and state in order to keep connecting smaller wetlands in the valley. Preservation was also supported due to the positive water quality effects as well as for the habitat for wildlife.

“A lot more potential for an environmental corridor in a lot of places, I’m all for them expanding the whole thing and them connecting it all. I think the whole

thing should be restored for no other reason than for flood control, I mean you can't fight nature down there as a lot of farmers have learned." (Geologist)

"I am all for preservation, I think we need to be very careful, more careful than we have been with development, out in areas like that, I do think it's part of a large ecosystem that we need to manage and preserve and not shrink but potentially grow." (County Planner)

"We're trying to expand it...part of the goal is to try to get the rest of that valley through there connected." (NRCS Allen)

"Well if you know it all boils down to money, money and the right opportunities are there it should definitely be expanded if possible." (Environmental Organization)

"For the habitat and for the cleaning of the water that's in the watershed and the filtering of sediments and nutrients before the water comes on down the little river and into the Wabash...but funding on everything is tight now." (County Surveyor)

Theme 4- No friction between Allen and Huntington Counties regarding storm water or valley management

There is no tension between Huntington and Allen Counties regarding any type of water issue that the KI's were aware of when asked. The management of the valley and storm water management has not brought up any disagreements between the counties. A positive interaction between the counties was reported with County members working together on drainage issues. The agreement between community members yielded mixed responses on valley management. Some KI's thought that there was general agreement among the communities on how the valley is being managed, while others perceived a wide variety of different attitudes. There was a general consensus that the community believes there is someone out there working on the wetlands and the valley even if the community is not involved.

"No I think there's a pretty general agreement, I mean you've got me, you've got the Little River people, we're all in agreement, the landowners who are

voluntarily signing up, they are in agreement, it's just a few farmers down there who hold wetlands a little bit in arms." (NRCS Allen)

"I'm not, you know other than just Huntington is the receiver of all the storm water from Allen and so there is some of that, but I've never sensed any friction what so ever." (Environmental Organization)

"Absolutely none, none....we have a joint board on the Little River Project, between Allen County members and Huntington County members." (Commissioner)

Theme 5- Development high in valley region, continued community sprawl

Development within Huntington County is mostly occurring in the NW region. KI's identified development within Allen County mostly occurring in the SW and along the I-69 corridor. The NW area of Huntington County and the SW area of Allen County is where the valley runs. Regional development was said to be crowded and putting pressure on the farm lands in the valley. Allen County was stated to be pro-development. It was also stated that development in Allen County is now starting to develop on marginal areas and that all of the prime development areas have already been developed. This also relates to the issue of sprawl being a concern within Allen County and the feeling that farmers are being pushed out of the community. Cheaper taxes in Huntington County were linked to increased development in NW Huntington. A few KI's related this to issues of increased storm water and runoff but that theme was consistent among all KI's. The general population sees development as a good thing for jobs and tax revenue for the counties.

"I always have concerns over the continued sprawl in the community." (County Planner)

"Urban development is up in the NW part of Huntington, Allen County Corridor spilling over because our taxes are cheaper so most of it is spilling over from Fort Wayne." (NRCS Huntington)

"Everywhere, down there especially in the Little River valley, Abiote, with the new mall a few years ago. It's pretty crowded down there, farmers are getting pushed." (NRCS Allen)

“When the city tends to expand in the past 20 years it’s been primarily in these two directions so along the I-69 corridor, north and south.” (Environmental Organization)

“From my perspective, we have pretty much, for the most part, developed all of the prime development areas. So now we’re seeing areas that are developed areas that I would call marginal...floodplain areas...wetland areas...” (Environmental Organization)

“Lack of development is where the concern is, that development is not moving along at a pace or the level it should be or could be.” (County Surveyor)

Theme 6- No barriers to community involvement

The KIs identified that the communities have virtually no barriers to being involved in land use and development decisions. The KI’s were directly asked if there were any barriers to participation and if so what they are. While pathways to communicate are always open, people only voice their concerns when they are upset and when something is directly affecting them. As for avenues to voice concerns, community members may attend public planning meetings, neighborhood meetings, or contact a city official. At planning meetings everyone who would like to speak is given the opportunity and usually those meetings involve developers who directly answer questions as well. The amount of perceived public participation varied as some stated that there was an overwhelming amount of involvement and other saying that public participation has dwindled.

“Not really, if there was any barrier at all, it would be maybe that the time of the meeting you know whether it’s a day meeting or any evening meeting, other than that, I can’t see any barriers.” (Geologist)

“I think public involvement is by and large participation at all kind of levels is weighing through the year. You know your service clubs, you know the lions clubs, the rotary, all suffer the lack of participation. I think people get concerned about community when it affects them.” (County Surveyor)

“I’m always surprised how much participation there is in some of these planning meetings cause those area dry meetings obviously. I’m always impressed how many people show up to see what’s going on and they are just there for general

knowledge....they are always playing on that public access channel too. So even if people don't go they have the opportunity to catch pieces of it."
(Environmental Organization)

"I think that most people are totally aware that meetings are open and they can just show up and they always get a voice to speak." (County Planner)

Theme 7- Water quality unawareness

Water quality while important to the KI's is not something that they believe resonates with community members. As long as people are able to turn on their tap and get water and flush their toilet, they think everything is good. E. coli is an issue with water quality which has been shown to be because of the geese within waterways and retention areas. Community members have long blamed agriculture but investigation revealed that agriculture was not causing that specific water quality issue. Within the City of Fort Wayne, it is rare that they ever get a water quality complaint. For water quality, KI's stressed that there needs to be an ongoing effort for improved water quality. The older generation seems to have the most trouble with grasping water quality. The combined sewage overflow system in both counties also increases the water quality issue and residents are slightly becoming more aware of stormwater issues because of their bills going up to separate the systems. Both counties bypass their wastewater treatment plant in heavy rains which sends wastewater directly into streams.

"We set up this storm water committee to talk primarily we wanted to talk about storm water quality and river water quality, and there are folks, many of whom are older just don't get the whole concept of storm water and water quality. They keep drawing us back to storm water quantity issues, it's really hard to get people to think in terms of water quality." (County Water Resources)

"I'm not sure water quality is an issue that resonates with a lot of people."
(Resident)

"From the E. coli I'd say very high because the sad part of it, it is high. We've got this pool of water, we've got this rain, the rain moistens all the feces there and we've got the E. coli there. Well then when that discharges out, it discharges toward our local stream, all the sudden we took the contamination from here and we've sent it downstream." (Environmental Organization)

“With the rivers coming in to Fort Wayne people understand that there’s probably something wrong, they’re very silty...I think that that general awareness is there.” (Environmental Organization)

“...it’s all variable and if I tried to temperate that across the 350000 people that live here, I don’t know. I’m not sure a lot of people understand a lot about water.” (County Surveyor)

“I think what has helped to make it unfold is Huntington and Fort Wayne have combined sewer systems... People’s water bills have increased dramatically for the separation so people may be starting to wonder yea the stormwater goes somewhere, where?” (Geologist)

Theme 8- Storm water issues are caused from increased development

Water issues overall were gauged to be high among KI’s when they were asked to rate their concerns from low, medium, or high. People on high ground are not concerned about flooding and stormwater issues whereas people on low ground or at the bottom of the hill are very concerned. In development and planning stormwater is a major issue for both of the counties with new projects. There are much more stringent conditions that developments must follow in order to be approved. The urban growth from Fort Wayne is a concern that the increasing development keeps putting more pressure on the systems that manage water. Outside of planning for new developments, the relationship of development and more hard surfaces leading to increased storm water is not something that resonates with community members.

“We didn’t used to worry about it. We were worried about general drainage and fields and all that. But you know we’re starting to put two and three acres under roof and so we now require a stormwater management plans for stormwater management on any building over like 10,000 sq ft.” (County Planner)

“It’s just you know urban growth is putting a lot of pressure on our systems, it’s putting pressure on the tile, we just have to watch what we’re doing, make sure it’s not going to cause problems down the road.” (NRCS Allen)

“River flooding is certainly an issue but then we have neighborhood flooding, the rivers can be as low as they are now and if we get a really heavy rain their streets are going to flood.” (Storm water Management)

“With communities growing, with the amount of impervious surface growing, we’ve added stress the storm drains, added stress to the sanitation system...” (Environmental Organization)

Theme 9- Environmental education about wetlands and water issues is necessary in the community

The necessity of education was stressed by many KI’s. There is a need to educate the public on wetlands and also on positive environmental practices like recycling. Environmental educational needs have a connection to positive future impacts on rivers and streams. There is some concern about mosquitoes near areas close to wetlands. That perception is unfounded but is present none the less within some neighborhoods. Education about healthy wetlands would show that they do not harbor mosquitoes. KI’s stress education is necessary early in life and that getting into schools would be the most effective way so that children can in a sense teach their parents. Community members want to do the right thing to help the environment but do not necessarily have the knowledge to know what they can do to help improve their environment.

“Folks have concerns...it’s primarily about mosquitoes. They think they have more mosquitoes in the neighborhood because the wetland is there. They also think that they get more bird poop on their cars because the wetland is there.” (County Water Resources)

“Improving water quality, that’s kind of an esoteric thing, but if you say okay you know recycling your plastic bottles or don’t throw your cigarette butt out the window, that will help. I think people will do things but you have to tell them what to do you have to show them benefit. I think it’s particularly true if you show them what’s in it for them.” (County Water Resources)

“I look at recycling efforts for education. We need to talk to elementary kids...so you’re building it from the basically the kids are driving the parents to recycle. In floodplain and management or prevention of development into floodplain, it can’t work at that level. At some point we got to get into either the high school or the post high school level.” (Environmental Organization)

Theme 10- Conservation organizations appreciated, not outright supported

There are no negative connotations or views towards wetland or conservation organizations within the communities. KI's were asked how conservation organizations were viewed within the community. Many of the organizations have received positive feedback. The feedback they have received does not turn into support financially or otherwise but as just appreciation that they are in the community. There is a strong property rights point of view in Huntington and Allen Counties with farmers and all community members alike. This view leads to some questioning conservation organization intentions. If people are not directly affected by them or their land is not affected they do not have a problem with conservation.

"Ignorance or indifference, what have you, a strong property rights point of view here I would say." (Geologist)

"I think wetland conservation has always been something of a positive in the public eye." (NRCS Huntington)

"I think the attitude is, as long as the preservation is done privately there's no problem, but if you're doing it by, with public money or telling other people how to manage their land I think that depresses the enthusiasm for it." (Geologist)

"I think they respect what we do, they like it, now do they support us maybe not... you like to know that they are here even though you may not go and support them...I'm glad someone's out there doing this for wetlands and for water quality now let's just let them do this." (Environmental Organization)

4.3 Survey Results

Surveys were mailed to 1,900 to residents within Allen and Huntington Counties. Some were returned because addresses were incorrect (27) or the residents were deceased (2). There were 516 total usable surveys returned by residents – a response rate of 27.6 percent.

This section represents the results from the mail survey and will be presented in multiple sections. First, demographics of respondents; Second, local wetland awareness and wetland knowledge; Third, respondents values and environmental behaviors; Fourth, attitudes

towards wetlands, conservation, development, and green space, and finally, results from the multiple linear regression which identifies variables associated with increasing pro-wetland attitudes among respondents.

4.3.1 Demographics and Other Characteristics

In this study, survey respondents were 52 percent male. Survey respondents were well educated (Figure 4.1). Only 1 percent has only attained their high school degree. Thirteen percent completed high school or a GED 19 percent had some college, 17 percent had an Associates or technical degree. Nearly one in three (30 percent) had a Bachelor's degree and 19 percent has a graduate/professional degree.

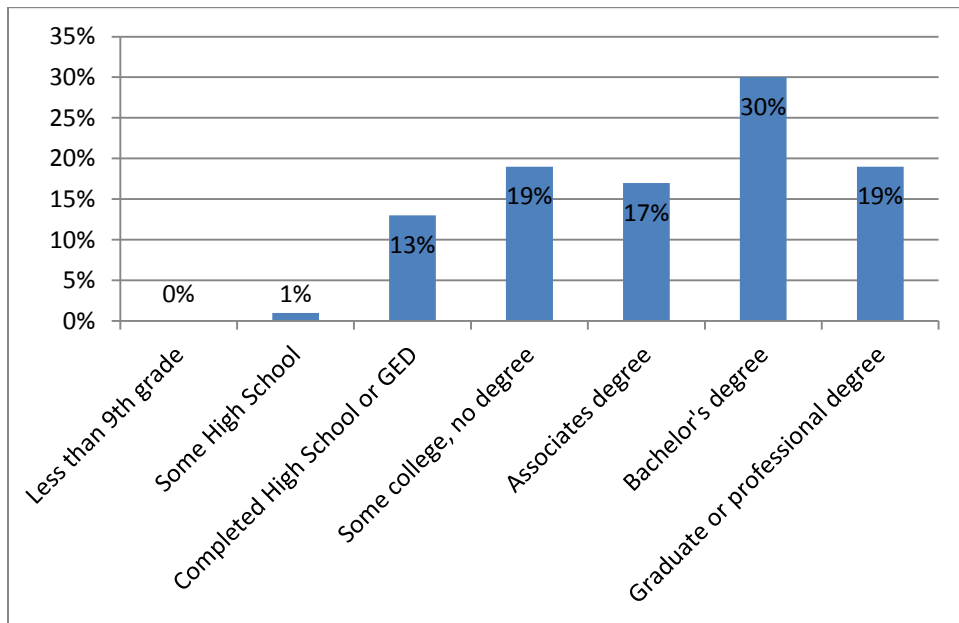


Figure 4.1 Percent Distribution of Education Level of Survey Respondents

The income level of respondents is also high. Fourteen percent had a household yearly income of \$150,000 or more (Figure 4.2). Only 2 percent earned less than \$15,000 and only 5 percent earned between \$15,000 to \$24,000. The most respondents (24 percent) earned \$50,000 to \$74,999.

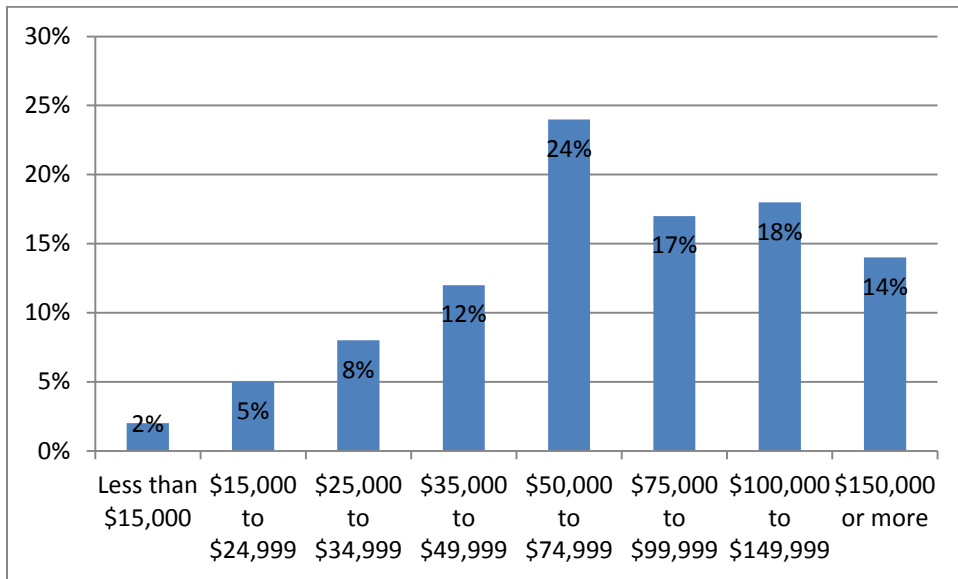


Figure 4.2 Percent Distribution of Income of Survey Respondents

There were 17 farmers that responded to the survey, 3.3 percent of the sample. The age of the respondents varied from 24 to 91 years old. The average age was 56 years old and the standard deviation was 13.6. Respondents answered how they would describe their community by choosing between urban, suburban, and rural (Figure 4.3). Fifty six percent of respondents described the community they lived in as suburban. Twenty six percent of respondents lived in urban communities followed by 18 percent in a rural setting.

Survey respondents in this study leaned substantially toward the conservative end of the political spectrum (Figure 4.4). Almost one in three respondents (31 percent) self-identified as “moderate conservative,” 19 percent as “conservative,” and 26 percent as “moderate.” Only 18 percent indicated they were “moderate liberal” and 6 percent “liberal.”

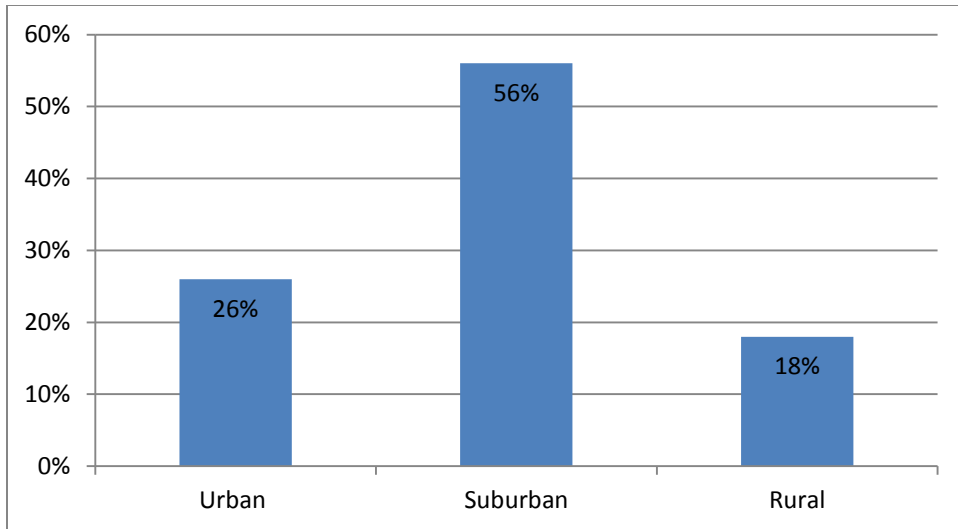


Figure 4.3 Percent Distribution of Respondents Community

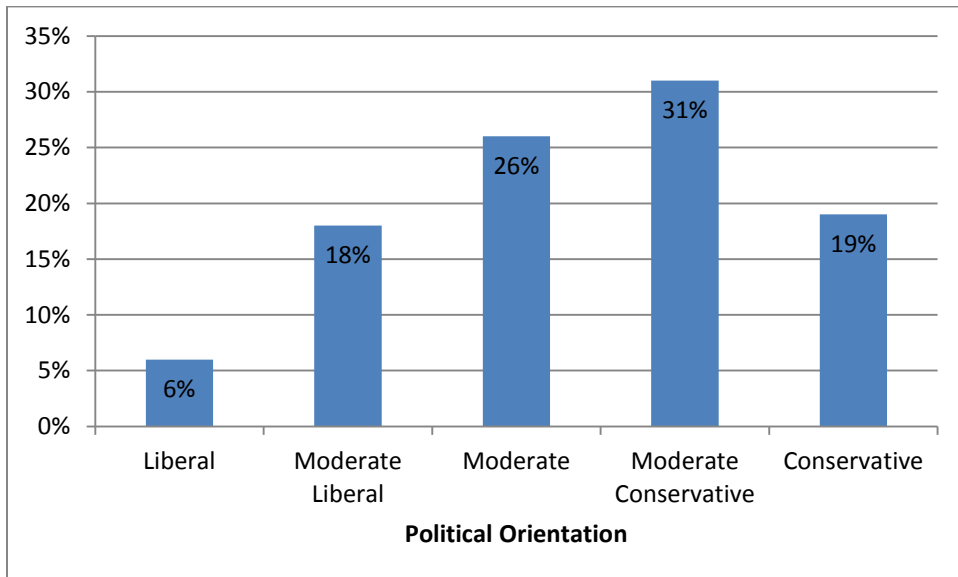


Figure 4.4 Percent Distribution of Respondents Political Views

4.3.2 *Local Wetland Awareness and Wetland Knowledge*

The opening question of the survey asked residents if they were familiar with Eagle Marsh and over two thirds of respondents (69 percent) identified they were. Those that were familiar were asked how many times in the last year they had visited. Overwhelmingly, most of those respondents (60 percent) had not actually visited the site of Eagle Marsh (Table 4.1). Just

about one in three respondents (30 percent) had visited Eagle Marsh 1 to 4 times in the last year. Five percent of respondents had visited 5-9 times and 3 percent had visited 10-20 times. Only 2 percent of those aware of Eagle Marsh had visited more than 20 times in the last year.

Table 4.1 Percent Distribution of the Number of Visits to Eagle Marsh in the Past Year

Visits in the past year	Percent
0	60
1-4	30
5-9	5
10-20	3
More than 20	2

Respondents who had visited Eagle Marsh at least once were asked what they do while they are there. They were able to check all that applied. The most common activity (24 percent) was walking the natural trails within and around Eagle Marsh (Table 4.2). Eight percent stated they visit for birding, 8 percent as well for wildlife interaction and 6 percent for photography. Four percent visited for some type of youth environmental education program or event and 1 percent visited to volunteer. Respondents were able to select “Other” and write in an activity. The most common activity written in was biking.

Table 4.2 Percent Distribution of Reasons for Visiting Eagle Marsh by Activity

Eagle Marsh Activity	Percent
Youth Environmental Education	4
Walk Nature Trails	24
Birding	8
Wildlife Interactions	8
Photography	6
Volunteer	1
Other	0.5

(Note: percent total does not sum to 100 because only respondents whom had visited Eagle Marsh in the last year answered this question and were asked to check all that applied)

The last inquiry residents had about Eagle Marsh was to report the distance to it from their home (Table 4.3). Only 198 out of 516 respondents answered this question because if they were not aware of Eagle Marsh or had not visited they were asked to skip to another section of the survey. However, those that did respond reported living mostly (59 percent) within 1-5 miles of Eagle Marsh. Twenty seven percent lived 6-10 miles away and 8 percent live 11-15 miles away. Only 5 percent reported living more than 15 miles away and 1 percent responded that they did not know how far away they lived.

Table 4.3 Percent Distribution of the Distance Respondents Live from Eagle Marsh

Distance	Percent
1-5 miles	59
6-10 miles	27
11-15 miles	8
More than 15	5
Don't know	1

(Note: percentage includes only those respondents whom answered this question, 198/516)

Residents were asked numerous statements on wetlands. The specific statements in Table 4.4 were designed to be knowledge related questions on wetlands supported by the literature. The first statement simply states “I know what a wetland is” and respondents were able to rate their agreement with that statement. A 5-point Likert scale was used where 1 = strongly disagree and 5 = strongly agree. Respondents generally believed they did know what a wetland was with 91 percent said they agree or strongly agree. An even higher percentage (94 percent) agreed or strongly agreed with the statement that wetlands provide valuable wildlife habitat. Similarly, 93 percent agreed or strongly agreed that wetlands can be used for educational purposes. There was more variation to the statements about wetlands reducing flooding and wetlands protecting water quality. The statement “wetlands reduce flooding” received a mean score of 4.0 (SD= 0.9) with 71 percent saying they agreed or strongly agreed.

“Wetlands protect water quality” received the lowest mean score (3.8, SD=1,0) and had only 56 percent selecting agree or strongly agree.

Table 4.4 Agreement Scores with Statements regarding Wetland Knowledge

Statement	Mean	StDv	SD	D	N	A	SA
I know what a wetland is	4.3	0.8	1%	2%	6%	49%	42%
Wetlands provide valuable wildlife habitat	4.5	0.7	1%	2%	3%	31%	63%
Wetlands can be used for educational purposes	4.5	0.7	1%	1%	5%	35%	58%
Wetlands reduce flooding	4.0	0.9	1%	4%	24%	34%	37%
Wetlands protect water quality	3.8	1.0	1%	4%	39%	25%	31%

4.3.3 Values and Environmental Behaviors

Residents were asked which aspects of wetlands are important contributors to their overall well-being (using a 5-point Likert scale where 1 = very unimportant and 5 = very important) (Table 4.5). Highest rated among all aspects was “conservation” (mean = 4.2, SD = 0.9) with 83 percent saying it is important or very important. “Water quality protection” (mean = 4.0, SD = 0.9) and “birding opportunities” (mean = 4.0, SD = 1.0) shared the same mean score with 70 and 73 percent saying that it was important or very important, respectively. “Recreation” and “biking” received similar scores (mean = 3.5, SD = 0.9, 1.0, respectively) with 51 percent saying recreation was important or very important, and 52 percent saying biking was important or very important. “Spiritual connection” and “sense of community” had the lowest scores (mean = 3.3, SD = 1.1, mean = 3.2, SD = 1.0, respectively) with only 44 percent saying the former is important or very important and 36 percent saying the same of the latter.

Residents were presented with a list of actions that demonstrated some level of environmental awareness. They were asked to check all that applied (Table 4.6). About three out of four (76 percent) of respondents have watched a television show on the environment,

the most frequent behavior. Second highest, with 54 percent participation, residents reduced their use of lawn/garden chemicals. Other high participation activities were not using a product anymore because it caused environmental problems (42%) and having read a conservation or environmental magazine (44%). The two activities with the least participation were attending a public hearing or meeting on the environment (9%) and having contacted a government agency about an environmental issue (11%).

Table 4.5 Importance Scores of Contributors to Well-being from Wetlands

Statement	Mean	StDv	VU	U	N	I	VI
Sense of place	3.4	1.0	5%	9%	43%	30%	12%
Solitude	3.7	1.0	4%	5%	25%	47%	20%
Walking/hiking	3.8	0.9	3%	6%	22%	47%	22%
Biking	3.5	1.0	4%	7%	37%	37%	15%
Spiritual connection	3.3	1.1	8%	11%	37%	30%	14%
Recreation	3.5	0.9	4%	8%	36%	41%	10%
Sense of community	3.2	1.0	6%	12%	46%	27%	9%
Conservation	4.2	0.9	2%	2%	12%	40%	43%
Increased flood protection	4.1	0.9	2%	3%	18%	38%	38%
Water quality protection	4.0	0.9	2%	2%	25%	38%	32%
Birding opportunities	4.0	1.0	3%	6%	18%	39%	34%

Table 4.6 Participation Frequency of Environmental Behaviors

Behavior	Percent Have done
Watched a television show on the environment	76
Reduced use of lawn/garden chemicals	54
Read a conservation or environmental magazine	44
Stopped buying a product because it caused environmental problems	42
Voted for or against a political candidate, in part, due to their position on the environment	35
Contributed money or time to an environmental or wildlife group	34
Contacted a government agency about an environmental issue	11
Attended a public hearing or meeting about the environment	9

(Note: sum does not equal 100 because respondents were asked to check all that applied)

Three diagrams with various overlapping circles where one circle represented them and the other represented nature, which included animate objects (like plants and animals) as well as inanimate object (like streams, the atmosphere, and landscapes) were provided to residents and asked them to indicate which most closely represented their perspective (Figure 4.5). Three percent identified the diagram without any overlap, 46 percent identified the diagram showing moderate overlap, and 51 percent identified the diagram the diagram showing the most overlap.

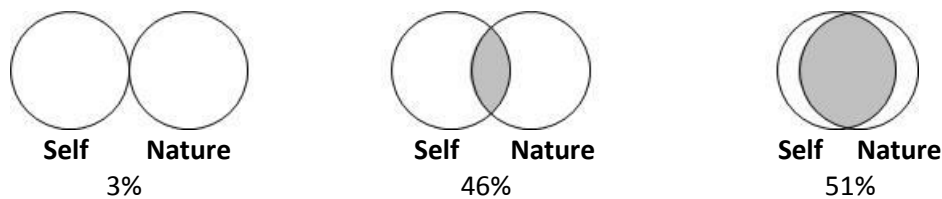


Figure 4.5 Percent Distribution among Images representing Various Levels of Overlap Between “Self” and “Nature”

Residents were asked to indicate how important several issues were to them (5-point Likert scale 1 = very unimportant and 5 = very important). All mean scores were higher than 4.0 except for one, “family legacy,” where 68 percent identified it as important or very important (mean = 3.9, SD = 1.0) (Table 4.7). The highest score came from “access to clean drinking water” (mean = 4.8, SD = .6), with 98 percent identifying it as important or very important. Several issues had the same score, “crime prevention,” “protecting groundwater,” “retirement security,” and “cost of living” all had a mean of 4.6 and standard deviation of 0.7.

Table 4.7 Importance Scores of Life Issues

Statement	Mean	StDv	VU	U	N	I	VI
Health care costs	4.6	0.7	2%	1%	1%	30%	66%
Low unemployment	4.3	0.8	1%	2%	8%	44%	45%
Crime prevention	4.5	0.7	1%	1%	2%	36%	60%
Access to clean drinking water	4.8	0.6	1%	0%	1%	15%	83%
Affordable college tuition	4.1	1.0	3%	2%	18%	33%	44%
Green space	4.2	0.8	2%	2%	10%	45%	41%
Land health	4.3	0.8	1%	1%	8%	42%	47%
Protecting recreation	4.1	0.8	1%	2%	18%	43%	36%
Family legacy	3.9	1.0	2%	6%	24%	33%	35%
Protecting groundwater	4.5	0.7	1%	1%	5%	34%	60%
Retirement security	4.5	0.7	1%	1%	6%	31%	61%
Cost of living	4.5	0.7	1%	0%	4%	37%	59%
Quality of life	4.7	0.6	1%	0%	2%	22%	75%

4.3.4 Conservation, Development, and Green Space Attitudes

Conservation and corresponding respondents attitudes was another topic in the survey. Many statements were asked to be rated again on a 5-point Likert scale (Table 4.8). Statements focused on things such as individual property rights, agricultural area conflicts with conservation, and the importance of conservation and conserving wetlands. Highly score items (mean ≥ 4.0) were “without conservation, wetlands would be developed or farmed,” “wetlands need to be protected,” and “people need more information on what could be done to take better care of wetlands in general” with means of 4.0, 4.3, and 4.1, respectively. A negative statement about conserving wetlands, “trying to teach people about the importance of wetlands is a waste of time and money” had a mean of 1.9 (SD = 0.8) with 82 percent disagreeing or strongly disagreeing. The most spread out responses were to “individual property rights are more important than environmental protection” with a standard deviation of 1.8, the

highest standard deviation from all scored statements. Thirty seven percent selected neither agree nor disagree, 45 percent disagreed or strongly disagreed, and 18 percent agreed or strongly agreed. Thirty eight percent of respondents thought farmers should receive more reimbursements to maintain wetlands, while only 20 percent disagreed or strongly disagreed. Residents were given statements about development, land management, and their desire for green space in their community. The development statements were phrased to be both pro-development and anti-development (5-point Likert scale used 1 = strongly disagree 5 = strongly agree, Table 4.9). The highest scored statement (mean = 4.1, SD = 0.8) is “development increases run off from hard surfaces during major storm events” with 79 percent agreeing or strongly agreeing. Other high scored statements were “development increases community traffic” and “development increases community noise” with 76 percent and 73 percent agreeing or strongly agreeing, respectively (mean = 4.0, 4.0, SD = 0.7, 0.8). The two statements “development in my community should increase” and “development should fill vacant spaces in the community” had similar responses (mean = 2.8, 2.9, SD = 1.1, 1.2) with 40 percent and 39 percent disagreeing or strongly disagreeing. The lowest scored statement of the development section was “economic growth is more important than the environment” with a mean of 2.2 (SD = 1.0) and only 7 percent agreeing or strongly agreeing.

Table 4.8 Agreement Scores to Statements regarding Conservation

Statement	Mean	StDv	SD	D	N	A	SA
Without conservation, wetlands would be developed or farmed	4.0	0.9	2%	4%	18%	45%	31%
Individual property rights are more important than environmental protection	2.7	1.8	15%	30%	37%	14%	4%
Wetlands need to be protected	4.3	0.8	1%	1%	12%	44%	42%
Cropland should be reclaimed for conservation areas	2.9	0.9	6%	24%	53%	13%	4%
Unproductive cropland should be reclaimed for conservation areas	3.8	0.9	2%	5%	26%	47%	20%
No income can be generated from land that is not worked	2.7	1.0	12%	36%	34%	12%	6%
Agricultural productivity is more important than conserving wetlands	2.5	0.9	12%	36%	41%	9%	2%
Land conservation is incompatible with running an agricultural business	2.2	0.9	22%	46%	26%	4%	2%
Conserving wetlands offers no advantage or benefits to me	2.0	0.9	30%	45%	20%	4%	1%
Government organizations should pay for wetland conservation	3.2	1.0	7%	12%	43%	27%	10%
Farmers should receive more reimbursements to maintain wetlands	3.2	1.0	6%	14%	42%	31%	7%
People who own wetlands have the right to use their land any way they want	3.0	1.0	7%	28%	35%	20%	9%
People need more information on what could be done to take better care of wetlands in general	4.1	0.8	1%	2%	11%	53%	33%
Trying to teach people about the importance of wetlands is a waste of time and money	1.9	0.8	36%	46%	14%	3%	1%
Wetlands on private lands should be conserved voluntarily	3.4	0.9	3%	12%	39%	35%	11%
Local government should give information guidelines to promote conservation, but not regulate	3.5	1.0	4%	14%	27%	39%	16%

Table 4.9 Agreement Scores to Statements regarding Development

Statement	Mean	StDv	SD	D	N	A	SA
Development in my community should increase	2.8	1.1	14%	26%	31%	23%	6%
Increasing development puts pressure on sanitation and storm water utilities	4.0	0.8	2%	2%	16%	53%	27%
Wetlands inhibit development	2.5	1.0	15%	40%	30%	13%	2%
Development increases community traffic	4.0	0.7	1%	3%	10%	59%	27%
Development increases community noise	4.0	0.8	1%	3%	14%	56%	27%
Development should fill vacant spaces in the community	2.9	1.2	14%	25%	30%	22%	9%
Development increases run off from hard surfaces during major storm events	4.1	0.8	1%	3%	17%	46%	33%
All of the prime areas in my community have been developed	2.7	1.0	9%	36%	34%	17%	4%
There are more opportunities for development in my community	3.5	0.9	4%	10%	31%	47%	9%
Development has caused my community to become crowded	3.0	1.0	5%	30%	36%	22%	8%
Economic growth is more important than the environment	2.2	1.0	27%	37%	29%	5%	2%

Statements about the visual aspects of land management and green spaces in the community were followed by the development statements, using the same 5-point Likert scale (Table 4.10). Residents highly scored “green spaces should be created along with new development” and “views of wildlife and wild areas are important to me” with 87 percent and 84 percent agreeing or strongly agreeing, respectively (both mean = 4.2, SD = 0.8). The only negative statement in this section scored low with a mean of 1.9 (SD = 0.9) and only 6 percent agreeing or strongly agreeing that “visual landscapes in my community are not important to me.” Eagle Marsh was the topic of one statement and 68 percent of respondents agreed or strongly agreed that more natural resources like Eagle Marsh will benefit the community.

Table 4.10 Agreement Scores to Statements regarding Future Landscape Views

Statement	Mean	StDv	SD	D	N	A	SA
More natural resources like Eagle Marsh will benefit the community	3.9	0.9	1%	3%	28%	40%	28%
Green spaces should be created along with new development	4.2	0.8	1%	2%	10%	50%	37%
The local history of my neighborhood should be considered in county or city land planning	4.0	0.8	2%	1%	22%	51%	24%
Views of wildlife and wild areas are important to me	4.2	0.8	1%	2%	13%	48%	36%
Visual landscapes in my community are not important to me	1.9	0.9	37%	45%	12%	4%	2%
Development near conservation land have a negative impact on the natural resource	3.3	1.0	3%	17%	38%	31%	11%
Development near or next to wetlands are necessary for economic growth	2.6	0.8	13%	29%	48%	9%	1%

4.3.5 Wetland Attitudes

There were several statements related to attitudes towards wetlands that were presented in the survey (5-point Likert scale 1 = strongly disagree 5 = strongly agree, Table 4.11). The statements provided are both positive and negative so some lower means represent a positive attitude. There were two statements with a mean right near the middle, “wetlands increase mosquitoes in the surrounding area” and “wetlands close to neighborhoods increase property values” with means of 3.3 and 3.0 (SD = 1.0, SD = 0.8), respectively. The highest scored response (mean = 4.3, SD = 0.9) was “I think wetlands are a scenic feature in the landscape” with 82 percent agreeing or strongly agreeing. Another high scoring statement was “communities benefit from wetlands” with 76 percent agreeing or strongly agreeing (mean = 4.0, SD = 0.8). The lowest scoring statement (mean = 1.8, SD = 0.9) was a negative statement about the intrinsic value of wetlands, “wetlands are valuable only if they produce jobs and income for people” with 82 percent disagreeing or strongly disagreeing and only 1 percent

strongly agreeing. Sixty three percent of respondents agreed or strongly agreed that they were concerned about wetland loss in the state of Indiana.

Table 4.11 Agreement Scores to Statements regarding Wetland Attitudes

Statement	Mean	StDv	SD	D	N	A	SA
Wetlands cause inconveniences to farm operators	2.5	1.0	18%	31%	35%	13%	3%
Most wetland areas are suitable for agricultural production when drained	2.9	1.0	9%	19%	47%	21%	4%
I am concerned about wetland loss in the state of Indiana	3.8	1.0	2%	5%	30%	35%	28%
I think wetlands are a scenic feature in a landscape	4.3	0.9	1%	2%	14%	34%	48%
Wetlands increase mosquitoes in the surrounding area	3.3	1.0	4%	10%	42%	32%	12%
Wetlands close to neighborhoods increase property values	3.0	0.8	4%	16%	57%	18%	5%
The primary use of wetlands should be for products that are useful to humans	2.4	1.0	18%	39%	30%	10%	3%
Communities benefit from wetlands	4.0	0.8	1%	2%	21%	46%	30%
The value of wetlands exists only in the human mind, without people, wetlands have no value	1.9	1.0	38%	39%	17%	4%	3%
Wetlands are valuable only if they produce jobs and income for people	1.8	0.9	42%	40%	14%	3%	1%

One of the goals of this research was to see how distance from the Little River valley influenced resident’s attitudes towards wetlands. There was no significant difference found between the four distance options that respondents could check as their distance from Eagle Marsh and respondents wetland attitudes. The wetland attitude score was given by summing the statement responses, with some statements reverse coded (see Data Preparation in Chapter 3). More one way ANOVA tests were performed to see some socio-demographic differences in wetland attitudes; later a linear regression is described to see what variables explain wetland

attitudes. There was a significance difference at the $p < .05$ level between two of the community types (Figure 4.3). Urban residents had a significantly higher mean (mean difference +2.05) for their wetland attitude score compared to rural residents ($p = .030$).

Table 4.12 Difference in Wetland Attitude Scores by Political Identities

Political (1)	Political (2)	Mean Difference (1 - 2)
Liberal	Moderate Liberal	3.00
	Moderate	5.300***
	Moderate Conservative	6.060***
	Conservative	6.810***
Moderate Liberal	Liberal	-3.00
	Moderate	2.304*
	Moderate Conservative	3.060***
	Conservative	3.810***
Moderate	Liberal	-5.300***
	Moderate Liberal	-2.300*
	Moderate Conservative	0.76
	Conservative	1.50
Moderate Conservative	Liberal	-6.060***
	Moderate Liberal	-3.060***
	Moderate	-0.76
	Conservative	0.75
Conservative	Liberal	-6.810***
	Moderate Liberal	-3.810***
	Moderate	-1.50
	Moderate Conservative	-0.75

* $p < 0.05$, ** $p < 0.01$ *** $p \leq 0.001$

There was also a significant difference ($p \leq 0.001$) in political identification and wetland attitudes. Since there were multiple comparisons (5 different political identities) a post-hoc Bonferroni correction was performed to identify differences between the individual responses (Table 4.12). There were many significant differences at the $p \leq 0.001$ level, most notably between “liberal” and “moderate”, “liberal” and “moderate conservative,” and “liberal” and “conservative,” with “liberal” having a higher mean score by 5.30, 6.06, and 6.81, respectively. There was significance at the $p \leq 0.05$ level between “moderate” and “moderate liberal.”

Whether or not a respondent is a farmer was significant to 0.001 level (Table 4.13). Education level and income level were both insignificant when ran against wetland attitude scores.

Table 4.13 One Way ANOVA analysis of Farmer/Non Farmer and Wetland Attitudes

ANOVA	Sum of Squares	df	Mean Square	F	Sig
Between Groups	625.30	1	625.30	19.37	0.000***
Within Groups	16010.88	496	32.28		
Total	16636.18	497			

*p < 0.05, **p < 0.01 ***p ≤ 0.001

4.3.6 Linear Regression

Part of the goal of this research was to determine what contributes to residents attitudes towards wetlands. A theoretical framework was not part of the purview of this thesis, however, a model for future studies can be proposed with this work. The variable construct “wetland attitudes” was the dependent variable with a selection of other variables being independent (See Table 4.15 for a list of IVs). Variable constructs were constructed from a combination of like-statements/questions from the survey. To ensure that individual statements/questions are actually measuring the same construct their reliability was confirmed using Cronbach’s alpha (Table 4.14). A factor can be assumed to be “reasonably representative” of the variable if the Cronbach’s alpha is greater than 0.70 (Gliem, J. & Gliem R., 2003).

The sections that used variable constructs (i.e., combined statements) were wetland attitudes, conservation attitudes, wetland knowledge, important life issues, well-being, green space attitudes and development attitudes. All of the statements from the wetland attitudes section – 10 statements (Table 4.11) were summed together, the same is true for the wetland knowledge statements (Table 4.4). Their Cronbach’s alpha scores were 0.796 and 0.807, respectively.

The issue assessment included all statements from question 8 and had an alpha score of 0.902. Question 6 was also scored all together for respondent’s well-being and had an alpha score of 0.924. The conservation attitudes section took only selected statements from question 10 (A, B, C, E, F, G, H, I, M, N) that received a high Cronbach’s alpha of 0.820. The green space attitudes factor took statements A, B, D, and E from question 14 and had a Cronbach’s alpha score of 0.755. Those statements were chosen for their ability to all relate to one another and pass a Cronbach’s alpha of 0.70. Lastly, the development attitudes factor was determined from

Table 4.14 Cronbach’s alpha Scores for Regression Factors

Factor	Cronbach's alpha
Conservation Attitudes	0.820
Wetland Attitudes	0.796
Wetland Knowledge	0.807
Important Life Issues	0.902
Well Being	0.924
Green Space Attitudes	0.755
Development Attitudes	0.795

four statements (12B, 12D, 12E, and 12G). The Cronbach’s alpha for development attitudes was 0.795. All of the factors are assumed to be repeatable and reliable based on their Cronbach’s alpha score.

One linear regression analysis was performed (Table 4.15) with wetland attitudes as the dependent variable. Independent variables were entered into the regression analysis in four blocks. Without a theoretical framework, the blocks were determined based on the survey questions to see the effect of socio-demographic information, wetland knowledge, values, and environmental attitudes on attitudes towards wetlands. All variables were drawn directly from the mail survey questions or were the mean scores from combined statements as stated above. The regression coefficient B (Beta) is presented in the regression model. Beta is the change in

the dependent variable (y), associated with one unit change in the independent variable (x) (Menard, 1995). Pearson's correlations for all regression variables are presented in Appendix G. Given the amount of variables used in the linear regression, it was important to check for multicollinearity. Using the Variance Inflation Factor (VIF), this was done checking how much the variance of the coefficient estimate is being inflated by multicollinearity (Manfield & Helms, 1982). There were no issues with any two or more variables influencing one another (Table 4.16).

Entering the first block into the regression analysis yielded three significant socio-demographic variables, education, farmer status, and income (Table 4.15). Education and whether or not the respondent is a farmer are both significant to the 0.001 level, with an R^2 of .087. Being a farmer and higher income are negatively correlated. The Income level is significant to the 0.05 level. Those three variables explain 8.7 percent of respondent's wetland attitudes. In Block 2, the variable wetland knowledge ($p < .001$) is added to the model and increases the R^2 to .501. The same three variables in Block 1 also remained significant. Income increased in significance and education lowered in significance, both to the 0.01 level after the addition of Block 2. Block 3, representing life issues, well-being, and environmental behavior variables, increases the R^2 to .570. The variable well-being is significant at the 0.001 as is wetland knowledge. Income drops out of the model and farmer status ($p < .0.01$) and education ($P < 0.05$) remain significant.

Table 4.15 Linear Block Regression Model for Explaining Wetland Attitudes

	<u>Block 1</u>	<u>Block 2</u>	<u>Block 3</u>	<u>Block 4</u>	<u>Reduced Model</u>
	B	B	B	B	B
Socio-Demographics					
Gender	-0.067	-0.036	0.008	0.024	
Age	0.064	0.084	0.070	0.090*	
Level Education	0.173***	0.115**	0.091*	0.039	
Farmer	-0.209***	-0.139***	-0.111**	-0.087**	-0.086**
Income	-0.105*	-0.111**	-0.071	-0.047	
Years in Community	0.013	-0.063	-0.064	-0.049	
Knowledge					
Wetland Knowledge		0.652***	0.484***	0.345***	0.301***
Values					
Important Life Issues			-0.064	-0.052	
Well Being			0.343***	0.148***	0.086*
Environmental Behavior			-0.006	-0.032	
Environmental Attitudes					
Development				-0.031	
Green Space				0.124*	0.168***
Conservation				0.370***	0.370***
Multiple R	0.295	0.707	0.755	0.816	0.788
R²	0.087	0.501	0.570	0.665	0.621

*p < 0.05, **p < 0.01 ***p ≤ 0.001

The final block adds development attitudes, green space attitudes, and conservation attitudes to increase the R² to 0.665. Age, which has not been significant throughout the first three blocks, becomes significant at the 0.05 level and a positive attitude toward green space becomes significant at that level as well when added. Farmer status remains significant throughout all the blocks and after the addition of Block 4 remains at the 0.01 level. Wetland knowledge, well-being, and conservation attitudes are all significant at the 0.001 level in the

final block. Overall, 66.5 percent of respondent’s wetland attitudes are explained by age, farmer status, wetland knowledge, well-being, green space attitudes, and conservation attitudes.

Table 4.16 Variance Inflation Factor (VIF) values of Significant Variables

Independent Variable	Dependent Variable				
	a.	b.	c.	d.	e.
a. Farmer/Non Farmer		1.03	1.03	1.03	1.03
b. Knowledge	1.75		1.64	1.61	1.69
c. Well Being	1.84	1.73		1.74	1.72
d. Conservation	2.03	1.87	1.907		1.78
e. Green Space	1.93	1.86	1.79	1.7	

The reduced model is given in the last column of the table. In the reduced mode, the R² value remains high at .0621, approximately 62.1 percent of the variation in resident’s wetland attitudes is explained by whether or not they are a farmer, their wetland knowledge, their well-being, green space attitudes and conservation attitudes.

4.3.7 Response Bias

Compared to the combined census information for the eight townships that were surveyed (Area Population), the frequency of males in our sample was slightly higher (Figure 4.6). Education levels were far different than the census numbers for the eight townships (Figure 4.7). The education level of the survey sample is much higher than the area population. Only eight percent of the area population completed a graduate or professional degree. Eighty five percent of the survey sample has had at least some college, compared to 54 percent of the area population.

The survey sample and the area population differed largely in terms of household income as well (Figure 4.8). Eighty five percent of the survey sample makes \$35,000 or more, compared to 57 percent of the area population. Fourteen percent of the survey sample makes

\$150,000 or more and only 2 percent makes less than \$15,000 a year. Seventeen percent and eighteen percent make \$75,000 to \$99,999 and \$100,000 to \$149,999, respectively.

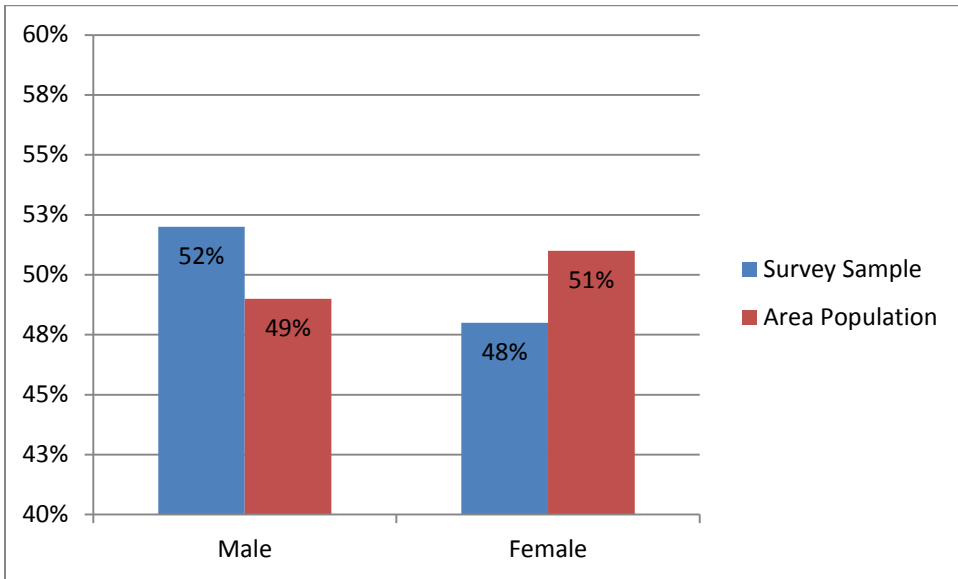


Figure 4.6 Percent Distribution of Respondents and Area Population by Gender

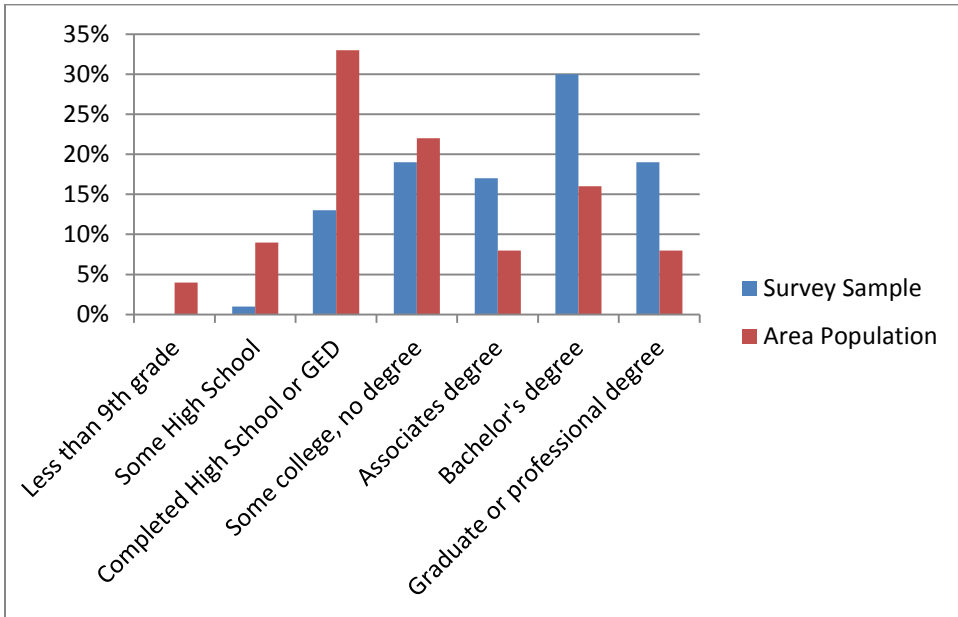


Figure 4.7 Percent Distribution of Education Attainment by Respondents and Area Population

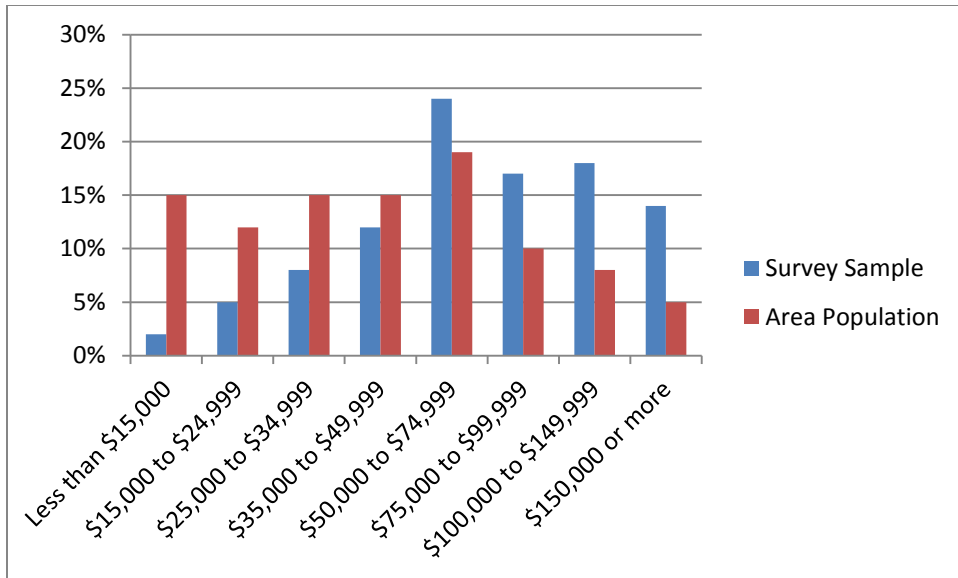


Figure 4.8 Percent Distribution of Income by Survey Sample and Area Population

Non-response bias is when people do not respond to the survey because they are different in some way than the people who did. Those differences measured are education and income. People with lower education may feel they do not know enough about the topic to answer the questions. Low income residents may have been less likely to respond for many unknown reasons like time, age, or employment status.

CHAPTER V. DISCUSSION

The focus of this study was to evaluate the attitudes residents living near the Great Marsh have toward wetlands and how wetlands are managed. Further, project PIs wanted to better understand the factors that shape those attitudes. Key Informant interviews and a mail survey to a random selection of residents living in one of the eight townships surrounding a wetland were conducted to gain insight. This chapter presents an analysis of the results from the survey including respondent's characteristics, environmental concerns, wetland values and attitudes and finally, a summary of the linear regression. Results are compared to similar attitudinal studies of wetlands.

5.1 Respondent Characteristics

Survey respondents are spread across the spectrums of political identification, age, income level and educational background. When compared to the population of the eight townships, the survey sample was more educated and wealthier. This could have led to potential bias in our results, impacting how respondents answered knowledge questions, questions about the financial aspects of conservation, and economic development, among other things. Stakeholders with a higher level of education have been shown to value wetlands more than those with less education (Kreutzwiser & Pietraszko, 1986). A highly educated sample may value wetlands more than the general population.

Education and income were likely not factors in that 69 percent of respondents were familiar with Eagle Marsh. Eagle Marsh is a highly visible, 716 acre wetland preserve in Allen County. Further, the Marsh is located adjacent to a major interstate highway offering views of the Marsh itself and a identifying sign. The Marsh was described by one resident as the “gateway to Fort Wayne” and many respondents stated they were familiar with it because they drove by it every day. The people that do visit do so to walk or bike on the nature trails. Although, respondents did not visit very frequently, of the 40 percent who had visited Eagle Marsh, 30 percent of them visited between 1-4 times in the last year.

Analyzing the distance from Eagle Marsh and respondents wetland attitudes was a goal of this research, however, the questionnaire failed to properly collect that information from respondents. Unfortunately, if participants stated they were familiar with Eagle Marsh but had not visited it in the last year, they were mistakenly told to skip the question about how far they live from Eagle Marsh and go to the wetland attitudes question. As a result, there was a significant amount of missing data for the distance from Eagle Marsh question; only 198 out of the 516 respondents answered the question. The sampled area spanned about 25 miles (distance from Fort Wayne to Huntington) and it’s possible we would not have seen any great variations in attitudes. If we had surveyed randomly across the state or a significantly larger area, there might have been enough variation to make a statement about distance and attitudes. Aside from this issue, Eagle Marsh is in an urban area and wetlands in urban areas are likely to receive more visitors (Callaway and Zedler, 2004). Most of the visitors to Eagle Marsh came from within a distance of 1-4 miles.

Survey respondents tended to be conservative or moderate conservative. This characteristic is supported by the interviews and statements key informants supplied about

their personal political identities and those living in and around the Fort Wayne and Huntington areas. Survey respondents were mostly from suburban areas (56%), with 26 and 18 percent being from urban and rural areas, respectively. This fits the population density patterns of the survey area. There were a large number of Fort Wayne residents who received the survey by random sample of the eight townships because of its larger population, but not all areas of Fort Wayne are considered urban. It was also expected that there would be a lot of people in our survey sample in between Fort Wayne and Huntington where the valley connects through, thus a large number of suburban residents.

5.2 *Environmental Concerns*

Residents are concerned about many aspects of development, conservation, and land management. Development concerns centered on increased traffic, noise, and flooding issues. The data shows that residents believe “development increases run off from hard surfaces during major storm events,” with 79 percent agreeing or strongly agreeing with that statement. While there are flooding concerns, there is no overwhelming concern about there being too much development present in the community. Only 21 percent agreed or strongly agreed that all the prime areas in their community have been developed. This does not, however, mean that residents are looking for development to increase; only 29 percent agreed or strongly agreed that it should. As it came up in the interviews, both counties are in the process of separating their sanitation and storm water utilities, an expensive undertaking. Eighty percent of residents agreed or strongly agreed that increasing development puts pressure on sanitation and storm water utilities. There was little concern that wetland areas inhibit development, only 15 percent agreed or strongly agreed with that statement. Until the middle of the 20th century, wetlands were perceived as impediments to economic development (Vileisis, 1997). Attitudes towards

wetlands have changed more recently, thanks in large part to increased knowledge and understanding of their ecological function (Boyer & Polasky, 2004). This can explain why there is not a large amount of concern about wetlands inhibiting development because, as discussed later, residents are more knowledgeable about their functions.

It is not clear if residents think development near conservation land negatively affects the natural resource as 38 percent neither agree nor disagree. The economics of growth also elicited a neutral response with 48 percent saying they neither agree nor disagree with the statement “development near or next to wetlands is necessary for economic growth.” Overall, residents are much more concerned about views of wildlife and wild areas. The visual layout of the community is important to residents and 87 percent agree or strongly agree that green spaces should be created along with new development. The local history of the area is also something residents would like to see incorporated into city land planning. This is a positive for the Little River Wetlands Project since the areas they have restored are based on local historical maps.

Environmental organizations and other interviewees emphasized the strong property rights point of view held within their communities. The survey results show some mixed thoughts on property rights. For example, 35 percent neither agree nor disagree that people who own wetlands have the right to use their land any way they want. This indecision could be due, in part, to that fact that only 5 percent of respondents presently have any wetlands on their property. Thirty percent disagreed that cropland should be reclaimed for conservation areas and 53 percent neither agreed nor disagreed. When that statement changed “cropland” to “unproductive cropland,” there was a large shift as 67 agreed or strongly agreed that it should be reclaimed for conservation and only 26 percent neither agreed nor disagreed. This

shows that residents are concerned about farmer's cropland but are also concerned about the best use for land.

Cropland generates the largest easement payments from the Wetlands Reserve Program (Shultz, 2005). Since 75 percent of wetlands are privately owned, individual landowners have a major impact on the future of the country's wetlands (EPA, 2012). When asked directly about wetlands on private property, 46 percent agreed or strongly agreed that they should be conserved voluntarily and only 15 percent disagreed or strongly disagreed. While there are residents in our sample who value wetlands highly, overall, individual property rights are respected.

5.3 *Value of Wetlands*

Residents think wetlands are valuable even if they do not benefit humans by producing income or jobs. Fifty six percent of respondents disagreed or strongly disagreed that the primary use of wetlands should be for products that are useful to humans and even more (82%) disagreed or strongly disagreed that wetlands are valuable only if they produce jobs and income for people. This finding supports the literature, which suggests that the intrinsic value of wetland areas is an important factor in understanding people's decisions regarding natural areas and how they are conceived (Winter, 2005). Johnson & Pflugh (2008) suggest that citizens have also overlooked economic benefits and supported wetland preservation, not because it is economically beneficial, but because they believe it is personally important. Beyond intrinsic values, residents believe that communities benefit from wetlands and that they are a scenic feature in the landscape. There are a large amount of wetlands in the Fort Wayne to Huntington area and their appearance has likely become a normal landscape feature for residents.

Aside from the regular appearance of wetlands in the landscape, they also contribute to personal well-being. The solitude they provide, along with hiking and birding opportunities were all important to respondents. Going deeper into what they can provide, water quality protection and increased flood protection are highly valued by residents. Based on the interviews and background research this area has flooding issues on a regular basis. We expected the survey results to show that residents place flood protection as a high priority. Along with recreational values, wetlands provide a sense of community, a sense of place, and a spiritual connection for some. Respondents have a very strong connection to nature in general with 51 percent identifying a large overlap between themselves and nature and 46 percent identifying some overlap. Davenport (2010) suggested that wetlands hold diverse and significant meanings to community members and these results support that statement. In terms of a large scale restoration like the Little River Wetlands Project, well-being and health aspects from conservation areas have been shown to increase collaborative participation by citizens (Balram & Bragicevic, 2005). Given that residents value wetlands, there should be options for resident participation within future land management decisions by LRWP.

The strong appreciation of wetlands and the strong property rights views discussed previously are very interesting in this community. Residents have somehow found a balance where they are supportive of conservation and wetlands in the area but they also support property rights, which are somewhat counter intuitive to one another. Strong property rights views can lend themselves to work against conservation since residents support being free to do whatever they would like with their land. Residents value their own property highly and thoughts of having it taken away for conservation are only supported if it is done voluntarily. There may be a disconnect between conservation officials and residents regarding how the land

conservation process works. Residents need to be informed that future conservation land is only going to be conserved on private property if it is done voluntarily.

5.4 *Wetland Function and Knowledge*

When trying to assess how people understand and think about wetland function it was important to ask residents about their knowledge of wetlands. If residents are able to recognize potentially beneficial functions of wetlands we can begin to see how that information can contribute to positive wetland attitudes. The first statement they were asked to respond to, “I know what a wetland is,” immediately sought their perceived knowledge and ninety one percent agreed or strongly agreed. There were several more statements presented to gauge wetland knowledge. Residents understand some of the functions of wetlands being wildlife habitat, reducing flooding, water quality protection, and educational potential.

Overall, residents understand wetland function very well. Ninety four percent and ninety three percent agreed or strongly agreed to statements that wetlands provide valuable wildlife habitat and that “wetlands can be used for educational purposes.” The least understood function of wetlands is water quality protection as only 56 percent of respondents agreed or strongly agreed to the statement “wetlands protect water quality.” Interviewees frequently brought up a lack of water quality awareness in the community. They stated that there is an understanding of water quantity issues but not water quality issues. Aside from just that one statement on wetlands protecting water quality, it does seem that residents do understand water quality issues. Access to clean drinking water is important or very important to 98 percent of respondents. Similarly, 94 percent of respondents find that protecting groundwater is important or very important. Interviewees think that residents do not understand water quality issues and it is clear that they do have some understanding. There may not be as many

uninformed residents as the environmental organizations and county officials think. Their educational focus on water quality issues might have brought that awareness up or it may be something may not have been adequately analyzed in the community.

Almost three quarters (71%) of respondents agreed or strongly agreed to the statement that wetlands reduce flooding. Like previously discussed, flooding is an important issue for these communities and that is represented by the data. Interview participants also regularly discussed how the community appreciates the wildlife views at Eagle Marsh. It is possible that residents with negative wetlands attitudes would not be inclined to acknowledge the functions of wetlands. Those respondents that do not know what a wetland is would also be less likely to identify wetland functions.

5.5 *Wetland Attitudes*

The knowledge statements did not draw on any feelings of concern or appreciation of wetlands which can be more informative in understanding attitudes. Residents are concerned about wetland loss in Indiana with only 7 percent disagreeing or strongly disagreeing with the statement "I am concerned about wetland loss in Indiana." Several interview participants suggested that residents were concerned that wetlands promote mosquito problems. Forty four percent agree or strongly agree with the statement that wetlands increase mosquitoes, while only 14 percent disagree or strongly disagree. While a large percentage of residents did not agree nor disagree, this concern about wetlands promoting mosquito populations does exist in the community.

There was a significant difference between community type and wetland attitudes. The options of community types provided to residents were rural, suburban, and urban. Residents identified which type of community they lived in. Residents in urban areas have a significantly (p

< .05) more positive attitude toward wetlands than those residents in rural areas. Kempton, Boster, & Hartley (1995) showed that residents in urban areas have environmental concerns and a strong desire to interact with nature (Kempton, Boster & Hartley, 1995). It also has been suggested that residence is most strongly associated with environmental concern when local environmental conditions are the focus of the attention (Tremblay & Dunlap, 1978). This means that environmental issues within the local community are more likely to elicit concern from residents than non-local issues. When the focus is outside the local community, residents may not relate to the issues and therefore have fewer concerns. Callaway & Zedler (2004) showed that when residents are able to see the results of their efforts they can be more eager to be involved in restoration activities. The findings support that as Eagle Marsh is located in an urban environment and an area where residents can see it on a regular basis. Residents are able to see changes to the marsh over time and therefore can be more likely to become involved.

Rural environment are where you most commonly find farm operations. Residents who are not farmers have significantly ($p \leq .001$) more positive attitudes towards wetlands than those that identified as farmers. Interviewee's spoke of how farmers feel as though they are being pushed out of the area because of development. Previous research shows that some farmers believe that restoration causes (attempts to restore natural areas) are designed to financially force them out of a region by making their land unprofitable (Buckly & Crone, 2008). According to Reimer, Thompson, & Prokopy (2012), farmers in Indiana implement conservation practices on their farm but only for the main reason of financial benefit (Reimer, Thompson, & Prokopy, 2012). Farmers with a positive attitude toward wetland areas could be assumed to be supportive of wetland restoration attempts. Wetland restoration in the local community might eventually affect their farm and their ability to support themselves and their families financially.

Farmers that are supported by their farmland income therefore might have a less positive view of wetlands. However, enrollment in the WRP is voluntary; the option for the government to take over a farmer's cropland is not a major threat. The strong property rights viewpoint in the community shows that farmland being lost to wetland conservation efforts is a concern. It is not clear if residents or farmers are aware of the voluntary nature of the WRP program which might explain the property rights concern.

How respondents identify themselves politically impacts their attitudes about wetlands. Looking at the mean differences of each compared political identity, the most positive wetland attitudes come from the self-identified "liberal" and "moderate liberal" residents and the least positive attitudes towards wetlands come from the "conservation" identification. There is a significant difference ($p \leq .001$) between "liberal" residents and "conservative" residents. While these two identities were the furthest apart on the political spectrum provided, there was also a significant difference ($p \leq .05$) between "moderate liberal" and "moderate," which was less expected. "Moderate liberal" and "moderate conservative" were also highly significantly different, among others (Table 4.12). Our findings support the literature that people that identify as liberal are more environmentally concerned (Van Liere & Dunlap, 1980). The views towards wetlands becomes less positive going from liberal, moderate liberal, moderate, moderate conservative and finally conservative.

5.6 *Summary of Regression Analysis*

The results of the regression model successfully elucidate some of the key variables contributing to positive wetland attitudes among survey respondents. Regression analysis determined that being a farmer is negatively correlated with positive wetland attitudes. Additionally, wetland knowledge, well-being, positive attitudes towards green space and

conservation play a role in explaining about 62 percent of what contributes to wetland attitudes. The most parsimonious reduced model was created by putting only the significant variables from block four into a regression and showing only the significant variables afterwards. A large portion of the mail survey and the results presented in chapter four are directed towards explaining respondent's attitudes towards wetlands. The regression model presented in Table 4.15 is limited in terms of explaining every aspect of wetlands attitudes, but helps show some important factors that contribute to them.

Knowledge is a significant factor in the reduced model. The more knowledge participants have about wetland functions, the more positively they think about wetlands. The well-being variable consists of aspects of wetlands that are important contributors to some peoples' overall well-being (spirituality, recreation, sense of community, etc.). Well-being from wetland areas correlates positively to wetland attitudes. This shows that people that benefit from wetland areas via things like spirituality, recreation, and birding, have a more positive attitude towards wetlands. Positive attitudes towards conservation and green space also highly contribute to positive attitudes towards wetlands.

There were other significant variables in the regression analysis that were not significant in the final reduced model. The level of education began as highly significant in block 1 and as new variables were added it lost significance and fell out after the addition of environmental attitudes – block 4. Previous research has shown education to be important in how stakeholders value wetlands (Kreutzwiser & Pietraszko, 1986). Our results show that education does not impact the attitudes residents have towards wetlands. The survey sample is highly educated so this may have biased this result. Age was not significant through the first three blocks but became significant in the final block. The results show that older residents have more positive

attitudes towards wetlands and this differs from previous research. Jacobson et. al (2003) showed that younger farmers were more likely to have environmental concerns. Previous research has also predominately shown age to have a negative correlation with environmental concern (Van Liere & Dunlap, 1980). While age is significant in this study, the positive correlation to wetland attitudes is not supported in the literature. This could be because the scope of this study was specific to one environmental topic, managing wetlands, while other studies have looked at overall environmental concern. As previously discussed, residents do have a high level of environmental concern, related specifically to development, flooding, and water quality.

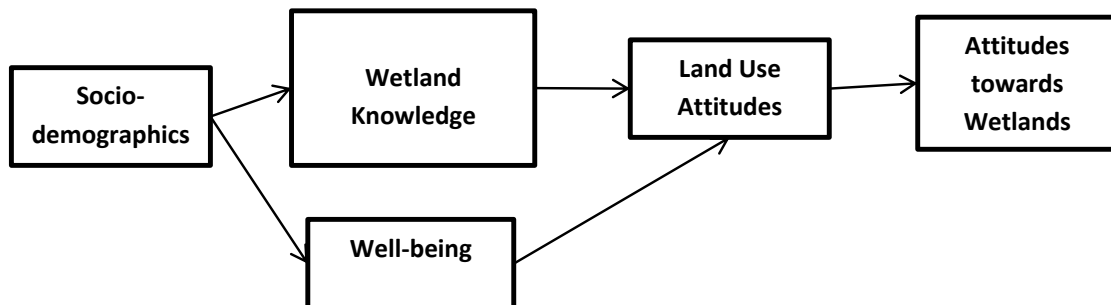


Figure 5.1 Proposed Model Explaining Wetland Attitudes

A proposed model created after the linear regression analysis is displayed (Figure 5.1). This model encompasses the important factors that contribute to wetland attitudes. Socio-demographic information was accountable for about 8 percent of wetland attitudes and that information informs wetland knowledge and well-being. Whether or not people have wetland knowledge and whether or not they believe wetlands contribute to their well-being relates to

their socio-demographic information. A large example in this research is whether or not they are a farmer. Knowledge has the largest box because it explains 41 percent of resident's attitudes towards wetlands. Knowledge and well-being inform land use attitudes (conservation and green space). Those attitudes shape out the overall attitudes towards wetlands.

In summary, the model explains that wetland attitudes have many facets. Wetland knowledge, positive green space attitudes, and positive conservation attitudes are all highly ($p \leq .001$) significant. Well-being is significant to the .05 level. Farmers have a negative correlation to positive wetland attitudes. This reduced proposed model can be compared to future research into wetland attitudes.

CHAPTER VI. CONCLUSIONS

In the past century, nearly 85 percent of Indiana's wetlands have been drained or filled in for other purposes such as development or crop production. Nationally more wetlands were lost to urban development and sprawl from 1998 to 2004 than any other land use (Dahl, 2006). Little River Wetlands Project was founded in 1990 to restore and preserve wetlands in and around the greater Fort Wayne area, as well as, offer educational opportunities to area residents and visitors about good wetland stewardship. The focus of this study was to better understand wetland attitudes in order to initiate dialogue among stakeholders concerning regional and local approaches to wetland management for maximum human and ecosystem benefit. This chapter summarizes the findings from the study and identifies steps for future research.

The response rate of 27.6 percent was higher than the expected rate of 20 percent. This participation rate shows that residents are interested in being a part of a community conversation about wetlands. The people that answered the survey are different than the general population in terms of education and income. The response bias for this survey is that the sample is wealthier and more educated than the general population.

Overall, residents are very knowledgeable about wetlands and highly value their functions. This community's appreciation of wetland function may not be the same as others in different situations because it has faced intense flooding and storm water management issues.

Aside from just wetlands, residents appreciate and value conservation and green spaces within the community. Eagle Marsh has many nature trails and lends itself to be enjoyed by the community. It is not only restored for ecological benefit. Residents want to have interaction with wildlife and natural areas and they do not like the noise and traffic that development brings. While environmental concerns are present, formal actions taken out of concern by residents is minimal. Residents value the conservation efforts and environmental organizations in their community, but are currently not actively involved. Attitudes towards wetlands do not emerge as a useful basis on which to actually predict involvement or support of conservation programs. Even with strong positive attitudes towards wetlands, residents are not connected to environmental initiatives through volunteering, contacting government officials, or attending public meetings. The communication lines between the public, government, and other stakeholders are open, but underutilized.

Linear regression was used to identify which variables significantly contribute to positive wetland attitudes. Whether people are a farmer or not, wetland knowledge, well-being, positive green space attitudes and positive conservation attitudes all play a role in explaining resident's attitudes. Proponents of green space and conservation are not surprisingly supportive of wetland conservation and the functions wetlands bring to the area. Even though over 30 percent of the sample was not familiar with the largest wetland in the area, the knowledge about and value for nature are heavily present. The urban setting of the wetland does also possibly improve perception as nature preserves do not usually exist so close to a large downtown area. Residents appreciate the availability of that type of area, but as the preservation expands farmers in the surrounding area are starting to feel encroached upon.

The services wetland areas provide vary by location and the type of wetland. There is a baseline of public support of wetlands from these residents. The residents clearly show that the emphasis of support is not only for the function of the wetland, but also on the structural aspects that wetlands provide to the community. Flood protection is very important but so is the visual aspect of having a wetland in the area. This balance can be challenging during a restoration and there needs to be focus throughout the planning stages to make sure both qualities are maintained.

The future of the Great Marsh valley area is going to be decided by many parties. Stakeholders include local residents, farmers, Little River Wetlands Project (and other environmental organizations), developers and the local government. This research explored the values, attitudes, and perceptions that many of these stakeholders have regarding wetlands. Farmers value property rights and perceive wetlands as taking up valuable crop space. Residents appreciate wetlands and the functions they provide to the community like wildlife habitat, reduced flooding and water quality protection. These two differing viewpoints do not necessarily mean there is no middle ground. Farmers are not looking for increasing development that can inhibit their operations and residents do not want the increased noise and traffic. The more open communication there is about planning for future land use, the better. Little River has its goals of preservation and restoration throughout the Great Marsh valley and the farmers in the area work their land for agricultural productivity. With clear intentions of respecting individual property rights, something residents support, LRWP can gain support from farmers. They can focus on education, increased wetland knowledge, and well-being gained from wetland areas, which is a strong indicator of positive wetland attitudes.

6.1 *Implications*

The findings presented in this research will help the Little River Wetlands Project, government officials, land developers, and other environmental organizations as they look to further understand their community's attitudes towards wetlands. LRWP's work with the community extends beyond just residents. They partner with other environmental organizations and work with the local and state government on obtaining land for their trust. From this model, the things that they could focus on most would be improving knowledge about wetlands and promoting recreation opportunities near their preserves. These are things that they already actively do through their organization so examining closer who they are reaching would be important. Government officials, like surveyors and commissioners, could use these findings to better understand their constituent's views towards conservation within their community. The county environmental programs, like the NRCS who runs the WRP, would benefit immensely from knowing resident's attitudes towards wetlands in their county. The WRP seeks to restore a large amount of acres back to wetlands and place easements on those acres. These findings could improve how the NRCS markets their wetland restoration efforts.

Residents believe that communities benefit from wetlands and this can be a good place to start a community dialogue about the future of the Great Marsh valley. While funding may not be available from public local funds, the governing bodies can look at these results and see what is important to residents in terms of a balance between development and conservation efforts. These results can also benefit environmental organizations in the area. They can take into account the environmental attitudes of the general population, which may be different from their members. These results show that the community is interested in being a part of a conversation about future land management. These findings can inspire stakeholders in

development and conservation efforts to begin to talk, amongst themselves and with residents, about balancing and maximizing the human and ecological benefit in future land use decisions.

Aside from local impact, this research has potential implications for agencies like the Indiana Department of Environmental Management and the Indiana Department of Natural Resources. Fort Wayne is Indiana's second largest city and information about resident's attitudes towards wetlands is not commonly collected in urban areas. The agencies may be able to utilize the information contained herein to strengthen their approach to managing and educating Indiana residents about wetlands.

6.2 Future Research

The research contained here is an essential first step in an attempt to begin to understand and explain wetland attitudes. The proposed model explaining a portion of wetland attitudes is currently without additional support. It would be beneficial to ask more questions to this population to gain more understanding about their attitudes and how they are formed. There are some unknowns about the balance between property rights and pro-conservation attitudes and how they both manage to have strong support. There can be more clear questions about land conservation and what that actually means to residents. Exploring where the concern about property loss (personal land being taken away) comes from would also be important.

The next logical step would be to evaluate the model with a larger population. There would be value in a state-wide survey that contains residents from various demographics and knowledge bases. While the respondents in this research were all within a reasonable distance to a large nature preserve, a state-wide survey would encompass people without regular access to natural resources.

A larger, non-regionally specific, survey would be beneficial in order to look at the attitudes of people that do not have large wetlands in their community or backyard. People that are unexposed to them in their day to day life might have different concerns and attitudes. The specific functions wetlands provide to this community may not be appreciated the same in a different area. The proposed model can be tested against a community without a large scale restoration project in progress.

Another viable research option would be to compare wetland education efforts throughout the state, and even nationally. Areas with high overall education efforts may be able to be compared to areas without any wetland education efforts. Verified delivery methods of wetland information that engage the public or local residents would be beneficial for organizations like INDR, IDEM and Little River Wetlands Project.

Additionally, the residents and government of the greater Fort Wayne area, including the Little River Wetlands Project would benefit from understanding collaborative methods of wetlands management. Case studies of successful large scale restoration efforts within communities could be exchanged and shared with stakeholders. They would serve as examples of management options and keep dialogue pathways open for continued land planning.

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Appendix A – Interview Phone Script

Managing Wetlands: A Community Perspective

PI: Jenny Sunday

Following is a phone script to contact potential participants.

Good morning/afternoon/evening Mr./Ms. _____. My name is Jenny Sunday from Ball States' Department of Natural Resources and Environmental Management. How are you today? We are conducting a research project to learn more about stakeholder attitudes and perceptions concerning wetland restoration and management near Fort Wayne, Indiana. We are doing this research by conducting interviews with interested participants who live and/or work in or near Fort Wayne and Huntington. We are asking all participants the same questions about: your community, wetlands, wetland restoration and land management within the Fort Wayne and Huntington area. The in-person interview will take about 45 minutes.

Would you be willing to participate?

If yes – continue to next section

If no – Ask if there is anyone they know (who fit the KI criteria) who might be willing to participate. Ask for contact information. Thank them for their time and end the conversation politely.

If willing to participate:

Which day and time works best for you to participate?

Where would you like the interview to take place?

Thank you very much. Confirm interview time, date and location.

Goodbye.

Appendix B – Key Informant Interview Guide

Managing Wetlands: A Community Perspective

PI: Jenny Sunday

Name: _____ Date: _____
Interview #: _____ Time: _____
Place: _____ County: _____

- 1) Do people in your community talk about the Great Marsh? What do you hear people say about the marsh?
- 2) How would you characterize your community's attitude toward the Great Marsh?
 - Is it an ecosystem that should be preserved? Expanded? Or reduced in size and the land used for other purposes?
 - Has this attitude changed over the past 10-20 years? If so, what has changed?
- 3) Is there a general level of agreement/disagreement in the community about how the marshland running from Ft. Wayne to Huntington should be managed? Why or why not?
- 4) Are you aware of any friction/disagreements between Allen and Huntington counties regarding how the Great Marsh is managed?
 - If so – how did these disagreements begin?
 - Changed over time? How?
- 5) Where is development happening in your county?
 - Is there concern about development in the county?
 - If there is concern, what is your sense of the community's interest in addressing this issue? Are there efforts addressing these concerns in your community?
 - How long have these efforts been going on?
- 6) What do you think could encourage and support more community involvement in land use/development decisions?
 - What are barriers to involvement?

- 7) What, if any, are some community concerns regarding water and stormwater management?
 - How would you describe this level of concern? (high, medium, low)?
 - Has this changed over time?
- 8) Are you aware of any friction/disagreements between Allen and Huntington counties in particular regarding how stormwater is managed?
 - If so – how did these disagreements begin?
 - Changed over time? How?
- 9) Are you aware of current programs related to wetland conservation?
 - Who runs these program(s)?
 - What are they doing for wetland conservation?
 - Are they positive or negative connotations towards them?
- 10) Can you describe the community's general attitude toward the various wetland conservation agencies and interests?
 - Have these relationships changed over time?
 - Are people for or against conservation and whom?
 - What would you describe as the motivations to be for/ against it?
- 11) Have we covered everything you think is important? Or – is there anything else about this community or about wetland management or issues that we haven't covered?
- 12) What year you were born?
- 13) What is your occupation?
- 14) What is the highest level of education completed?
- 15) What are your political leanings?
- 16) Are there other people you think we should talk to?
 - Name_____
 - Contact Information_____

Appendix C – Wetland Questionnaire

Please read each question and indicate your answer in the space provided. Your responses will be most useful if you read each question and follow directions carefully.

Q1. Are you familiar with Eagle Marsh in Fort Wayne, Indiana?

(Eagle Marsh is the largest wetland in the area)

Please CHECK only one:

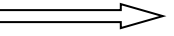
Yes

No 

If NO, please **SKIP** to **Q5** on Page 2

Q2. How many times have you visited Eagle Marsh in the past year?

Please CHECK only one:

0 

1-4

5-9

10-20

More than 20

If 0, please **SKIP** to **Q5** on Page 2

Q3. What kinds of activities do you like to do when you visit Eagle Marsh?

Please CHECK all that apply:

A. Youth environmental education

B. Walk nature trails

C. Birding

D. Wildlife interaction

E. Photography

F. Volunteer with the wetland conservation org there

G. Other - Please list

Q4. How far would you estimate you live from Eagle Marsh?

Please CHECK only one:

1-5 miles

6-10 miles

11-15 miles

More than 15

Don't know

The next few questions explore your general attitudes towards wetlands

Q5. How strongly do you agree or disagree with the following statements about wetlands?

- 1 = Strongly Disagree (SD)
- 2 = Disagree (D)
- 3 = Neither Disagree nor Agree (N)
- 4 = Agree (A)
- 5 = Strongly Agree (SA)

Please **CIRCLE** a number for *each* statement:

STATEMENT	AGREEMENT				
	SD	D	N	A	SA
	<i>..circle one for each statement..</i>				
A. I know what a wetland is	1	2	3	4	5
B. Wetlands cause inconveniences to farm operators	1	2	3	4	5
C. Most wetland areas are suitable for agricultural production when drained	1	2	3	4	5
D. I am concerned about wetland loss in the state of Indiana	1	2	3	4	5
E. Wetlands provide valuable wildlife habitat	1	2	3	4	5
F. Wetlands can be used for educational purposes	1	2	3	4	5
G. I think wetlands are a scenic feature in a landscape	1	2	3	4	5
H. Wetlands reduce flooding	1	2	3	4	5
I. Wetlands protect water quality	1	2	3	4	5
J. Wetlands increase mosquitoes in the surrounding area	1	2	3	4	5
K. Wetlands close to neighborhoods increase property values	1	2	3	4	5
L. The primary use of wetlands should be for products that are useful to humans	1	2	3	4	5
M. Communities benefit from wetlands	1	2	3	4	5
N. The value of wetlands exists in the human mind, without people, wetlands have no value	1	2	3	4	5
O. Wetlands are valuable only if they produce jobs and income for people	1	2	3	4	5

Q6. The following are aspects of wetlands that are important contributors to some peoples' overall well-being. Please indicate how important or unimportant the following aspects of wetlands are to your well-being.

- 1 = Very Unimportant (VU)
- 2 = Unimportant (U)
- 3 = Neither Unimportant nor Important (N)
- 4 = Important (I)
- 5 = Very Important (VI)

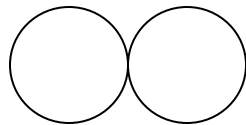
Please **CIRCLE** a number for each reason:

ASPECTS OF WETLANDS	IMPORTANCE				
	VU	U	N	I	VI
	<i>..circle one for each activity..</i>				
A. The sense of place I get from wetlands	1	2	3	4	5
B. The solitude of the wetlands	1	2	3	4	5
C. Walking/hiking around wetlands	1	2	3	4	5
D. Biking through wetland trails	1	2	3	4	5
E. Spiritual connection with wetlands	1	2	3	4	5
F. Recreation within wetlands	1	2	3	4	5
G. The sense of community I get from wetlands	1	2	3	4	5
H. The conservation of wetlands	1	2	3	4	5
I. Increased flood protection from wetlands	1	2	3	4	5
J. Water quality protection from wetlands	1	2	3	4	5
K. Birding opportunities in wetlands	1	2	3	4	5

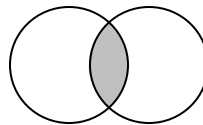
The next several questions explore your relationship to nature and your environment

Q7. In the following diagrams, one circle represents you and the other circle represents nature, which includes animate objects (like plants and animals) and inanimate objects (like streams, the atmosphere, and landscapes).

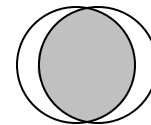
Please **CIRCLE** the one diagram that best represents your relationship with nature:



Self Nature



Self Nature



Self Nature

Q8. In the context of your life, please indicate how important each of the following issues are to you?

- 1 = Very Unimportant (VU)
- 2 = Unimportant (U)
- 3 = Neither Unimportant nor Important (N)
- 4 = Important (I)
- 5 = Very Important (VI)

Please CIRCLE a number for each reason:

STATEMENT	IMPORTANCE				
	VU	U	N	I	VI
	<i>..circle one for each activity..</i>				
A. Health care costs	1	2	3	4	5
B. Low unemployment	1	2	3	4	5
C. Crime prevention	1	2	3	4	5
D. Access to clean drinking water	1	2	3	4	5
E. Affordable college tuition	1	2	3	4	5
F. Green space	1	2	3	4	5
G. Land health	1	2	3	4	5
H. Protecting recreation	1	2	3	4	5
I. Family legacy	1	2	3	4	5
J. Protecting groundwater	1	2	3	4	5
K. Retirement security	1	2	3	4	5
L. Cost of living	1	2	3	4	5
M. Quality of life	1	2	3	4	5

Q9. In the past year, have you or members of your household done any of the following?

Please CHECK all that apply:

- Reduced use of lawn/garden chemicals
- Contributed money or time to an environmental or a wildlife group
- Stopped buying a product because it caused environmental problems
- Attended a public hearing or meeting about the environment
- Contacted a government agency about an environmental issue
- Read a conservation or environmental magazine
- Watched a television show on the environment
- Voted for or against a political candidate, in part, due to their position on the environment

The next several questions explore your attitudes towards conservation.

Q10. How strongly do you agree or disagree with the following statements about conservation?

- 1 = Strongly Disagree (SD)
- 2 = Disagree (D)
- 3 = Neither Disagree nor Agree (N)
- 4 = Agree (A)
- 5 = Strongly Agree (SA)

Please **CIRCLE** a number for each statement:

STATEMENT	AGREEMENT				
	SD	D	N	A	SA
<i>..circle one for each statement..</i>					
A. Without conservation, wetlands would be developed or farmed	1	2	3	4	5
B. Individual property rights are more important than environmental protection	1	2	3	4	5
C. Wetlands need to be protected	1	2	3	4	5
D. Cropland should be reclaimed for conservation areas	1	2	3	4	5
E. Unproductive cropland should be reclaimed for conservation areas	1	2	3	4	5
F. No income can be generated from land that is not worked	1	2	3	4	5
G. Agricultural productivity is more important than conserving wetlands	1	2	3	4	5
H. Land conservation is incompatible with running an agricultural business	1	2	3	4	5
I. Conserving wetlands offers no advantages or benefits to me	1	2	3	4	5
J. Government organizations should pay for wetland conservation	1	2	3	4	5
K. Farmers should receive more reimbursements to maintain wetlands	1	2	3	4	5
L. People who own wetlands have the right to use their land any way they want	1	2	3	4	5
M. People need more information on what could be done to take better care of wetlands in general	1	2	3	4	5
N. Trying to teach people about the importance of wetlands is a waste of time and money	1	2	3	4	5
O. Wetlands on private lands should be conserved voluntarily	1	2	3	4	5
P. Local government should give information and guidelines to promote conservation, but not regulate	1	2	3	4	5

Q11a. Do you presently have any property in wetlands?

Please **CHECK** only one:

___ No 

If NO, please **SKIP** to **Q12** on Page 7

___ Yes 

If YES, please **CONTINUE** with **Q11b.**

Q11b. Have you participated in any of the following programs?

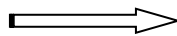
Please **CHECK** all that apply:

___ Conservation Reserve Program

___ Wetland Reserve Program

___ Wildlife Habitat Incentive Program

___ No



If NO, please explain why you have not participated

Q11c. How much land have you enrolled?

_____ number of acres

Q11d. When did you enroll your land?

Year _____

The next question asks about your attitudes towards development.

Q12. How strongly do you agree or disagree with the following statements about commercial/residential development in your community?

- 1 = Strongly Disagree (SD)
- 2 = Disagree (D)
- 3 = Neither Disagree nor Agree (N)
- 4 = Agree (A)
- 5 = Strongly Agree (SA)

Please CIRCLE a number for each statement:

STATEMENT	AGREEMENT				
	SD	D	N	A	SA
	<i>..circle one for each statement..</i>				
A. Development in my community should increase	1	2	3	4	5
B. Increasing development puts pressure on sanitation and storm water utilities	1	2	3	4	5
C. Wetlands inhibit development	1	2	3	4	5
D. Development increases community traffic	1	2	3	4	5
E. Development increases community noise	1	2	3	4	5
F. Development should fill vacant spaces in the community	1	2	3	4	5
G. Development increases run off from hard surfaces during major storm events	1	2	3	4	5
H. All of the prime areas in my community have been developed	1	2	3	4	5
I. There are more opportunities for development in my community	1	2	3	4	5
J. Development has caused my community to become crowded	1	2	3	4	5
K. Economic growth is more important than the environment	1	2	3	4	5

The next few questions explore how you see your community.

Q13. What do you enjoy most about living where you do?

Q14. How strongly do you agree or disagree with the following statements about your preference for future landscapes in your community?

- 1 = Strongly Disagree (SD)
- 2 = Disagree (D)
- 3 = Neither Disagree nor Agree (N)
- 4 = Agree (A)
- 5 = Strongly Agree (SA)

Please **CIRCLE** a number for each statement:

STATEMENT	AGREEMENT				
	SD	D	N	A	SA
<i>..circle one for each statement..</i>					
A. More natural resources like Eagle Marsh will benefit the community	1	2	3	4	5
B. Green spaces should be created along with new development	1	2	3	4	5
C. The local history of my neighborhood should be considered in county or city land planning	1	2	3	4	5
D. Views of wildlife and wild areas are important to me	1	2	3	4	5
E. Visual landscapes in my community are not important to me	1	2	3	4	5
G. Developments near conservation land have a negative impact on the natural resource	1	2	3	4	5
H. Development near or next to wetlands are necessary for economic growth	1	2	3	4	5

*Finally, we'd like to ask you a few questions about yourself.
All information will be treated confidentially and never linked with your name.*

Q15. What is your gender?

Please CHECK only one:

___ Female ___ Male

Q16. What was the highest grade of school you completed?

Please CHECK only one:

- A. ___ None
- B. ___ Grade school
- C. ___ Some high school
- D. ___ Completed high school or GED
- E. ___ Some college
- F. ___ Technical school beyond high school or Associates Degree
- G. ___ Bachelor's Degree
- H. ___ Graduate/Professional Degree

Q17. How long have you lived in your present community?

_____ number of years in community

Q18. Are you a farmer?

_____ Yes _____ No

Q19. How would you describe the community you live in?

_____ Urban _____ Suburban _____ Rural

Q20. When were you born?

Year 19_____

THANK YOU!

Those are all the questions we have.

Thank you very much for your time and cooperation in completing this survey!

Please return the completed questionnaire using the postage-paid envelope provided.

If you have any comments that you would like to share with us, please use the space

below:

Appendix D – First Mailing Letter

Dear _____,

I am a student at Ball State University and I am writing to ask for your help in a research project I am conducting regarding Indiana residents and their attitudes about water quality and wetlands. Using the information that you provide in this survey we hope to better understand people's attitudes and perceptions concerning wetlands and wetland restoration near Fort Wayne and Huntington.

You do not need any special knowledge about water quality, wetlands or wetland management to participate in the study. By agreeing to participate, you will contribute a great deal to our understanding of how community residents relate to water, wetlands, and wetland management. Your address was randomly chosen from public records at the county tax assessor's office.

Your answers are completely confidential and will only be used in the context of summarizing findings for the entire study in which no individual's answers can be identified. Once your completed questionnaire has been returned, your name will be deleted from the mailing list and never connected to your answers in any way. Your participation in this research is completely voluntary and you may end your participation by not completing the survey. You may also decline to answer specific questions included in the survey. This survey should only take 10 to 15 minutes to complete. Please use the self-addressed stamped envelope to return the survey to Jenny Sunday by January 18, 2013. Once your completed survey has been received you will be included in a drawing in which three winners will receive \$50 gift certificates to Panera as a thank you for participating.

By completing and returning the survey you are agreeing that you have read this letter and consent to participate in this research. For legal purposes, persons must be 18 years of age or older to participate. Please keep this letter for your records or future reference. If you have any questions about this research contact Jenny Sunday (765-285-5785) or Dr. Joshua Gruver (765-285-5789) or via email at jmsunday@bsu.edu and jbgruver@bsu.edu, respectively. If you have any questions about your rights as a research participant, contact Ball State's Office of Research Integrity at (765) 285-5052.

Thank you for taking the time to assist us. If you require additional information or have questions please contact me. I'd be happy to speak with you.

Sincerely,

Jenny Sunday
Principal Investigator
Dept of Natural Res. and Envir. Mgmt
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Appendix E – Second Mailing Letter

Dear _____,

In mid-January I sent you a survey asking for your help in a research project I am conducting as a graduate student at Ball State University regarding Indiana residents and their attitudes about water quality and wetlands. Your input is very important to us and we hope you will consider participating. Using the information that you provide in this survey we hope to better understand people's attitudes and perceptions concerning wetlands and wetland restoration near Fort Wayne and Huntington. If you have recently returned your completed survey, it may still be en-route, please ignore this letter and thank you for your participation.

I am writing again because of the importance of hearing from everyone in the mailing sample. The comments of people who have responded vary widely and are very useful. You do not need any special knowledge about water quality, wetlands or wetland management to participate. By agreeing to participate, you will contribute a great deal to our understanding of how community residents relate to water, wetlands, and wetland management.

Your address was randomly chosen from public records at the county tax assessor's office. Your answers are completely confidential and will only be used in the context of summarizing findings for the entire study in which no individual's answers can be identified. Once your completed questionnaire has been returned, your name will be deleted from the mailing list and never connected to your answers in any way. Your participation in this research is completely voluntary and you may end your participation by not completing the survey. You may also decline to answer specific questions. This survey should only take 10 to 15 minutes to complete. Please use the self-addressed stamped envelope to return the survey to Jenny Sunday. Once your completed survey has been received you will be included in a drawing in which three winners will receive \$50 gift certificates to Panera as a thank you for participating.

By completing and returning the survey you are agreeing that you have read this letter and consent to participate in this research. Persons must be 18 years of age or older to participate. If you have any questions about this research contact Jenny Sunday (765-285-5785) or Dr. Joshua Gruver (765-285-5789) or via email at jmsunday@bsu.edu and jbgruver@bsu.edu, respectively. If you have any questions about your rights as a research participant, contact Ball State's Office of Research Integrity at (765) 285-5052.

Thank you for taking the time to assist us. If you require additional information or have questions please contact me. I'd be happy to speak with you.

Sincerely,

Jenny Sunday
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Thank You

You recently received a survey from the Department of Natural Resources and Environmental Management at Ball State University. If you have completed the survey, *Managing Wetlands: A Community Perspective*, thank you! If you have yet complete it, this is a reminder that your response is very important to us.

In the event that you need a replacement questionnaire, we would be happy to send you another. Please contact Jenny Sunday via email at jmsunday@bsu.edu or call 765-285-5785.

Appendix G – Pearson’s Correlations

Table 4.17 Pearson Correlations for Linear Regression Variables

Variable	a	b	c	d	e	f	g	h	i	j	k	l	m
a. Wetland Attitudes													
b. Gender	-0.097*												
c. Age	0.008	0.125**											
d. Level Ed.	0.113*	-0.052	-0.124**										
e. Farmer Status	-0.194**	0.134**	0.036	-0.027									
f. Income	-0.052	0.123**	-0.071	0.359**	0.044								
g. Yrs Comm	-0.060	0.121**	0.441**	-0.171**	0.158**	-0.082							
h. Knowledge	0.668**	-0.023	-0.020	0.077	-0.091*	0.058	-0.011						
i. Life Issues	0.203**	-0.093*	-0.012	-0.091*	-0.002	-0.084	-0.032	0.261**					
j. Well-Being	0.585**	-0.164**	0.017	0.038	-0.170**	-0.093*	-0.020	0.562**	0.360**				
k. EnviBehav	0.194**	-0.048	0.102*	0.031	-0.044	-0.061	0.072	0.207**	0.147**	0.245**			
l. Development	0.254**	-0.012	-0.048	0.068	0.005	0.049	-0.052	0.320**	0.149**	0.176**	0.117*		
m. GreenSpace	0.651**	-0.162**	-0.036	0.154**	-0.137**	-0.024	-0.104*	0.560**	0.301**	0.598**	0.261**	0.352**	
n. Conservation	0.734**	-0.087	-0.047	0.108*	-0.132**	-0.047	-0.087	0.594**	0.268**	0.585**	0.209**	0.375**	0.653**

*p<0.05, **p<0.01