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The Hewitt Creek Watershed Group: A study of mechanisms that led to the adoption of farm management practices to improve water quality

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The Hewitt Creek Watershed Group: A study of mechanisms that led to the adoption of farm management practices to improve water quality

By

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Abstract

As the world population grows, the need for food, fiber, and fuel will increase. Farmers are in a unique position to provide these resources and to serve as the stewards of the fresh water on the planet. However, currently farmers in the United States do not uniformly understand the role their practices have on water quality and therefore are not taking action to address the impacts their practices have had, and continue to have, on surface water and groundwater. Hewitt Creek Watershed farmers in northeast Iowa have demonstrated that it is possible for farmers to come together to address water and soil quality issues and while remaining profitable. Through the use of two feedback mechanisms, identity change and the use of performance-based management tools, they came to understand the environmental impacts of their farm practices on the surface and groundwater in their watershed. The practices they use now allow them to remain profitable and protect the soil and water on their land. In the process, many of these farmers have changed their attitudes and beliefs about their role in the quality of the water that leaves their farms and flows into the Mississippi River Watershed.

CHAPTER 1. INTRODUCTION

> Our ultimate dependence on agriculture – as individuals and as a society – makes farming a different kind of business and industry. Producing food and fiber is not like manufacturing goods or providing services. Not only is it extremely vital, but food and fiber production cannot be started or stopped at just any time of year. Farming depends upon seasons, climate, and basic biological processes (Wimberley 1:2002).

Throughout the 10,000-year history of farming (Buckland, 2004), farmers have been pushed to produce ever more food or fiber, and recently fuel, per unit of land. The more surplus a single farmer could produce, the more members of a society could adopt other skills that would allow societies to develop and flourish (Albrecht and Murdoch, 2002). However, the practice of industrial agriculture has created unintended consequences to the environment that have forced federal, state, and local government agencies to step in and attempt to reduce the negative impacts. Those negative consequences include water pollution, soil erosion, loss of plant and animal biodiversity, and the overall deterioration of the country's natural resource base (Pretty, 1995).

Agriculture is a human endeavor and carries with it the challenges that most human endeavors bring: the who, what, when, and where of how agriculture is practiced (Porter, Scott, and Simmons, 2010). Each decision to use a specific agricultural practice brings with it not only environmental, biological, and physical constraints, but social issues such as economics, and societal and individual needs and desires (Wimberley, 2002 and Porter, *et al.*, 2010). Wimberley (2002) and Porter *et al* (2010) have zeroed in on two important aspects of agriculture: humans don't always agree on how to practice agriculture, and they need the products of agriculture in order to survive.

For the purposes of this thesis agriculture is defined as the production of food, fiber, and fuel crops for human consumption. This paper also will focus on the practice of modern agriculture, also known as productivist agriculture, in the United States. Pretty (1995) provides a more complete definition

> Farmers have modernized by introducing machinery, replacing labour, specializing operations, and changing practices to ensure greater aggregate production. The pressure to increase economies of scale, by increasing field and farm size, has meant that the traditional mixed farm, a highly integrated system in which few external inputs are generated, has largely disappeared. (30-31:1995)

In the last 100 years, the rural landscape in United States has been dramatically altered. The rapid adoption of new agricultural technologies has had far-reaching impacts upon social, economic, and ecological systems (Pretty, 1995). Specifically, modern agriculture evolved into a "high input, high output system" (HIHO) (Pretty, 1995:29-30). This agriculture system developed in areas where the environment could be modified so that farmers could easily use these technologies (Pretty, 1995). According to Pretty (1995), the combination of the following attributes set the stage for the industrialization of agriculture in the United States:

- Access to roads, urban markets, ports,
- Access to inputs, machinery, marketing infrastructure, transport, agroprocessing facilities and credit;
- Good soils;
- Adequate supply of water, either through stable rainfall or irrigation systems;
- Access to modern crop varieties and livestock breeds; and
- Access to petroleum-based products and machinery.

In the practice of modern agriculture, large machines are used to plant, protect, and harvest crops. Profitability is increased by acquiring (through ownership or rental) more land; relying on technology and off-farm inputs to increase yields (crops and livestock) and the acquisition of machinery; producing a small number of crops using specialized farm equipment in order to maximize the use of land and increase efficiency; and not rarely factoring the environmental and social impacts when calculating the cost of production (Buckland, 2004).

The foundations for HIHO agriculture in the United States came ashore with the Europeans who migrated to the North American continent (Reeder and Westermann, 2006). When Europeans first arrived in North America they found rich soils loaded with organic matter (Reeder and Westerman, 2006). Native Americans were growing a few crops at that time, and the techniques they used earned them the reputation as "the nation's first no-tillers" (Reeder and Westerman, 2006:6). Even though the Native Americans shared their no–till corn production practices with the Europeans, the new Americans preferred to use the tillage tools they had used in their home countries (Reeder and Westerman, 2006). From the time the first European settlers arrived in the United States until the end of the 1960s, wood or iron hoes and mattocks and later the steel moldboard plow were used to till agricultural land in the United States (Reeder and Westermann, 2006). The increasing number of Europeans arriving in the United States found large tracts of land that contained rich soil and adequate rainfall (Albrecht and Murdock, 2002), allowing them to quickly establish farms and produce grain and livestock.

Then in the mid-nineteenth century, a blacksmith named John Deere developed the steel plow and started a revolution in food production.

> This plow, more than any other invention, symbolized the human ability literally to turn nature on its head. The steel plow became the foundation for the modern agriculture. As the plows and the machines that pulled them got bigger, more and

> more land could be farmed by fewer people. Every increase in scale and intensity, however, increased the environmental impacts as well. (Clay, 2004:1)

Today there are approximately 2.2 million farms in the United States (USDA, 2009), about 60 percent produce less than $10,000 per year income and account for only two percent of the food raised in the United States (USDA, 2009). In 2007 just 125,000 U.S. farms produced 75 percent of agricultural products (per value) (USDA, 2009). About half of the food produced in the United States is raised in nine states – California, Texas, Iowa, Nebraska, Kansas, Illinois, Minnesota, North Carolina, and Wisconsin (USDA, 2009). In order for that much food, fiber and fuel to be produced in that land area, modern farm management practices must be used (NRC, 2010).

The HIHO system has created challenges for local, state, and federal governments in the United States. The federal government has pushed farmers to produce more food to feed the country's growing population through the construction of infrastructure such as roads and irrigation systems, development of improved crop and livestock breeds at the U.S. land-grant universities, and subsidy programs that help lower the financial risk of raising some crops (Pretty, 1995). However, the federal government and state and local governments have had to deal with the negative impacts of water pollution, loss of natural habitat, air pollution, and flooding.

One of the first obvious signs that mechanical crop production was having a negative impact on the environment was the Dust Bowl in the 1930s. A nearly decade-long drought in the southern Plains killed the wheat that farmers had planted after plowing up the native grasses. Without a crop to keep the soil in place, the cropland was exposed to the ravages of wind storms that carried soil all the way to the East Coast

(Albrecht and Murdoch, 2002). This event pushed the U.S. government to create the Soil Conservation Service (SCS) in an effort to reduce or eliminate soil erosion on the land being cultivated by the country's farmers (Albrecht and Murdoch, 2002). Despite the use of technology and the $15 billion in funding that has been spent to curb soil loss since the SCS was formed in 1935, soil erosion is occurring at a faster rate than "at any time in history, including the Dust Bowl era" (Albrecht and Murdoch, 2002:282). Some soil scientists estimate that 2 billion tons of topsoil blows or washes off U.S. cropland each year (Albrecht and Murdoch, 2002).

When soil does move into surface water it often becomes a pollutant, along with the agricultural inputs that flow with it. The Federal Water Pollution Control Act – commonly known as the Clean Water Act – protects surface waters in the United States and is enforced by the Environmental Protection Agency (EPA) and the states (Copeland, 1991). The Clean Water Act (CWA) was established in 1948, but was substantially changed and expanded in 1972 (Copeland 1991).

For purposes of this thesis, only the Title VI portion of the CWA -- the regulatory section -- will be discussed. Copeland (1991) provides an overview of the history of this aspect of the CWA Until the late 1980s, EPA regulators focused on addressing point source pollution -- that is, pollution that could be connected to a specific source such as a business or some local, state or federal governmental entity, especially sewage treatment plants. In 1987, Congress amended the CWA to include nonpoint source pollution. Nonpoint source pollution is the result of storm water runoff from farms, forests, and urban areas, as well as the movement of water through agricultural drainage tiles. CWA regulations state that it is against the law to release any substance into the nation's waters, unless the entity releasing the substance has obtained a valid permit from the National Pollutant Discharge Elimination System (NPDES). To be granted a NPDES permit, an entity must have in place the appropriate technology to control and monitor potential pollutants in the water that it discharges. Under the CWA, the states, rather than the federal government, are responsible for managing runoff into waters. But, the EPA retains the right to enforce any criminal violations by bringing action directly against a polluter if it deems that the state has not taken appropriate action. The CWA also allows for U.S residents to bring suit in federal court against the EPA or state government officials to compel them to carry out their duties under the CWA.

Environmental Challenges

While soil conservation is still a challenge in U.S. agriculture today, the over-application and the accumulation of crop inputs to soil have created a new source of water pollution. Pesticides, herbicides, and nutrients have helped boost crop yields, but the effects of these inputs have caused a number of environmental problems that go beyond the farm field where these inputs were applied (Clay, 2004). One specific example of the surface water pollution issue is the hypoxia zone in the northern Gulf of Mexico (USGS, 2000). High levels of nutrients (mostly nitrogen and phosphorous applied to farmland, along with animal and human waste) flow down the Mississippi River to the Gulf each spring (USGS, 2000). These nutrients create large algal blooms that disrupt the balance of dissolved oxygen in the water, reducing the levels of oxygen to a rate that is below the level needed by some aquatic animals and plants to survive (USGS, 2000). The result is the formation of a 6,000 to 7,000 square mile “dead zone” that threatens the $4 billion a year seafood industry in the Gulf and threatened and endangered species.

In 1950, North American farmers produced 30 units of crops for every one unit produced by farmers in Asia or sub-Saharan Africa (Buckland, 2004). By 2000, the North American farmer was producing 500 times more food than farmers using traditional methods (Buckland, 2004). However, the practices used by North American farmers to increase that ratio have had a negative impact on the soil in these areas. How big an impact those practices have had is hard to measure because inorganic inputs have allowed North American farmers to increase yields even though soil quality has diminished (Buckland, 2004). Scientists studying the flow of nutrients into the Gulf of Mexico estimate that most of the nitrogen (60 percent) and more than half of the phosphorus (54 percent) come from the Central Mississippi and Ohio River basins (represented in Figure 1), which cover just under a third of the entire land base that makes up the Mississippi and Atchafalaya River Basins (Alexander, et al, 2008).

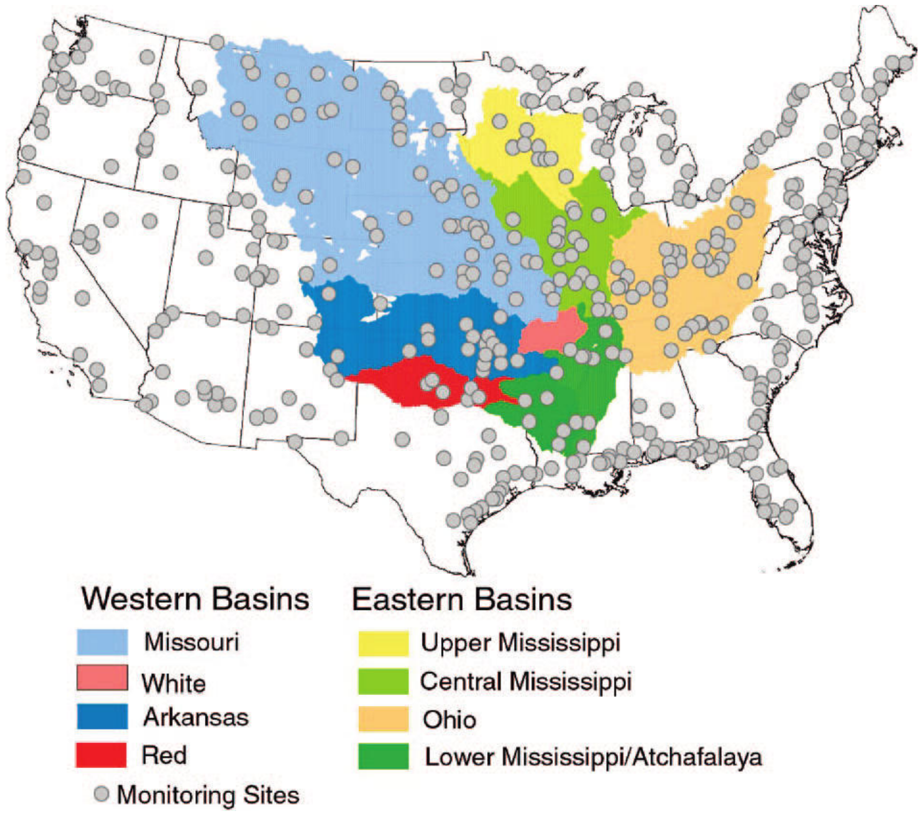

Figure 1. Major Hydrologic Regions of the Mississippi and Atchafalaya River Basins. (Alexander, *et al.*, 2008:825)

Like many other Americans, farmers faced financial hard times during The Great Depression. In order to protect the country's food supply and support rural incomes, the U.S. government started to subsidize important crops (Clay, 2004). Even though this 80-year-old safety net has protected some farmers' income, it has not protected the environment to the same degree (Clay, 2004). One impact of the subsidies is that some crops, such as corn and soybeans, are produced in large amounts because these crops receive high levels of assistance. Some argue that as a result of subsidies, U.S. farmers are overproducing these commodities in an effort to take advantage of the federal farm program; with declines in soil and water quality as a result (Clay, 2004). As recently as the 2002 Farm Bill, the U.S. Congress provided increases in subsidies for some crops, while ignoring the empirical evidence that the production of such crops has had, and continues to have, a negative impact on the ecosystems where these crops are grown. In some cases, the production of these crops is destroying other ecosystems hundreds of miles away, as in the case of the hypoxia zone in the Gulf of Mexico (Clay, 2004).

Government Response to Environmental Challenges

The federal government has made some attempts to address the environmental impact of industrial farming practices through its conservation assistance programs. The Conservation Reserve Program (CRP) was introduced in the 1985 U.S. Farm Bill. This effort was established to encourage “farmers to convert highly erodible cropland or other environmentally sensitive acreage to vegetative cover, such as tame or native grasses, wildlife plantings, trees, filter strips, or riparian buffers” (NRCS, 2010a). Farmers who agree to multi-year contracts to remove this land from production are then paid rent to replace the reduced farm income and are provided a share of the money needed to install the appropriate vegetation on the reserved land (NRCS, 2010a).

The Environmental Quality Incentives Program (EQIP) also provides technical and financial help to farmers and ranchers who want to install structures or adopt management practices to reduce the environmental impacts of agriculture on their land (NRCS, 2010b). Funding is allotted at the state level and is issued according to the greatest local need, the availability of eligible land and local costs for installing structures (NRCS, 2010b).

Farmer Response to Environmental Challenges

Recently, Iowa farmers were asked to report on their understanding of the need to target conservation efforts in the areas where such practices have the potential to reduce soil erosion and improve water quality problems (Arbuckle, Lasley, Korsching, and Kast, 2009). Three-quarters of the farmers who responded to the *2009 Iowa Farm and Rural Life Poll* indicated that they support the idea that “conservation funding should be higher for land that is most vulnerable to soil and water quality problems” and that “limited resources should be spent where they have the most impact” (Arbuckle *et al*., 2009:12). Arbuckle, *et al.* (2009) see these responses as a sign that Iowa farmers support moving to targeted conservation practices in an effort to use resources in the most efficient manner possible to reduce soil erosion and improve water quality on agricultural land. When asked specifically about the issue of agriculture nutrient flow into waterways and lakes, 78 percent said that Iowa farmers need to do a better job of keeping soil and nutrients on the land and out of waterways and lakes (Arbuckle, *et al*., 2009). However, fewer Iowa farmers (58%) see the connection between their practices and the silting of Iowa lakes or how their practices contribute to the hypoxia zone in the Gulf of Mexico (Arbuckle, *et al*., 2009).

While farmers have been slower in recognizing the role agriculture plays in affecting the environment, the public sees a clear connection between farm practices and environmental issues. U.S. public opinion research shows that most Americans feel that agriculture has caused “significant environmental problems” (Harris and Bailey, 2002:34). Harris and Bailey report that agrichemical companies, the government, and consumers are seen by the general public as bearing some of the responsibility for the pollution problems caused by U.S. agricultural production. However, the public see farmers as having the most direct role in causing environmental damage (Harris and Bailey, 2002). Particularly, a majority of those surveyed indicated that they believed that farmers were more interested in earning profit than protecting the environment; that farmers use fertilizers and chemicals in excess; and that large farms are more likely to cause environmental problems than small farms (Harris and Bailey, 2002). This survey also reports that U.S. citizens see agricultural pollution as a big problem and now consider it as serious as industrial pollution. Not only do a majority of Americans think that pollution from farm should be regulated the same way as other types of pollution, there is significant support for financially penalizing farmers who do not conserve soil (Harris and Bailey, 2002). The respondents also agreed that farmers should go beyond taking action to stop polluting, they should work to repair the damage caused by past farming practices and that in the future they should be active stewards of the land. In addition, the respondents overwhelmingly agreed that farmland ownership does not give the owner “unlimited rights to exploit soil and water” (Harris and Bailey, 2002:37).

Farming in the 21st Century

For the first 10,000 years of farming, farmers were viewed as a provider of food for the world. In the early years of the United States, farmers were seen as pioneers. Their ability to use the soil and water to produce food allowed other immigrants to follow and settle vast sections of North America. But in the mid-1800s the development of the steel plow sparked a mechanical revolution that changed how food, fiber, and fuel were produced by increasing the expectations that yields and the amount of land one farmer could manage would regularly increase. This view of agriculture, however, did not include consideration of or action to address the negative environmental, social, and long-term economic issues that would result. Farmers who were once seen as pioneers and essential to well-being of the country are now perceived as business men and women who put profit before the public welfare when it comes to environmental issues.

So what should a U.S. farmer do? On the one hand they are urged to produce as much food, fiber, and fuel as possible, but on the other hand they are told not to harm the environment, specifically soil and water. The experiences in a small watershed in northeast Iowa present an example of how a group of farmers, when forced to acknowledge their farming practices were polluting a creek, took action at the individual and group levels to reduce the flow of pollutants from their land to their creeks. The farmers of Hewitt Creek Watershed did not recognize their practices threatened their watershed until the Iowa Department of Natural Resources (DNR) listed a section of Hickory Creek in the Hewitt Creek Watershed as an Environmental Protection Agency (EPA) 303(d) impaired waterway. The manner in which these farmers responded to this designation provides insights into how farmers can be successful and profitable producers of food, fiber and fuel, *and* co-produce environmental products that improve the ecosystems touched by their practices. Specifically this thesis will examine:

- the good farmer identity;
- the role it plays in determining which agricultural practices are used; and
- how farmers gather to take collective action.

The basis for how farmers can reconstruct their good farmer identities to include caring for the environment is found in the social psychological theoretical framework known as identity theory. Chapter 2 will outlines how identity theory can explain the process how Hewitt Creek farmers used to change the way they see themselves and their farm operation practices, enabling them to reduce the agricultural pollutants leaving their farms. Chapter 3 outlines the Hewitt Creek Experience. Chapter 4 provides an overview of the methods used to perform the research for this thesis. Chapter 5 focuses on how individual farmers came to make changes in their behavior. Chapter 6 examines how individual farmers came together to take collective action to reduce the amount of agricultural pollutants leaving their farms and flowing into a creek in their watershed. Finally, Chapter 7 addresses the limitations, suggestions for future research, and offers insight into the value of this research.

CHAPTER 2. THEORY

A number of sociological and social psychological theoretical frameworks could be examined to help explain the motivations and actions that prompt farmers to co-produce environmental products in their farm operations. This paper focuses primarily on symbolic interactionism and one of the theoretical frameworks it generated -- identity theory. Specifically, this thesis examines identity theory as it relates to the individual and group levels of analysis. In addition, the paper examines the concept of performance-based management to understand the role it may play in triggering attitude and behavior change.

Symbolic interactionism (SI) is considered by some sociologists as “a nature common to all human beings” (McCall, 2006:1). This concept was first examined by Scottish moral philosophers in the eighteenth century (McCall, 2006). Since then the concept of SI has been debated by European and American social scientists. One important aspect of SI is the ability for humans to see themselves as objects. When individuals are self-aware they are able to evaluate a situation and plan to act (Stets and Burke, 2003). The theory of SI states that humans see themselves as not only individuals, but also as part of society. They can control their own actions, interact with society in a meaningful way, and form the structures that create society (Stets and Burke, 2003).

One of SI’s offspring is structural symbolic interactionism (Stryker, 1980). Stryker contends that social structure is formed by the interactions of individuals within a specific society or culture (1980). As individuals interact with each other in a consistent manner, a structure is formed (Stryker, 1980). If a person or group members change their interactions with each other or other groups, the social structure is changed (Stryker, 1980). Therefore structural symbolic interaction is thought by some to be the bridge that connects the individual to society, allowing the individual to change society and vice versa (Stryker, 1980).

Individual Level of Analysis

Peter Burke (1991, 2003, 2009), with substantial input from Stets and others, builds on Stryker's structural symbolic interactionism in his description of identity theory. Identity is "a set of meanings that define who one is when one is an occupant of a particular role in society, a member of a particular group, or claims particular characteristics that identify him or her as a unique person" (Burke and Stets, 2009:3). These identities build the structures that create society and set the expectations on how an individual and those around them will act (Stets and Burke, 2000). In this structure, the individual develops three aspects of identity: person, role, and social.

Person Identity

A person identity is comprised of "the set of meanings that are tied to and sustain the individual" (Stets, 2006a:90). Since person identities are shaped by society and are activated when we connect with others, person identities are usually quite high in an individual's identity salience hierarchy (Stets, 2006a). A salience hierarchy is the prioritizing system an individual uses to rank his or her identities. The more likely a person is to use a particular identity on a regular basis, the higher it is in the hierarchy (Stryker, 1980). Since a more salient identity is likely to be activated more often, it becomes possible to predict how a person may act in specific situations (Burke and Stets, 2009). Some consider the person identity to be an individual's master identity. In this capacity the person identity is often considered the organizer and modifier of a person's role and group identities (Burke, 2004).

It is easy to assume that a person identity is nothing more than a static set of specific beliefs that an individual uses in everyday life to interact with themselves and society. But the person identity performs other functions. The person identity is maintained and changed by a feedback process that checks the social environment to see what kind of responses (reflected appraisals) a person's actions are generating from the social environment (Stets and Burke, 2003).

The feedback loop shown in Figure 2A demonstrates how this process operates. Its four parts operate as a system through which an individual is constantly checking whether or not his or her actions are producing the desired effect (Burke, 1991). Specifically, this feedback loop allows an individual to see if the standards that he or she holds for a particular identity are being verified. At the top is the identity standard/comparator, which is the set of meanings/standards an individual carries as part of a particular identity (Burke, 1991). The output level is activated when a person interacts with the social/physical environment. Feedback from interaction with the social/physical environment is reflected back to the person through the input phase of the feedback loop. The individual then compares that input to the identity standard/comparator. If the feedback matches the comparator, the identity is verified and the person continues to act in a similar manner. If the input does not match the comparator, the individual is faced with making changes to behavior or to the identity standard/comparator (Burke, 1991). The feedback loop is really the first step in the identity control system (Burke, 1991).

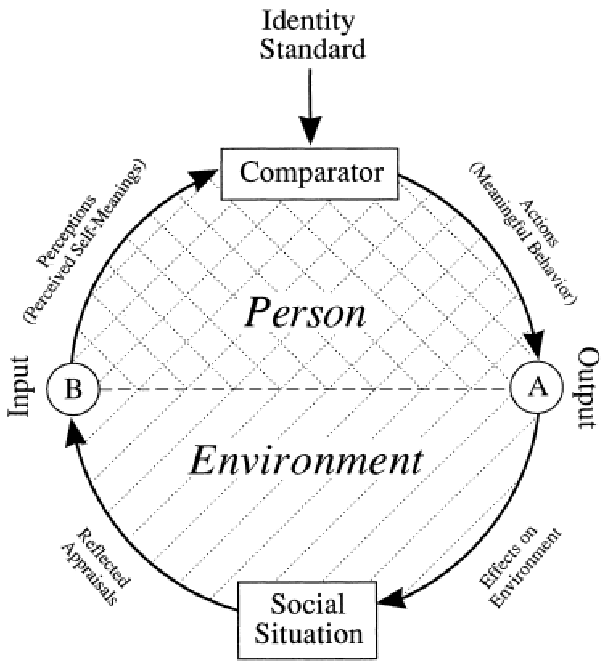

Figure 2A. The Identity Control Model (Burke, 1991:838)

The above process continues as long as an individual has an active identity and is known as part of the self-verification process (Burke and Stets, 2000).

This feedback model allows the individual to behave in a manner that balances both the "internal self-meanings" (self-views) and the social situation he or she is responding to at any given moment in order to enact the most appropriate behavior (Stets and Burke, 2003:137). As Figure 2A demonstrates, identities are goal-driven. That is, the process allows an individual to achieve a goal by changing the environment, adjusting behavior, or seeking more information in order to make a decision on how to act (Stets and Burke, 2003). The concept operates within person, role, and social identities.

For example, let's assume a farmer decides one summer day that he is going to plant corn next year in a field that is currently planted with soybeans. A number of actions are available to him to accomplish the goal of growing corn in that field. One specific set of decisions that he will need to make is how to ensure that is the soil has enough fertility for him to grow corn. The first decision is how to determine the soil's fertility. Several options can be used to determine soil fertility, including testing the soil following the harvest of the current year's crop; estimating the amount of nutrients in that field; assuming there is about the same amount of fertility as the last time the farmer planted corn following soybeans in that field; or hiring a crop adviser to determine the level of fertility in that field. This example assumes the soil is tested and that additional nitrogen is needed to produce a high-yielding corn crop that year.

Now the farmer has more decisions to make. If profit is the focus, and he has livestock, then it is likely that using the manure produced by livestock is probably the lowest cost fertilizer. However, choosing that type of nitrogen introduces a set of decisions and actions that are different than the set of actions and decisions that accompany the use of another type of fertilizer. The goal of growing corn will be accomplished, but the actions the farmer takes to achieve that goal are different depending on the situation.

Role Identity

A role identity "includes all of the meanings that a person attaches to himself while performing that role" (Stets, 2006a:89). Role identities always correspond to a role held by another person (Stets, 2006a). For example, the role of teacher can only exist if there are students (Stets, 2006a). An individual uses the feedback process outlined in Figure 2A to manage role identities and the conflict that can develop between identity standards. For example, if a farmer's person and farmer role identities included "environmental steward," then learning that a regulatory agency determined that farmer's actions have caused water pollution, would result in that farmer's person and farmer (role) identities not being verified. This lack of verification forced this farmer to resolve the conflict by making changes in his farm practices to verify his environmental steward identity. Stets and Burke describe this as "when the meanings of role identities conflict with the meaning of person identities, people may act without regard to role identity in order to maintain their person identity" (146:2003).

The feedback loop offered in Figure 2A is an important aspect of how an individual performs role identities. Burke and Tsushima (1999) offer an expanded model of Burke's 1991 feedback loop that is built upon Powers (1973) control theory model. In the advanced model, shown in Figure 2B, the top third of the model represents the principle-level, and the lower part of the model represents the program-level (Tsushima and Burke, 1999:173). "Principle-level standards are conceptualizations of abstract goal states such as values, beliefs, and ideals" (Burke and Stets, 2009:137). Burke and Stets go on to define program-level standards as more concrete and based on actions one would take to support the more abstract principle-level standards (Burke and Stets, 2009). This two-level model is comprised of several single feedback loops (Figure 2A) at the program-level that support a single standard at the principle-level. Several comparators, outputs, and inputs at the program-level are used to verify a particular identity standard at the principle-level. In this model, program-level activities change if the principle-level standard is not being verified (Tsushima and Burke, 1999). For example, if the standard at the principle-level is the good farmer identity, the individual may try several actions (programs) in order to find the right combination of actions that verify their good farmer identity.

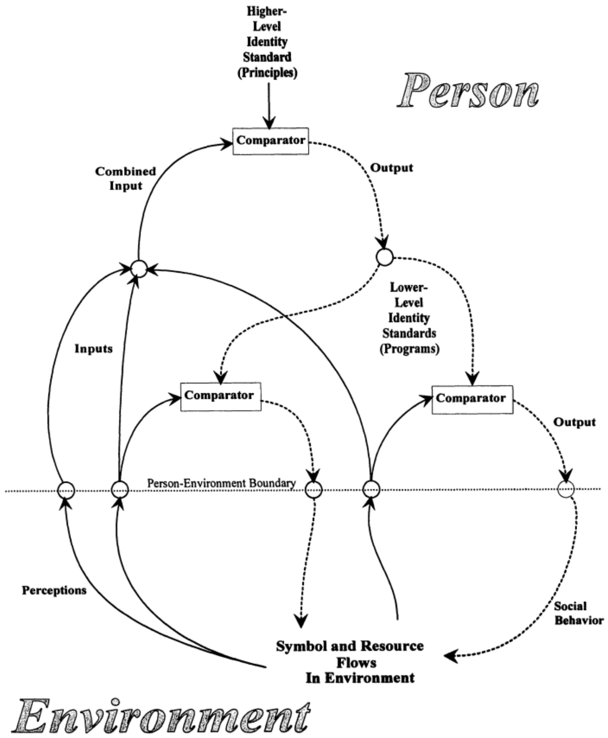

Figure 2B. Identity Model Showing Two Levels. (Tsushima and Burke, 1999:174)

Burke argues that the interaction and adjustments of identity between the principle and program-levels are how we change our identities (2006). He suggests that this can happen slowly through everyday interactions (as a spouse or parent) over a long period of time, or may change rapidly as the result of a single negative (being the victim of a crime or natural disaster) or positive (winning the lottery or the Nobel Peace Prize) event outside of our control (Burke, 2006).

Social Identity

Since this thesis is focused on the sociological view of identity theory, social identity is defined at the individual level of analysis through the sociological social psychological viewpoint proposed by Stryker (1980) and Burke (Stets and Burke, 2003).

Social identity is the way “people categorize themselves as similar to some, labeled the in-group, and different from others, the out-group” (Stets, 2006a:89). Social identities give individuals a chance to feel they are part of something bigger than themselves. Since it can be difficult to differentiate between a role identity and a group identity, Stets offers a simple explanation. “It is what one does in one’s role identity that is important compared to who one is on the basis of one’s group identity” (2006:90). When individuals are able to link their role and person identities with an abstract group identity, that individual more completely connects to that group identity than they would if their role and person identities were not closely linked (Burke and Stets, 2000).

These three types of identities require a mechanism to manage them. This is where Stryker’s ideas of salience and commitment come into the picture (1980). As discussed earlier, some identities have more salience for an individual, so those identities rank higher in a person’s identity hierarchy. A high ranking does not mean that the identity is a person’s favorite. Instead a high-ranking means that the identity is more likely to be activated and verified in the interactions that come with an individual’s person, role, and social identities (Stets, 2006b). Commitment to an identity is based on qualitative and quantitative aspects of one’s attachment to this identity (Stets, 2006b). The quantitative portion of commitment is based on the number of people that a person is attached to through this identity (Stets, 2006b). The qualitative aspect of commitment is defined as the intensity of a person’s connection to that identity (Stets, 2006b).

Social Structure

Person, role, and social identities are influenced by the culture that surrounds an individual, and, in turn, the individual can influence the surrounding culture. If a person’s social structure changes, it is likely he or she will change person, role, and social identities in an effort to adapt to the new structure (Stets, 2006a). In addition, changes in any one type of identity can lead to changes in the individual's other identities. In describing the various identities people hold, this thesis references social structure. It is important to examine how social structure fits within identity theory.

As individuals activate and verify their person, role, and social identities, a social structure is formed connecting the individual to society (Burke, 2004). Burke suggests that two components create secure social structures. The first occurs when individuals respond and adapt to the expected and unexpected interactions with others and their physical and social environment (Burke, 2004). The other stabilizer can be found in the identity verification process (Burke, 2004). Since this social structure requires that people cooperate and coordinate as role partners or group members, it is difficult for an individual to change the symbols and meanings used in these interactions without causing a breakdown in these social processes (Burke, 2004). "When we identify with the social categories that structure society, and when we behave according to the expectations tied to our identification, we are acting in the context of, referring to, and reaffirming social structure" (Stets and Burke, 2000:232). This general overview of the major aspects of identity theory builds the framework to understanding the good farmer identity, which includes all the four major aspects discussed above: person identity, role identity, group identity, and structure.

Good Farmer Identity

Burton (2004) has applied the identity theory framework to understand how farmers in the Marston Vale area (near Bedfordshire in eastern England) manage their identities. His research focused on determining why the farmers in Marston Vale were not voluntarily participating in a government-supported project to reforest parts of the region. He met with some of the Marston Vale farmers and asked them why they were not interested in the reforestation plan. Their response was simple. They said they were farmers, not foresters, and that the plan to reforest their farmland was an assault on their identities as "good farmers" (Burton, 2004). After the farmers explained that reforesting farmland was not what "good farmers" do, Burton asked – 'What do good farmers do?' When he analyzed their answers, he concluded that these farmers had a strong relationship among their person, role, and group identities as farmers, prompting him to propose the good farmer identity (Burton, 2004).

In his conversations with Marston Vale farmers, Burton identified four key indicators of the good farmer identity: 1) physical appearance of the crop and/or livestock; 2) crop yield per hectare or other similar measures of production; 3) "Hedgerow farming," which is the comparison and evaluation process of how well farmers in specific geographic areas are meeting the local, informal, farming standards; and 4) the "farm" identity that covers the farm itself, and often extends to the family farming the land and the history of the farm (Burton, 2004).

Burton teamed up with a geographer, Wilson, to develop a typology to describe the Marston Vale farmers. They argue that like most people, the Marston Vale farmers sort their multiple identities into a hierarchy with the most important identity as the most influential (2006). Most typologies categorize farmers according to just one descriptor. That is, they are grouped by the type of crop they produce, the economic value of the crops they produce, or where their farm is located geographically. However, when Burton and Wilson analyzed interviews with the Marston Vale farmers, they discovered that these farmers described themselves in different kinds of categories. Burton and Wilson categorized the Marston Vale farmers into three primary categories based on how they practiced farming (2006).

The most predominant category is agricultural producer/agribusiness type (Burton and Wilson, 2006). This would be considered a principal level identity. Seventy-eight percent of the farmers described themselves as farmers who use highly mechanized and industrial farm practices to produce food. These farmers believed that improved yields, land acquisition, and improved operation efficiencies are the way to increase income. Therefore the greater the yield, the more they have verified their farmer identity. The agricultural producer/agribusiness identity remains strong primarily because these farmers produce grain and raise livestock to not only "feed the world," but also to support their families and local communities. To provide the most food possible, these farmers need to raise healthy plants and animals that produce ever increasing yields for the growing world population. Much of what they raise is sold as a commodity to be processed by others off-farm (Burton and Wilson, 2006).

The second category is diversifier. Thirteen percent of the farmers described themselves as farmers who use their farm to help them create what is known in U.S. agriculture as value-added agriculture. These farmers do many of the same things that an agricultural producer/agribusiness farmer does, but instead of selling the commodity for processing by others, they do some processing on the farm; choose to raise niche crops that are wanted by small groups of buyers; or some combination of farm practices, food processing, or supplying specialty markets (Burton and Wilson, 2006).

The final category, conservationist, fit just eight percent of the Marston Vale farmers. These farmers take the environmental manager approach when planning and implementing farm management practices. They see the land as something more than a resource to create income. Even though they may grow commodities and adopt agriculture producer/agribusiness farming methods, they also place importance on the use of practices that produce ecosystem services – clean water, habitat for wildlife, and soil conservation. They do not always put economic results ahead of esthetic or environmental results (Burton and Wilson, 2006).

Can the concepts of the good farmer identity developed for British farmers be applied to U.S. farmers? The short answer is yes. The changes that farmers make to bring their good farmer identity into line with their internal standards can lead to the coalescing of the good farmer identity into a group identity that moves beyond the individual level. It initiates the formation of a group that allows some farmers to further demonstrate their good farmer identity while providing a safe place for other farmers to activate their good farmer identity. This advances Burton's and Wilson's work and connects the concepts of social identity, social group identity, and collective action.

Collective Action

In the case study examined for this paper, the changes in identity among some individuals led to the formation of a group that created a place where farmers could come together to take collective action to clean up their polluted watershed. The formation of such a group allowed members to learn from each other. It changed behavior in order to reduce the level of pollution flowing from their farms into the ground and surface water. Three theoretical frameworks provide the major support for the resulting action: identity theory, social group identity theory, and performance-based management. In actuality, the formation of the watershed group and the use of performance-based management techniques could be considered a collective identity -- “the shared definition of a group that derives from its members’ common interests and solidarity” (Gamson, 1992:55) -- that resulted in local social movement.

When Stryker’s (2000) role identity theory in collective movements is combined with Deaux’s and Reid’s (2000) interpretation of social group identity theory, the results explain how individuals unite to form or participate in collective movements. One mechanism that catalyzed the formation of a social movement in watershed management is the concept of performance-based management. Performance-based management is the mechanism used by this group to achieve group-level induced changes and to motivate some individuals to make changes to their person and farmer role identities. Deaux’s and Reid’s (2000) work comes out of the social identity framework developed by Henri Tajfel (1972). They offer a method that measures how connected individual members are to a group and the group ideals. Deaux and Reid identified six factors that measure both how groups form as well as how strongly individual members tie their identity to group action. This supports Stryker’s view of identity theory as it relates to collective action.

Stryker argues that identity theory sees group membership as “playing a role in a network of reciprocal roles” (2000:30) and that social group identity views group membership as being part of a category of individuals that share similar traits (2000). This supports the general view of symbolic structural interactionists that 1) the self has multiple identities that must be reconciled within the individual, 2) individuals are multi-faceted and shape society, 3) therefore society must be multi-faceted as well; and 4) the interaction between the individual and society refines and molds each side of the equation (Stryker, 2000). Stryker describes a group as a “functioning unit of interacting persons typically occupying differentiated positions within the unit and playing complementary roles that organize members to deal with a task” (2000:30). The distinction that “people do not live in categories, they live in groups” (Stryker, 2000; 30) is especially important.

The groups that are tied to a small geographic space such as an HUC 12 (15 to 56 square miles) watershed may create a local social structure that is stable, meaning that members have multiple identities in a fixed social network. Such a social structure suggests that many individuals experience a great deal of overlap in their person, role, and group identities.

Deaux and Reid (2000) chose to examine group-level interactions of collective action groups rather than the typical individual and cultural levels of analysis. They argue that it is easier to see the dynamic nature of social movements at the group level rather than at the individual or societal level (Deaux and Reid, 2000). They used three ideas to develop a measure of group level collectivism; however, this thesis will focus only on the one most connected to the research question: “assessing group level collectivism by asking individuals how collective they feel toward the group” (Deaux and Reid, 2000:180). Their definition of collectivism closely describes the watershed group that was studied in this thesis research.

> Collectivism implies an emphasis on group cohesion, common fate, distinction from outgroups, and shared norms and standards. As such, higher levels of collectivism should be associated with greater social action on behalf of and on the part of the in-group (Deaux and Reid, 2000:186).

Six factors can be used to measure collectivism when applied to individuals within a group. Those factors are social identity, common fate, personal view of collectivism, behavioral involvement, standards and goals, and emotional attachment. From these six factors they developed the Identity-Specific Collectivism Scale (ISCOL), shown in Figure 2C (Deaux and Reid, 2000:183).

Factor 1: Social Identity	Being a _______ is central to who I am. I am glad to be a ________.
Factor 2: Common Fate	When ______s do well, I feel good. The success of ________s as a group is more important than my own personal success.
Factor 3: Discomfort with Collective	I feel uneasy with other __________s. Even though I am a__________, I do not feel particularly connected to other __________s.
Factor 4: Behavioral Involvement	My most rewarding friendships are with other __________s. I am more likely to help a _________, than to help someone who is not a ___________.
Factor 5: Standards and Goals	__________s have a set of standards that I feel I must live by. I tend to share the same opinions as other _________s.
Factor 6: Emotional Attachment	I feel a common bond with other __________s.

Figure 2C. Identity-Specific Collectivism Scale. (Deaux and Reid, 2000:183)

Deaux and Reid suggest that "emotional attachment and behavioral involvement" factors relate to Stryker's view of affective and interactive commitment in relation to collective movements (Deaux and Reid, 2000:184). These six factors also address the cognitive, affective, and behavioral components of human understanding (Deaux and Reid, 2000).

> How and why collectivism emerges, at both individual and groups levels, is an issue of tremendous importance. A full understanding of group action (whether for good or for harm) demands we look both to the individual and group – and even more important, at the theoretical paths between these levels (Deaux and Reid, 2000:188).

Performance-based Management

Performance-based management provides a framework for individuals and groups to improve a process or product. In its most basic form, performance-based management is a feedback loop -- for instance, a watershed group using this method as a way to adjust the members' water use practices to reduce pollution of the surface waters in the watershed. The six-step continuous management process offered in Figure 2D starts at the top with awareness. In this step the individual (or group) acknowledges that there is a problem or process that needs to be improved. In the assessment step, the situation is analyzed, usually with science-based measures to get a clear picture of the current state of the situation; the assessment often provides baseline measures that will be used in later steps of the process. The goals and plans step is where the users lay out specific, measurable goals they will use to address the problem. In the targeting step the plans and goals are prioritized. The performance step, quite simply, is where the goals and plans are executed. The results of the actions taken in the performance step are then evaluated and take the users back to the awareness step and through the cycle again in an attempt to continuously improve the process or product.

Figure 2D. Performance-based Environmental Management Model Used in Hewitt Creek Watershed Group, 2006-2008. (Morton and McGuire, 2011)

The goal of improvement management programs is to “provide timely, accurate, and constructive feedback so that production practices can be constantly upgraded with the final product meeting or exceeding quality control standards” (Morton and McGuire, 2011). “Such systems allow the users to move from ‘compliance mode’ management into ‘performance mode’ where improvement is continuous” (Morton and McGuire, 2011). This process provided ways of tracking individual and watershed goals in a science-based manner that could be used to make better management decisions as more data are collected.

Conclusion

This chapter presented three theoretical frameworks: identity theory, social identity theory, and the good farmer identity theory. In addition, two types of feedback loops were offered: identity control process and performance-based management. The activation of the theories and feedback mechanisms outlined in this chapter provide the answer to this question: *What mechanism allowed Hewitt Creek farmers to move their conservation farmer identity to a higher rank in their good farmer identity hierarchy, thereby allowing these farmers to take the actions needed to address the pollution in their watershed?*

CHAPTER 3. HEWITT CREEK WATERSHED STORY

The Hewitt Creek Watershed in Dubuque County, Iowa has existed since the last ice age shaped its topography. Today the significant majority of this 23,000-acre watershed is home to about 80 farms, including several family-operated dairy operations, and the baseball field made famous in the movie “The Field of Dreams.”

However the members of this watershed did not formally recognize its existence until the Iowa Department of Natural Resources (IDNR) listed a section of Hickory Creek in the Hewitt Creek Watershed as an Environmental Protection Agency (EPA) 303(d) impaired waterway in 2002. Specifically the ruling stated that it was “partially supporting” aquatic life and contained unusually high levels of nitrogen, phosphorus, and animal fecal coli form bacteria (IDNR, 2002).

The implications of this listing meant that unless farmers in the watershed reduced the flow of these agricultural pollutants flowing from their farms into local creeks, they faced the possibility that the IDNR would step in and regulate farming practices until the creek was delisted. This situation is increasingly common across the United States. It is estimated that nonpoint sources move four billion tons of sediment, 80 percent of the nitrogen, 50 percent of the phosphorous, and 98 percent of the fecal coliform bacteria that pours into streams and rivers (Morton, 2003).

This impairment caused the farmers in this watershed great concern. They first responded by ordering their own tests of the impaired waterway because they suspected that the IDNR tests were inaccurate. However, follow-up water tests confirmed that agricultural inputs were in fact polluting the creek. This action forced the Hewitt Creek farmers to acknowledge that they were polluting their creek.

Iowa State University (ISU) Extension offered to help the Hewitt Creek farmers form a locally-led watershed group; a small group agreed to take leadership and formally organize the group. This effort was funded by Iowa Farm Bureau Federation, USDA CSREES (NIFA) Water Program, Iowa State University Extension, Iowa Watershed Improvement Fund, Iowa Department of Agriculture and Land Stewardship, and Upper Iowa University. This assistance paid a portion of the salaries of the ISU Extension specialists, expenses for field days and other educational events, and for the incentive program. Many farmers were concerned that by joining they would be putting themselves at risk of being singled out by state and federal water quality regulators. However, when they came to understand that there would be no involvement by regulatory agencies or staff, they slowly came to see the watershed group as a resource that could help keep them from garnering more attention from regulators.

The ISU Extension watershed technical experts coached the Hewitt Creek Watershed Group members on how to use a performance-based management approach to reduce the agricultural pollutants leaving their farms. The three primary tools used were the Phosphorus Index (P-Index)[1], cornstalk nitrate test[2], and the Soil Conditioning Index[3]. These decision-making tools helped farmers assess their current farming practices and develop plans to modify their farm operations to target the areas where

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[1] The Phosphorus Index (P-Index) is a risk assessment tool for assessing the potential of phosphorus delivery from fields to surface waters and is used in nutrient management and conservation planning tools for the USDA-NRCS.

[2] The cornstalk nitrate test is designed to estimate the amount of nitrogen left in the soil at the end of a crop year. Corn plants that contain more nitrogen than needed to attain maximum yields accumulate nitrate in their lower stalks at the end of the season.

[3] The Soil Conditioning Index estimates trends in soil organic matter, which are assumed to be an indicator of soil quality trends. The index was developed from Revised Universal Soil Loss Equation (RUSLE) technology.

improvements were needed to make the appropriate changes to reduce the amount of pollutants leaving their farms. Using these tools allowed farmers to test various practices including the use of fall cover crops, side-by-side comparisons of various levels of fertilizer application rates, practices to reduce manure flows from their beef and dairy feedlots, and the regular use of soil tests in order to determine specific fertilizer application rates for each field. This information was shared at the groups' regularly scheduled meetings during the winter and summer months.

The data collected from these tests during the first year of the project provided farmers and the ISU Extension watershed specialists with baseline measurements (Morton and McGuire, 2011). The watershed technical specialists met with each farmer to explain the results of the baseline test results and offered a range of farm management practices that farmers could use to improve the scores for each of the tests. Watershed group members were invited to use any or all of the tests, depending on the needs of their farm operation. These tests gave the farmers the information needed to develop a performance-based assessment of the farms that were enrolled in the project. Each participant provided information about specific fields on their farms (Morton and McGuire, 2011). No names were used in the reports shared with members. Instead, a code number, known only to the farmer and the watershed specialists, was assigned to each participant. This allowed the watershed specialists to create a report that documented individual-level and group-level success at reaching watershed goals (Morton and McGuire, 2011). The group's primary goal was to clean up the creek. The members realized that since nonpoint source pollution was the cause, they would need to involve most, if not all, farmers in the watershed in order to adequately reduce the pollution. Therefore the group made a concerted effort to involve as many farmers as possible in the group. The group also established an incentive program that would financially support the adoption of practices that would reduce the flow of agricultural pollutants into Hickory Creek. The farmers determined which farm management practices would receive the incentives and the value of each incentive.

During the three-year project (crop seasons 2006, 2007, and 2008), the group sponsored field days that allowed members, and any other interested individuals, to see how well a test plot was performing and to visit a practice that had been installed in a livestock or crop operation. There was significant support for this project from the Dubuque County and Iowa Farm Bureau organizations. This helped publicize the group's efforts, which in turn prompted local, state, and regional news coverage; invitations to share the group's efforts with state and federal legislator; and sharing of the group's outcomes at several county, regional, state, and national extension education meetings and environmental management conferences.

By 2008, the Hewitt Creek farmers interviewed had accepted that the pollution in their watershed was in fact happening, that they had a role in causing the pollution, that they had taken measures since 2005 to improve the quality of the water leaving their farms, that there was much clean-up left to be done in the watershed, and that they were taking action on their own to continue the project beyond the pilot stage supported by ISU Extension, the Iowa Farm Bureau Federation, and the Heartland Water Quality Project.

CHAPTER 4. METHODS

Qualitative and quantitative research approaches were used to collect and analyze the data for this thesis. Neuman (2006) argues that each approach has its strengths and weaknesses, that the question being studied should determine which method is used, and that using both allows for a more thorough understanding of the phenomenon being studied. Researchers use both styles to “systematically collect and analyze empirical data and carefully examine the patterns in them to understand and explain social life” (Neuman, 2006:16). Qualitative research data types include words and impressions from interviews, photos, and symbols (Neuman, 2006). Quantitative measures are primarily measures of something being expressed as numbers (Neuman, 2006).

Qualitative social science research methods are based primarily on inductive logic (Neuman, 2006:60). Inductive reasoning is used by a researcher when investigating specific social situations and the actors within those situations. The researcher then evaluates the individuals, actions, and environment. These reflections are then taken to a higher level of abstraction and usually connected to a theoretical framework. In this thesis the interviews were analyzed in this manner.

In the deductive approach to sociological research, the researcher starts with an abstract idea or a theory and then uses the data to move toward an explicit idea. Stated another way, the research begins with a specific view of how the social environment is working and then uses observable or measurable methods to test that concept. In this thesis the survey results and measurement of the changes in farm management practices are examined to identity the factors that played a role in their identity change.

Case Study Method

The case study approach was adopted for this thesis as the optimal way to present a variety of data. The combination of data types and the longitudinal aspects provide a view of the changes in the Hewitt Creek watershed over more than three years. The most compelling reason for using this style of analysis is that it allows researchers to study human social interaction in everyday life (Feagin, Orum, and Sjoberg, 1991). The case study measures everyday interaction through four mechanisms.

> 1) It permits the grounding of observations and concepts about social action and social structures in natural settings studied at close hand.
> 2) It provides information from a number of sources and over a period of time, thus permitting a more holistic study of complex social networks and of complexes of social action and social meanings.
> 3) It can furnish the dimensions of time and history to the study of social life, thereby enabling the investigator to examine continuity and change in world life patterns.
> 4) It encourages and facilitates, in practice, theoretical innovation and generalization. (Feagin, et al., 6-7:1991)

The case study format generally is considered an applied research method that lacks the control over the social interaction that a researcher would have when performing an experiment in a laboratory setting (Kazdin, 2011). However, this lack of control should not reduce the value of the information gleaned from studying a single unit. Kazdin argues that there are many benefits to using the case study methodology (2011). Two of arguments apply directly to the case study examined in this thesis. The first is that it allows for the study of unusual phenomena and the other is that case studies can provide ideas and hypothesis of how a particular practice or idea can be applied more broadly (Kazdin, 2011).

This research project examined two levels of analysis. The first is the degree to which individuals change the way they manage their farms in order to reduce the amount of agricultural pollutants leaving their farms through surface and ground water (change in identity standards). The second level analyzes how the farmers organized themselves to take collective action to develop additional methods for reducing the amount of agricultural pollutants leaving their farms. This combination of qualitative and quantitative data allows for a more comprehensive understanding of the attitude and behavior adjustments that led these farmers to make modifications in their farm management practices. The Hewitt Creek Watershed was chosen to be studied because the individuals and the watershed group have demonstrated a high level of action to improve water quality in comparison to other watersheds in the area using the set of performance-based measurement tools and working through a locally-led watershed group. By understanding what led to this significantly higher level of behavior change the author expected to identify the factors that led to the increased involvement and be able to transfer that knowledge to other watersheds in an effort to increase the level of behavior change needed to involve residents in making changes to improve water quality. The case study also has provided a complete enough picture of the individual level actions that the author was able to propose a typology of the farmers in this watershed in relation to the way they viewed themselves as farmers in relationship to soil and water quality issues.

Qualitative Data

The first set of interviews was collected in July 2005 by Iowa State University (ISU) Department of Sociology graduate student Annette Bitto, under the direction of Dr.

Lois Wright Morton, Associate Professor, ISU Department of Sociology, and funded by the Heartland Regional Water Quality program. Morton served as the principal investigator for the human dimensions portion of this project. Bitto interviewed seven farmers at their farms and two ISU Extension watershed technical specialists at their office. The second set of interviews was conducted in December 2008 by ISU Department of Sociology graduate student Jean McGuire, funded by the subsequent 406 USDA Water Program grant, the Heartland Region Water Quality program. At that time, six of the original farmers and the two ISU Extension specialists were interviewed again. Four other farmers, one who had been with the project from the beginning and three farmers who joined the project later, also were interviewed. Some interviews took place at the farmers' homes and the remaining interviews were conducted at one of the two Hewitt Creek Watershed meetings held in December 2008. All procedures and questions were reviewed and approved by the Iowa State University Institutional Review Board in 2005 and reviewed again prior to the December 2008 interviews. All interviews were audio-taped and transcribed. Lists of the questions asked in the 2005 and 2008 interviews are available in Appendix A. Generally the farmers were asked about their attitudes about water quality in relation to farmers, how they perceived the role of regulators in regards to water quality, what they thought about the effectiveness of the three performance-based management tools (P-Index, Soil Condition Index, and the nitrate stalk test), and what they expected to change, or had changed, in their farm operations to address water quality.

In this research project, the qualitative data allowed for the exploration into the whys and hows of changes that were reported in the quantitative portion of the research. Specifically these data helped to explain how farmers used new performance-based management tools to reduce the impact of their farming practices on the land. The data also provided a peek inside the thinking processes of the Hewitt Creek farmers and how they viewed themselves and other farmers. The interviews on the whole offered insight into how the farmers saw themselves and their watershed after learning that their waterway was tainted with agricultural pollutants.

Quantitative Data

The quantitative data analyzed in this thesis were collected in two different ways. The first was through a baseline survey in 2005 and a follow up survey in 2009. A list of the questions used in both surveys can be found in Appendix B. It is important to note that the survey results presented in this thesis are based on the combined results of surveys of the Hewitt Creek watershed farmers and farmers in three other nearby polluted watersheds. In the 2005/2006 time frame 83 farmers in the three watersheds were asked to participate in the survey and 39 percent responded. The 2009 survey was sent to 50 farmers and the response rate was 24 percent. While this information is in a quantitative style, the survey was not administered to a random sample of the population, but to a self-selecting sample of the population.

The second type of data examined the very specific farm management measures collected by John Rodecap and Chad Ingels, Iowa State University Extension watershed specialists, working with the Hewitt Creek Watershed group from 2005 through 2008. These data include information such as the number of feet of new waterways installed, the reduction of nitrogen applied to farm fields, and the adoption of various soil conservation practices that reduced soil erosion. None of the data include personally identifiable information, so the study procedures are in compliance with the restrictions for this project as approved by the Iowa State University Institutional Review Board. The data collected were correlated to the adoption of specific farm management and the results of biological and chemical testing of farm land, crops, or animal manure and water from the impaired stream. These data were collected by Hewitt Creek Watershed group members or others contracted by the group members to perform the tests.

In this case, the quantitative data offer information that demonstrated that there was a change in farmers' beliefs and behavior concerning the role that specific farm management practices play in affecting soil and water quality. In addition, the data from this project provide information from science-based performance management tests that can be used to demonstrate the impact on the social and physical environment of the Hewitt Creek Watershed and supports the qualitative data collected in this project, resulting in a more complete understanding of the changes in this watershed.

CHAPTER 5. INDIVIDUAL RESULTS

This chapter presents data that explain how individual farmers came to change their farmer identities and behaviors to reduce the nonpoint source agricultural pollution in the water leaving their farms.

There are a number of parallels between the Marston Vale farmers in eastern England and the farmers in the Hewitt Creek Watershed in eastern Iowa. Both groups raise grain and livestock and were asked to participate in a voluntary, government-supported conservation program. Further, both groups were resistant to adopting these conservation practices because they already saw themselves as good farmers. Therefore, the good farmer identity proposed by Burton and Wilson provides an appropriate framework to analyze what farmers have been doing in the Hewitt Creek Watershed over the past several years. Specifically it helps explain: *What mechanism allowed Hewitt Creek farmers to move their conservation farmer identity to a higher rank in their good farmer identity hierarchy, thereby motivating these farmers to take the actions needed to address the pollution in their watershed?*

The Farmer Identity in the Hewitt Creek Watershed

Inductive analysis revealed that the farmers in the Hewitt Creek watershed responded to the challenges in their watershed by changing their person, role, and social identities in much the same way as the Marston Vale farmers. Burton's good farmer identity concept could explain why the Hewitt Creek farmers made changes in their farm management practices to improve water quality in their watershed. One more factor must be considered here – the concept of performance-based management. Here is the typology that the author developed to explain the actions of the Hewitt Creek farmers in response to the designation of their watershed as polluted with agricultural nonpoint source contaminants.

Hewitt Creek Watershed Farmer Identity Hypothesis

> ***Tier 1*****:** These farmers' "conservation farmer identity" was activated when they learned of the water impairment. They chose to take action to clean up the watershed in order to help reconcile the reality of their situation with their conservation farmer identity.
>
> ***Tier 2*****:** These farmers have a less well-defined or salient conservation farmer identity. When these farmers, with less salient conservationist identities, saw the *Tier 1* farmers taking responsibility and acting to improve water quality on their farms, they joined the effort. They felt comfortable adopting different practices because they saw that the *Tier 1* farmers were having success and the watershed group provided them the "cover" needed to adopt practices that were not part of what had been considered "normal" agricultural producer farm practices in the area.
>
> ***Tier 3*****:** These farmers have not accepted that they have a responsibility to make a change in their farming practices to improve water quality, but severe weather events during the project (2008) made them aware that the actions of *Tier 1* and *Tier 2* farmers resulted in lower rates of soil erosion after heavy rainfalls. These individuals have fully activated their agricultural producer identity in that they want to continue to improve their production and output, and their conservationist identity is only activated when it supports the agricultural producer identity.
>
> ***Tier 4*****:** This group of farmers has not taken action to address water quality in the Hewitt Creek watershed. These farmers have not fully activated their agricultural producer identity by acknowledging that some newer practices in use within the watershed could help improve their farm operations and they either don't have a conservation identity or that identity is very low in their identity hierarchy. It may be that these farmers are not committed to their agricultural producer or conservationist identities or that other identities are higher in their identity salience hierarchy.

The Hewitt Creek Watershed has existed since the last ice age, however the members of this watershed did not recognize its existence until the Iowa Department of Natural Resources (IDNR) listed a section of Hickory Creek in the Hewitt Creek

Watershed as an Environmental Protection Agency (EPA) 303(d) impaired waterway. This designation caused some of the farmers to identify themselves as a group. While the population of farmers in this watershed is fairly stable and it appears that many members have social, friendship, or family relationships among them, they did not see themselves as a category of farmers responsible for polluting a waterway before the IDNR made them aware of the situation with Hickory Creek in 2003. It is likely that most, if not all, of the residents of the watershed were not even aware that they lived in the Hewitt Creek Watershed and would have been unable to accurately describe the watershed's geographic boundaries before the impairment was publicized.

When the Hewitt Creek Watershed farmers and landowners learned of the pollution designation, they did not accept this externally ascribed group identity. They challenged this identity by arranging for another set of tests of the water in Hickory Creek in an attempt to refute the finding of nonpoint source agricultural pollution. Choosing to have the water retested was the first sign that at least some farmers in this watershed were getting feedback that did not verify their good farmer identities. In addition, since the pollutants found in the water could not be traced back to any one farm operation, it could be assumed that any or all members of this watershed had in some way contributed to the pollution. So, even farmers who used soil and water conservation farm management practices, were considered part of the group. No farmer, or even a small sub-category of farmers, could claim that they were not responsible for the contamination of Hickory Creek.

This change in the social and physical environment (the acceptance of the water impairment designation by the Iowa Department of Natural Resources) triggered a chain reaction that resulted in modifications in the locally accepted rules and norms for good farm management in the Hewitt Creek Watershed. The next step in the chain reaction was the formation of a locally –led watershed group. Tier 1 farmers were the first set of actors in the chain of change. Tier 1 farmers did not change their principle-level identities (Fig. 2B), but rather changed their program-level standards (Fig. 2A) in order to better support their principle-level identity. Remember principle-level standards are based on values, beliefs, and ideals and program-level standards as more concrete and based on actions one would take to verify principle-level standards (Burke and Stets, 2009).The Tier 2 famers made changes in their principle and program-level identities. That is, they modified their principle-level farmer identity to include conservation and agricultural production standards. That change required these farmers to modify their program-level actions to support the new agricultural producer/conservationist farmer identity. The Tier 3 farmers did not change their principle agricultural producer farmer identity, but did consider changing their program-level standards after seeing the result of changes farmers in Tiers 1 and 2 made concerning soil conservation. The change in the program-level actions would further support their principle-level standards as an agricultural producer. Finally, Tier 4 exists because not all farmers in the watershed are accounted for in Tiers 1, 2, and 3. At this time it appears that this group has not made any changes, but it is possible that this group will cease to exist if all farmers in the watershed adopt the new farm management norms being established by famers in Tier 1 and Tier 2. It is important to understand that if the principle-level identity standard does not include a conservationist and agricultural production standard, then the adaptation to the new rules and norms is not likely to be sustainable in Tiers 3 and 4.

The pollution was a direct threat to their view of themselves as good farmers. They were concerned that the Iowa DNR was going to involve itself in their farming operations. Here are their concerns in their own words.

> When you start getting the DNR involved, then you start getting farmers nervous. By going through this here program, we're trying to improve the watershed without any regulations, basically, so that someday if they say you've got to do this or you've got to do that, we're already making an effort to get there (Farmer 5, 2005).

> I had a friend who had DNR lived at his place. . . They're not constant, but they're present. I mean, they drive past, but as long as you didn't do anything wrong, they'll leave you alone . . . Absolutely. If [the DNR] would ever come on your farm, they could shut you down . . . like my friend found out. It cost him about $15,000 to comply with what they wanted him to do. And if a guy doesn't have $15,000 and if you don't do it, I don't know what happens after that. . . Doing some of these programs to clean the water up, a lot of that stuff is cheaply done and a farmer can do that **(**Farmer 6, 2005).

> And the other biggest factor I had in this is we had a manure release a few years ago, and after going through what my family went through dealing with the DNR, I thought if I can help someone avoid going through what we had to go through, it would be more than worth my time. So it was very hard, yeah. And I'll admit, we were wrong. I will not say we weren't wrong. We had a problem, but we rectified it right away or got on it and tried to rectify it . . . They [DNR] didn't even acknowledge that we were trying to take care of the problem, and that was the hardest part. We had people come in with dozers and backhoes the next day and build a big earthen dam to hold the water so it wouldn't get away, and was just a bad idea. (Farmer 7, 2005).

The pollution designation offered these farmers three ways in which to address the non-verification of their good farmer identity. They could 1) drop their good farmer identity completely, 2) accept that they were polluters and modify the standard of their good farmer identity to account for the "polluter" portion, or 3) they could change their behaviors (program-level) and address the pollution problem, thereby allowing them to keep their good farmer identity (principle-level) intact.

The Good Farmer Identity in Their Own Words

The four traits that Burton identified as defining the good farmer identity were: 1) physical appearance of the crop and/or livestock; 2) crop yield per hectare or other similar measures of production; 3) "Hedgerow farming," which is the comparison and evaluation process among farmers in a specific geographic area; and 4) the "farm" identity, which covers the farm itself, and often extends to the family farming the land and the history of the farm (Burton, 2004). Analyses of the interviews conducted in 2005 and 2008 demonstrate that the farmers involved in this project had changed their views of farming along the lines of Burton's four indicators. The physical appearance of a farm changed over the three years of the project. The first quote is short, but very concisely notes how having a "clean" field was important before 2002.

> <u>2005 – Physical Appearance</u>
> We used to go over it (a crop field each year) seven times (Farmer 4, 2005).

Three years later this farmer had come to see that it was okay if his farm looked slightly different than the neighbors. During this project some farmers adopted no-till or reduced till methods, reduced the amount of fertilizer used, and began planting cover crops in the fall to reduce soil erosion and increase soil fertility.

> <u>2008 – Physical Appearance</u>
> Yeah, because that way you don't have to feel like somebody's going to laugh at you because – boy, that guy did a dumb thing. We all try something, and some things work better than others. And that's how we learn (Farmer 4, 2008).

In HIHO farming, producers use crop yield as a measure of success. It is believed that getting the maximum, or even an acceptable yield, required that one applied a great deal of fertilizer. Water quality, and even in some cases profitability, are not considered as important as a measure of the farmer's good farmer identity. Depending on the local norms, a weed-free field, having a high crop yield, or being the first farmer to plant the crop that season may serve as more important measure of a good farmer.

> <u>2005 -- Crop Yields</u>
> Old rule of thumb, and for the education that we have, 1.2 units equals a bushel of corn. Well, these guys all want to push 200 bushel of corn, that's 300 units of nitrogen—let's give 'er a good drink! Well, I don't agree with that, but that's the technology that they had at the time. And it's the same thing (Farmer 3, 2005).

By adopting some new science-based management tools, these farmers found that they could make decisions that improved the water quality on their farms and still get good yields. Farmer 7 shares the story of how his seed dealer reacted when told that the corn the dealer had weighed had been grown without commercial nitrogen.

> <u>2008 – Crop Yields</u>
> He looked at me and he goes, "None at all?" And I said no. I said… 60 pounds of starter with 5 units… He goes, "How do you…?" And I said, "Well, you don't need it." I said we've just found that, we've done some side-by-side trials, and I said we've found that it doesn't pay to put 120 units on. You don't get any more bushels per acre than if you don't put any on. (Farmer 7, 2008)

Fencerow (hedgerow) farming was a topic about which a particular sub-group of the farmers interviewed were greatly concerned. They were concerned that their peers in their neighborhood would judge them as bad farmers if any of the water quality improvement practices they adopted affected the look of their fields.

> <u>2005—Fencerow Farming</u>
> I guess I feel I am watched, and I have people tell me that. You know, that, "Hey, your crops look good. What do you do?" If I can prevent someone from making a mistake, I gladly tell them the secret. "Here's how you do it. Don't do it this way because I did and it cost me. So start ahead of the curve and do it this way (Farmer 7, 2005).

> <u>2008—Fencerow Farming</u>
> My neighbors are all watching me. It's like the first year I did it – my agronomist from the co-op was driving by. I just got done chopping the corn. I already spread the manure on it, and I was disking it and pulling the harrow.

> And he stops out in the field with his pickup, and he says, “What in the hell are you doing? You’re the only guy in Dubuque County disking.” I says, “Stop by tomorrow. I’ll be seeding oats and rye.” And he just shook his head, and I said, “Then stop back in about two, three weeks and take a look at it.” And he’s the same guy that weighs my corn, and he just can’t believe it (Farmer 8, 2008).

As mentioned earlier, the Hewitt Creek Watershed farmers were not happy when the water quality problem changed others’ perceptions of them as farmers.

> <u>2005—Farm Identity</u>
> And actually that first meeting, I think I walked out, I was mad, because we listened to that guy from [town name] and he was putting the blame on us. And sometimes when you have a knee-jerk reaction, especially when somebody gets under your skin a little bit…But then you start thinking, well, if that’s what people think about us out here, I think we have to change our way of attacking our problem. So the only way you attack the problem is if you go back and you have more information and tell them that, “Hey, I think you’ve got the blame on the wrong guy” (Farmer 3, 2005).

Three years later this same farmer has come to see and accept the role farming practices had in polluting the Hewitt Creek Watershed. He also recognizes that the IDNR was right to put the watershed on notice.

> <u>2008—Farm Identity</u>
> You know, any time you have a positive thing coming back in the world, watershed has got… cesspool. Of course, that’s what you have when you have something that’s on the DNR hit list – you’ve got a cesspool *(*Farmer 3, 2008).

The Hewitt Creek Tiers

Additional analysis of the 2008 interviews demonstrates how the various farmers in *Tier 1* and *Tier 2* describe themselves and the farmers categorized as *Tier 3* and *Tier 4*.

> <u>Tier 1 Farmers</u>
> A bunch of us farmers got together, and we found out that we had high nitrates and fecal in the streams, and we wanted to get it cleaned up. And we started having meetings to figure out how we were going to get the streams cleaned up. One thing led to another, and here we are today, three years later (Farmer 8, 2008).

At first there was some hesitancy on the part of many farmers in the watershed who did not have a strong conservationist identity. This *Tier 1* farmer answered early critics by pointing out that performance-based measurements – feedback – would provide the ultimate proof.

> You know, they all thought we were nuts, but once you start backing things up with yield data and nitrates, hey, if you want to throw fifty bucks away, go ahead. A thousand dollars a ton for anhydrous. Well, maybe we can . . . do something different and it showed (Farmer 3, 2008).

The decision to change their actions supported local efforts to form a watershed group to improve the quality of the water in the Hewitt Creek Watershed. Once the *Tier 1* farmers became involved in the group, they accepted leadership roles and provided the support for the *Tier 2* farmers to start to make changes. Here is how one *Tier 1* farmer explained it.

> We went to the first couple meetings, and then [ISU Extension specialist] stopped numerous times. And I always felt when he stopped there was a reason he was stopping. And I guess we're conservation minded, and we try to do practices that are good for the environment. And we thought, well, this is a good thing, because maybe someone else… You're always hoping you can learn from someone and someone else can learn from you (Farmer 7, 2008).

The group used the performance-based management model to begin to change their farm management practices in order to address the water quality problems. By adopting this model they began to produce environmental services on their farms in addition to raising livestock and growing crops. They describe this process as cleaning up the water.

> I compare this Hewitt Creek to a piece of ground my brother just bought from a farmer south of us. It was depleted nutrient-wise big time, and we aren't getting top yields off it. But it's like I told my brother, I said, "We can't change it in two years' time. It's been taking 15 years where it's been depleted." And I kind of,

> when I think about that farm, I think about Hewitt Creek. It's the same thing – it didn't happen overnight, and it's not gonna get changed overnight. But if we keep going, keep trying, we'll get things done (Farmer 7, 2008).

The *Tier 1* farmers were not afraid to take chances in order to find ways of keeping their conservation and agricultural producer identities in balance. In some cases, their ideas didn't work, but failure did not deter their attempts to verify their good farmer identity.

> Well, this was one of our experiments we were trying, so I put 18 acres of no-till rye grass in, in the fall. That's wicked stuff. But [we did] GPS soil samples a year after that. And [that] couldn't believe the kind of organic matter I had in this farm. [This was an]… experiment. So plus[es] and minuses. What you learn through that experience – rye grass is great for building organic material, but it sucks your nitrogen up terrible on corn. So we had to go back and do some extra side dressing the following year. And that year we took a little ding in the yields, so . . . .we didn't continue that practice (Farmer 3, 2008).

The following excerpt from the final report to the funders of this project cites an example of how *Tier 1* farmers were willing to step up to challenges from the ISU Extension watershed specialists advising the Hewitt Creek Watershed Group. It also demonstrates how a single farmer's activation of his conservation identity sparked a discussion that rippled through watershed.

> An early project cooperator with significant dairy manure resources accepted the challenge to not apply commercial nitrogen to an alfalfa field that had manure applied at modest rates as determined by project staff assisting with manure spreader calibration and manure testing. The corn yield from the field was the highest in the local ag-coop annual yield contest resulting in considerable community discussion of a high yield with no commercial nitrogen application. This grower had been using 125 pounds of commercial N on corn following alfalfa (Rodecap, 2008).

The *Tier1* farmers recognized that they and the watershed group were helping *Tier 2* farmers to feel comfortable taking some risks.

> And there's a lot of other people will watch a neighbor – well, what's he think of me? I don't care. But when you dangle a little bit of cash in front of them and say, "Hey, you can try it." And then if somebody asked them, "Well, I get a little money for this." Well, at least he's got reason to tell the other guy, "Oh, okay. That's why you tried that." Well, then once they try it, it grows (Farmer 2, 2008).
>
> It gives them a reason, and I never really looked at it that way, but it probably gives them a reason, where I didn't need a reason. They're afraid to have their crop not look as good or look different than it did previously, because there is tons of neighbor pressure, you know. Everybody watches the other guy. They don't go pick corn 'til the other guy goes out. Or they don't do this 'til the other guy. Well, this gives them a reason to try something on their own. It may be a little different than the other guy that's not doing it (Farmer 2, 2008).

Tier 2 Farmers

Farmer 4 is the prototypical *Tier 2* farmer. He is very clear that he was not comfortable trying new farm management practices.

> Yeah, because that way you don't have to feel like somebody's going to laugh at you because – boy, that guy did a dumb thing. We all try something, and some things work better than others. And that's how we learn (Farmer 4, 2008).

There is evidence that Hewitt Creek Watershed Group gave some *Tier 2* farmers the confidence to try using performance-based management practices on their own farms. In this process they were able to begin being comfortable with moving their conservationist identity standard in line with their agricultural producer identity.

> Questions on why you did this or why you did that? Yeah, we had some other neighboring farmers who said, "How come you only spread fertilizer on half of that field, and you didn't spread fertilizer on the other half? We noticed when you were out there." And then I explained to them what I did then as a test.
>
> You know what? They all come back and wanted to know what I found out. Every single one of them wanted to know – "How did that turn out? What'd you find out?" Like this year, you know, there was a 24-bushel difference. "Well, we noticed you only spread that upper half and the bottom half you didn't. And you had that piece in there where you didn't put no fertilizer on this year. What was the deal with that?"

> And they all watch you now, but, you know, they're all interested in your results, and they want to know how things turned out – was it good, was it bad, made no difference? Because I think we've got a couple neighbors that are always skeptical about testing in the program, but they're still interested in what happens (Farmer 4, 2008).

<u>Tier 3 Farmers</u>

Since the *Tier 3* farmers are not part of the watershed group and were not interviewed, evidence of the existence of *Tier 3* farmers came indirectly from a *Tier 1* farmer sharing a conversation with a person who joined the watershed group and then dropped out.

> There was one guy that was a participant the first year… He's got some waterways, has somebody else put all his nitrogen on, so he thinks he has to work everything to put it in the ground. And this year obviously the rain hurt him bad. And going by what I've got, he said, "Your ground didn't move." He said, "I've got to do something different." And this guy's not in our group, right now currently not in it, but he did stop in, and he called and asked if he could come to look at the planter, first of all. He says, "I've got to do something different. I've got to start trying some no-till a little bit, doing something." And we farm on several sides of him, so he sees what we're doing, and he's come over and he's looked at it, and he's scratching his head. Maybe he won't do anything, but he's definitely said, "Hey, I've got to change what I'm doing." But he's not in the group, but that's his choice (Farmer 2, 2008).

<u>Tier 4 Farmers</u>

Evidence for *Tier 4* farmers also came indirectly from a *Tier 1* farmer. In this portion of the 2008 interview, a *Tier 1* farmer is responding to the question of how to get all farmers in the watershed making changes in their farm management practices in order to improve water quality. The italics are the farmer and the plain text is the interviewer.

> *F: That's in any business. Ten percent of the people cause ninety percent of the problem.*
>
> I: Okay. How do you get that ten percent involved?

> *F: You sell the neighbors all the way around. That's how you do it. You sell the neighbors all the way around.*
>
> I: 'Til it gets to the point where they can't avoid it?
>
> *F: Sure. That's the deal. They want to be in the groove. So if you've got a hardball out there that doesn't want to come, sell everybody around him. Soon he'll be in church. That's human nature (Farmer 3, 2008).*

This *Tier 1* farmer also shared what he would say if he were to talk with a farmer who did not think that being conservation-minded could be profitable.

> If a guy don't want to do it, that's fine, but you get everybody else around him doing it, then all of a sudden he sits there and says, "Well, I'm not in it." Well, I said, "We've got enough cost figures now, we can come sit on your farm and say, hey, what do you want to look at? Do you want to look at 55 working units that are showing reduced costs savings? Why wouldn't you want to look at it?" (Farmer 3, 2008).

CHAPTER 6. GROUP RESULTS

This chapter will look at three sources of data that demonstrate the power of taking collective action. All three sources examine farmers' attitudes and actions from the beginning (2005/2006) to the end (2009) of the projects. As was the case with the qualitative results, feedback (Figure 2A) was the key to making changes. This aspect of the study shows how use of performance-based management systems and several agricultural measurement tools helped farmers determine which farm management practices could be contributing to the nonpoint source pollution flowing from their farms into Hickory Creek.

Most people are not aware of the boundaries of their home watershed. So it is not surprising that the farmers in the Hewitt Creek Watershed were not aware that they were a group until they were notified that they may be the cause of nonpoint source pollution in their watershed. One day these farmers were just a collection of individuals, they next day they were a "group." Now they were lumped into one category – Hewitt Creek Watershed farmers.

There was no way for any one farmer or any small group of farmers to be singled out as causing or not causing the pollution. As far as those outside the watershed were concerned, all of these farmers were causing the pollution, whether that was, in fact, the case. This illustrates one of the challenges of nonpoint source pollution. It is impossible to identify individual polluters when all farmers are essentially using the same agricultural inputs at the same time. When this is combined with the public perception that all farmers are believed to be more interested in earning profits than causing pollution (Harris and Bailey, 2002), it means all farmers, even those who are environmentally responsible, are seen as part of the problem.

In an effort to clean up the pollution, some of the farmers and farmland owners accepted Iowa State University Extension researchers' offer to help them form a volunteer-managed watershed group. The motivation to organize was driven by the concern of some producers that they need to protect themselves from a perceived outside threat to their autonomy as farmers. That leads back to the research question: *What mechanism allowed Hewitt Creek farmers to move their conservation farmer identity to a higher rank in their good farmer identity hierarchy, thereby motivating these farmers to take the actions needed to address the pollution in their watershed?*

As indicated earlier, identity theory explains how individual farmers see themselves as persons, as farmers, and as members of farmers in a group. This is the foundation that allows for understanding how these individuals came to accept their role as probable polluters and work to clean up their watershed. However, it appears that the group formation and the associated "identity work" (Snow and McAdam, 2000) required for this group of individuals to come together and take collective action had a significant role in the outcomes.

When examining the results of surveys done with three farmer-led performance based watershed groups, including Hewitt Creek, and their farmer neighbors in northeast Iowa watersheds, one can see changes in the way farmers viewed their farming practices in relation to the quality of surface water in their respective watersheds (McGuire and Morton, 2009). Farmers were surveyed at the time of their group formation (2005/2006) and again in 2009 after the groups had been meeting for three to four years (McGuire and

Morton, 2009). Four topics within the survey show evidence of how the farmers in these watersheds changed their attitudes and behavior. Those areas of change included nitrogen use, manure application, farm nutrient impact on water quality, and farm management practices impact on water quality.

On the issue of nitrogen use, the number of farmers reporting making regular reductions of the amount of nitrogen they applied over the past five years, increased from 61 to 76 percent (McGuire and Morton, 2009). By 2009, 57 percent of the farmers reported reducing nitrogen application in order to reduce the amount of nitrogen flowing in groundwater sources. The use of tests to measure the amount of nitrogen in the soil increased dramatically (McGuire and Morton, 2009). In 2004/2005 only 2.8 percent and 4.3 percent of farmers used stalk N tests and late spring nitrogen tests, respectively. In 2009, the percentage of farmers using those tests was 63.3 percent and 28.2 percent, respectively (McGuire and Morton, 2009). Since these tests were the focus of education and incentives in the watershed groups, it demonstrates how these tools moved from practically no use, to significantly broader use as a feedback mechanism to support future management practices.

Another area where the focus of the watershed groups seemed to have an impact was in the area of manure application. In the baseline survey, only 19 percent of those who indicated they used animal manure as a fertilizer source said they calculated the nitrogen level of the manure before applying to crop land. The percentage calculating nitrogen levels increased to 36 percent by 2009 (McGuire and Morton, 2009).

Awareness that the byproducts and practices of livestock and crop production have an impact on water quality increased substantially. In the original surveys about 60 percent reported that *Some* or *Most* of the watershed residents thought there was a water quality problem in their watershed. By 2009 those two categories totaled 92 percent (McGuire and Morton, 2009). As a further confirmation of the power of the watershed groups' impact on beliefs in the three watersheds surveyed, the number of respondents reporting that they knew the goals for their watershed jumped from 12 percent in the original surveys to just over 38 percent in 2009 (McGuire and Morton, 2009). Farmers' recognition of the potential for nitrogen, phosphates, herbicides, soil erosion, and fecal coliform bacteria to pollute water increased as well (McGuire and Morton, 2009). Not only did they recognize the potential of various inputs and outputs of agriculture to pollute, the farmers also recognized how their farm practices lead to the contamination of water. In 2005/2006 about 53 percent of farmers were willing to make changes in farm practices to meet local watershed goals; by 2009 that number had grown to 67 percent. Farmers were asked to report which of more than 20 farm management practices they were using to reduce water pollution.

> In the baseline years 2005/2006 producers reported moderate to heavy use of grassed waterways (75%), soil testing (66.7%), reduced tillage (64.8%), nutrient management (61.1%) and filter strips along streams, ponds, lakes or rivers (50%). In the 2009 survey, all of these practices increased 5% (grassed waterways 79.1%) to 28.5% (reduced tillage 83.3%). Noteworthy were shifts in no till, 33.8% in baseline years compared to 50% in 2009, and the corresponding reduction in mechanical cultivation from 38.9% to 56.4% not using the practice. (McGuire and Morton, 2009:3)

Performance-based Management

As the survey results attest, there were dramatic changes in what farmers reported thinking and doing when it comes to farm management practices and the inputs and outputs that are part of the practice of farming. The performance-based management process requires that farmers perform annual tests of their soil and corn stalks as a feedback mechanism to guide decisions. Farmers using animal manure were urged to test it before applying it and to calibrate their application equipment to know how much manure was being applied per acre. For many of the farmers involved in the watershed group, this was the first time they performed any of these functions and recorded the results. There was concern by ISU Extension specialists involved in this project that farmers would not want to do the paperwork to keep the records necessary to using the performance-based management tools effectively. But that was not an issue.

> It hasn't been a lot of recordkeeping, but getting the results and going over them makes you more aware of what you're doing and if it's any good compared to somebody else, what they're doing. And I think that's probably the biggest benefit. That and learning what you were doing and why it was doing this to your nitrogen in the stalk and all this kind of stuff (Farmer 10, 2008).

In fact, the farmers quickly understood that the records would prove to be more valuable than the time invested.

> They [ISU Extension specialists] tell you what's available and what these results did. You're never too old to learn, and I've learned a lot since the last three years just in how to till the ground and learned about no-till and the carbon and all this kind of stuff, and I didn't know nothing about that before this (Farmer 10, 2008).

Further the performance management was able to produce individual level and group level results.

> Participation in the Hewitt Creek watershed project was significant (67% of watershed operators and owners). When given a voice in the structure of the incentive program watershed leaders chose to involve as many participants as possible by reducing incentive rates rather than increasing incentives for a few (Rodecap 2008).

The final report to one of the groups that funded the incentives provides a great overview of the actions taken by the farmers in this watershed.

> The performance indexes identified the level of potential contaminant delivery and the numerical value provided a target for progressive improvement in environmental performance. WIRB and Farm Bureau incentivized project activities that followed the 2005 Farm Bureau initiated funding included for 2006 through 2008:

Activity	Farms	Acres	Activity	Farms
P-index and SCI	47	9,893	Feedlot improvement	13
Cornstalk nitrate	36	8,537	Farmstead assessment	13
Waterways	32	131	Cover crops	13
Grid sampling	25	2,787	Stream fencing	4
Manure testing	15	4,931	Managed grazing	3

(Rodecap, 2009)

The final project report also provided an overview of the change that occurred through the watershed group.

> Over the three years an ownership of the impairment issues, development of remediation efforts and celebration of project successes resulted in leadership development and a very large commitment of watershed residents' time and effort. This development of "watershed community" is a major project outcome that will provide project sustainability. Neighbor-to-neighbor exchange of information was identified in the pre-project survey as the most important source of resident information and was very evident and useful to attain participation and dissemination of information. The cooperator in-kind contribution to the project is estimated at $80,937 or 21% of project total cost (Rodecap, 2009).

One of the major measures of the group's success may be found in the receptions that funders have given it. As a result of the work reported here, the HCWG has been able to secure funding from a state and federal source to continue its operation. In 2009, the Iowa Watershed Improvement Review Board (IWIRB) agreed to provide another round of funding to this group of $482,035 per year beginning in January 2010 and lasting five years (IWIRB, 2010).This grant was the first time IWIRB provided funding to continue work within the same watershed. IWIRB member comments were quite positive about the results and participation and felt the need to continue to learn how this process might work in the long run.

In addition, Hewitt Creek watershed and two nearby watersheds were awarded a $5.4 million grant through the Mississippi River Basin Healthy Watersheds Initiative in 2010. The grant will be administered through USDA's Natural Resources Conservation Service over the next five years. The Hewitt Creek Watershed Group's active involvement and high number of participating farmers in past several years played a significant role in the USDA's decision to provide additional funding.

The group is currently focused on investigating nitrogen loss from several agricultural drainage tile lines in the watershed in order to prioritize where inexpensive bioreactors containing wood chips to remove nitrates from water flowing out of agricultural drainage tile might be located to study their effectiveness. The members also are working on ways to attract more cooperators to watershed meetings during the next couple years.

CHAPTER 7. CONCLUSION

The practice of HIHO agriculture in the United States has resulted in significant negative impacts on local water bodies as well as the larger Mississippi River water basin. These environmental impacts can be lessened, if farmers adapt their farm management practices to include those that reduce or eliminate the movement of agricultural inputs and soil that leave their farms via ground and surface water.

As this thesis argues, the change can happen when farmers adjust their good farmer identities so that the conservationist identity moved up in their identity hierarchy so that it has a similar salience as the agricultural producer identity. For some farmers (*Tier1*) in this study, the mere act of being branded a "polluter" farmer in a contaminated watershed was enough to activate the conservationist identity. *Tier 2* farmers used interaction with their neighbors and the performance-based management tools through the farmer-led watershed group in order to elevate their conservationist identities in their good farmer identity hierarchy. For still others (*Tier 3*), the conservationist identity is not strong and does not appear to be salient when they deciding which farm management practices to employ. However, extreme weather proved to these farmers that conservation also can be profitable, thereby prompting them to consider conservation practices that verify their agricultural producer identity. The remaining farmers (*Tier 4*) have not activated either their agricultural producer or conservationist identities. It is possible that for these individuals there are other identities that have more salience, but it also may be that not enough time has passed for these farmers' identities to become salient.

The feedback loop is the form of the identity control model and the performance-based management process created a framework that allowed many of the farmers in the

Hewitt Creek Watershed to systematically modify their good farmer identities through the use of the performance-based management practices. Using these two sets of feedback loops allowed these producers to incorporate practices that conserve soil and keep agricultural production pollutants from leaving their farms, while maintaining or improving farm profitability. The connection of these farmers to a group facilitated the development of watershed goals that could be achieved when individual farm operators were able to make changes on their farms.

Limitations

This research provides merely a first glimpse at how U.S. farmers using HIHO agricultural practices can be motivated to adjust their views of farming to include producing environmental benefits in addition to producing high yields and being profitable. However, there are several limitations to the generalizability of these results.

The first limitation is the extremely small geographical area studied in this case. It is very likely that the highly homogenous population with long-term land tenure contributed to the high-level of mutual support that developed during this project. Future research should explore how the present results work in a more diverse social environment that is faced with a crisis or threat from outside.

The second factor that no doubt played a part in the success of these farmers in adapting new management practices was the high-level of regulatory action by the Iowa Department of Natural Resources in the watershed just prior to the start of this research in 2005. The impact of this factor is hard to measure, but more than one farmer voiced concerns in the initial interviews that Iowa DNR was considering using its regulatory power and the force of law to compel farmers to adopt specific farm management practices. The impact of possible sanctions may have played some role in prompting farmers to consider joining this group and making management changes.

The third factor influencing this project is that many farmers in this group had small livestock operations that provided manure that could be used as a nitrogen source. Once the farmers started to take credit for the nitrogen in the manure they applied to their fields, they realized that they did not need to purchase as much nitrogen as they had previously. This allowed many farmers to quickly reduce production costs and thereby increase profitability. In a watershed where producers do not have livestock manure available, it is unlikely that those farmers would see a rapid increase in profitability.

The final factor is the role a major weather event played in getting farmers involved in this project. In the last year (2008) of the study, unusually heavy rains caused severe, widespread flooding in the watershed in late spring and early summer, about six months before the interviews used in this study. Soil erosion can be hard to see, but the heavy rains made it clear that practices put in place to stop soil erosion were successful that year and served as an endorsement that the erosion practices that were in place in a dramatic manner.

Future Research

Research in this area must continue. As the population on the planet increases, the need for water, food, fiber, and fuel will increase. Farmers are in a unique position to play an important role as providers of food and the stewards of the fresh water on the planet. As noted in the introduction of this thesis, non-farmers currently see farmers as disproportionately high users and polluters of water. Even though farmers produce the food all humans and some animals need to survive, they need to recognize that if they do not take voluntary action to address the impacts their practices have on surface water and groundwater, it is likely that citizens (through their governments) will be forced to issue sanctions if water resources are not more carefully managed. It is expected local climates will change in a number of ways and will force farmers to adopt new farm management strategies and practices in order to continue producing high yields of food, fuel, and fiber (Buckland, 2004). Since water is an integral part of the climate system it is likely research in this area will apply to the issues brought by changing weather patterns.

The farmers in Hewitt Creek have demonstrated that it is possible for farmers to come together to address water and soil quality issues. They have used performance-based management tools to begin to understand the environmental impacts of their farm practices. Further, they are using these tools to fine tune their farm management practices in order to remain profitable and protect the soil and water on their land. In the process, many of these farmers have changed their attitudes and motivations so that these practices and mindsets are likely to stick with these farmers long-term.

APPENDIX A

Questions asked in the 2008 interviews with Hewitt Creek Watershed Group members and ISU Extension staff.

Follow-up questions for Water Quality Performance Program

1. How did you get involved in this program? What motivated you to participate?

2. How has your participation in this project affected how you think about conservation? What conservation activities have you considered or implemented because of your participation?

3. What does performance-measured management mean to you? To what extent has it helped make your operation more profitable? Or improved management of your farm, or helped you make decisions?

4. How do you think the program encourages farmers to change management?

5. Let's talk about farm records and your experience with them in this project.
    - Were your records adequate at the beginning of the project or did you have to obtain/record different information to complete the indexes?
    - If you had to do additional record keeping…
        1. How much time?
        2. How hard?
        3. What were the obstacles?
        4. Did you see a benefit that met or exceeded the amount of time you spent?
        5. What skills/education would do you think would help you do a better job of keeping records and analyzing the information they provide?
        6. What was good about keeping these records?
        7. What was bad about keeping these records?
        8. What could we do to help you with these farm records, or what changes could we make?

6. How did you use knowledge gained from the P-index, Soil Conditioning Index and/or cornstalk nitrate test? How did discussion of these indexes (and changes year to year) at the meetings help you?

7. What additional management tools do you need to make better decisions to improve production while protecting water?

8. To what extent will you continue to use the changes in management you implemented and are you likely to adapt other environmental management practices in the future?

9. To what extent do you think the performance program impacted those farmers who were not enrolled?

10. What beyond the payments would motivate you to continue to participate?

11. How could a conservation systems approach be rewarded differently?

12. Did you discuss water quality issues other than at project meetings? If you did, where and how often?

13. Do you believe it is possible to have a watershed community with common goals?

14. If a friend or family member not eligible to participate in this project asked you whether this project was worth the time and effort you put into it, what would you say?

15. Any final comments? Recommendations? What changes to the program would you recommend/suggest?

APPENDIX B

Survey Sent to Hewitt Creek Watershed Group Members in 2009.

2009 Farmer/Producer Watershed and Producer Performance-Incentive Survey

IOWA STATE UNIVERSITY
University Extension

June 2009
«QAID»

WATERSHED SURVEY

Instructions: Please answer *every* question. Use **black or blue ink**. Mark boxes like this ☒. If you want to change your response, completely fill in the incorrect box and mark the appropriate one.

Your participation is completely voluntary and confidential.
Do not write your name or address on the survey.
Please do not fill out this survey more than once.

Please check your watershed: *SELECT ONE ANSWER ONLY.*

- ☐ Coldwater and Palmer Creek
- ☐ Hewitt Creek
- ☐ Lime Creek
- ☐ North Fork

00003001

1) To what extent do you think the following threatens water quality in Iowa?
SELECT ONE ANSWER ON EACH LINE ACROSS.

	No Threat	Some Threat	A Lot of Threat	Don't Know
Nitrogen	☐	☐	☐	☐
Phosphate	☐	☐	☐	☐
Potash	☐	☐	☐	☐
Insecticides	☐	☐	☐	☐
Herbicides	☐	☐	☐	☐
Soil erosion	☐	☐	☐	☐
Fecal coli form bacteria	☐	☐	☐	☐
Private septic systems	☐	☐	☐	☐
Municipal waste systems	☐	☐	☐	☐

2) Does Iowa Department of Natural Resources (IDNR) enforce land use practices that affect water quality locally? *SELECT ONE ANSWER ONLY.*

☐ Not at all ☐ Selectively ☐ Extensively

3) Do you trust Iowa Department of Natural Resources' (IDNR's) science and recommendations on water quality problems? *SELECT ONE ANSWER ONLY.*

☐ Not at all ☐ Some ☐ A lot

4) To what extent have farmers in your watershed have implemented agricultural practices that will reduce water pollution? *SELECT ONE ANSWER ONLY.*

☐ Not at all ☐ Some ☐ A lot

«QAID1»

5) **What proportion of people in your watershed believe that there is a water quality problem?** *SELECT ONE ANSWER ONLY.*

- ☐ None.................. *Go to Question 6*
- ☐ Some................. *Go to Question 5a*
- ☐ Most .... *Go to Question 5a*
- ☐ Don't know .... *Go to Question 6*

5a) **What do they think the problem is?**

6) **Does your community have a watershed management plan?** *SELECT ONE ANSWER ONLY.*

☐ Yes ☐ No ☐ Don't know

7) **Does your community have a group that sets water quality goals for your watershed?** *SELECT ONE ANSWER ONLY.*

☐ Yes ☐ No ☐ Don't know

8) **Do you know the water quality goals for your watershed?** *SELECT ONE ANSWER ONLY.*

- ☐ Yes......................... *Go to Question 8a*
- ☐ No.......................... *Go to Question 9*
- ☐ Don't know .... *Go to Question 9*

00003002

8a) **If yes, can you list one?**

9) **To what extent do you think conservation practices are important to farmers in your watershed?** *SELECT ONE ANSWER ONLY.*

☐ Not at all ☐ Somewhat important ☐ Important ☐ Very important

10) **How well do you think people in your community understands the purpose and value of working together to solve local water issues?** *SELECT ONE ANSWER ON EACH LINE ACROSS.*

No understanding at all 1	2	3	4	High levels of understanding 5
☐	☐	☐	☐	☐

«QAID2»

11) Have you participated in a public discussion about your watershed in the last two years?
SELECT ONE ANSWER ONLY.

- ☐ Yes........................ *Go to Question 11a*
- ☐ No.......................... *Go to Question 12*
- ☐ Not sure................ *Go to Question 12*

11a) If yes, what are the main reasons you have participated in public discussions about your watershed?

12) Would you be willing to take some actions that would help meet local watershed goals?
SELECT ONE ANSWER ON EACH LINE ACROSS.

Not at all willing 1	2	3	4	Very willing 5
☐	☐	☐	☐	☐

13) Where do you get your information about water quality issues and best management practices to improve water quality? *SELECT ALL ANSWERS THAT APPLY.*

- ☐ Neighbors/friends
- ☐ Other farmers
- ☐ ISU Extension specialist
- ☐ ISU newsletters
- ☐ ISU websites
- ☐ Seed/fertilizer consultant
- ☐ District conservationist
- ☐ Iowa Department of Agriculture and Land Stewardship (IDALS)
- ☐ Department of Natural Resources (DNR)
- ☐ Natural Resources Conservation Service (NRCS) newsletters
- ☐ Soil and Water Conservation Districts (SWCD) newsletters
- ☐ Newspaper
- ☐ Farm association newsletter (Farm Bureau, Soybean Assoc., Corn Growers, Practical Farmers of Iowa)
- ☐ Magazines
- ☐ TV, radio
- ☐ Internet

00003003

«QAID3»

14) **Do you belong to/attend meetings/support?** *SELECT ALL ANSWERS THAT APPLY.*

- ☐ Iowa Environmental Council
- ☐ Trees Forever
- ☐ Iowa Farm Bureau
- ☐ Soybean Association
- ☐ Corn Growers Association
- ☐ Arbor Day Foundation
- ☐ Nature Conservancy
- ☐ Sierra Club
- ☐ Iowa Prairie Network
- ☐ Iowa Natural Heritage Foundation
- ☐ Ducks Unlimited
- ☐ Pheasants Forever
- ☐ Izaak Walton League
- ☐ Iowa Native Plant Society
- ☐ IOWATER volunteer
- ☐ Iowa NatureMapping volunteer
- ☐ Keepers of the Land
- ☐ Watershed group/alliance
- ☐ Local environmental group/alliance
- ☐ National Farmers' Organization
- ☐ Iowa Pork Producers Association
- ☐ Iowa Cattlemen's Association
- ☐ Practical Farmers of Iowa
- ☐ Service/fraternal organization (Lions, Kiwanis, etc.)
- ☐ Recreational groups (softball, bowling, gardening club, card club)
- ☐ Farmer Coop
- ☐ Political/civic groups (PTA, historical society, local development group, library)
- ☐ Church related
- ☐ Other (please list) ______________________________

00003004

15) **How do you think tile drainage impacts the water quality in your watershed?**
SELECT ONE ANSWER ONLY.

☐ Not at all ☐ Some ☐ A lot ☐ Don't know

«QAID4»

16) **Do you have an interest in creating wetlands to buffer between tile lines and streams on your farm?** *SELECT ONE ANSWER ONLY.*

- ☐ Yes
- ☐ No
- ☐ Need more information
- ☐ Have created wetland buffers already

17) **How satisfied are you that the conservation measures on your farm are adequate?** *SELECT ONE ANSWER ONLY.*

- ☐ Think we're doing a really good job
- ☐ Think we're doing an ok job
- ☐ Not concerned
- ☐ Think there is room for improvement
- ☐ Think there is lots of room for improvement

00003005

18) **Are you the farm...** *SELECT ONE ANSWER ONLY.*

- ☐ Owner/Operator
- ☐ Operator

  — ***Complete the remainder of questionniare.***

- ☐ Owner
- ☐ Ag Retailer

  — ***Go to Question 41.***

«QAID5»

Farm Practices

19) **To what extent do you use the following practices in order to reduce the amount of water pollution?** ***(including chemical pollution and soil erosion)***
SELECT ONE ANSWER ON EACH LINE ACROSS.

	Do Not Use	Limited Use	Moderate Use	Heavy Use
Soil testing	☐	☐	☐	☐
Filter strips (along streams, ponds, lakes, or rivers)	☐	☐	☐	☐
Ridge tillage	☐	☐	☐	☐
Terraces	☐	☐	☐	☐
Reduced tillage	☐	☐	☐	☐
Grass headlands	☐	☐	☐	☐
Contour strip farming	☐	☐	☐	☐
No-till	☐	☐	☐	☐
Contour buffer strips	☐	☐	☐	☐
Small grain rotations	☐	☐	☐	☐
Forage crop rotations	☐	☐	☐	☐
Mechanical cultivation	☐	☐	☐	☐
Integrated Pest Management	☐	☐	☐	☐
Systematic crop scouting	☐	☐	☐	☐
Farm based records	☐	☐	☐	☐
Nutrient management	☐	☐	☐	☐
Tree plantings	☐	☐	☐	☐
Timber stand improvement	☐	☐	☐	☐
Manure structures	☐	☐	☐	☐
Controlled drainage	☐	☐	☐	☐
Grassed waterways	☐	☐	☐	☐
Wetland restoration	☐	☐	☐	☐
CRP (Conservation Reserve Program)	☐	☐	☐	☐

00003006

«QAID6»

Nitrogen Use

20) In the last five years, have you made any regular reductions in the amount of nitrogen you apply to your crops? *SELECT ONE ANSWER ONLY.*

- ☐ Yes........................ *Go to Question 20a*
- ☐ No......................... *Go to Question 21*
- ☐ Don't know .... *Go to Question 21*

20a) If yes, why have you reduced the amount of nitrogen you apply? *SELECT ALL ANSWERS THAT APPLY.*

- ☐ To reduce costs
- ☐ Following new recommendations
- ☐ Credit taken from manure/legumes
- ☐ Concern over groundwater pollution
- ☐ Concern over health effects
- ☐ Want my farm to become more sustainable

00003007

21) To what extent do you use the following practices to manage nitrogen? *SELECT ONE ANSWER ON EACH LINE ACROSS.*

	Do Not Use	Limited Use	Moderate Use	Heavy Use
Soil testing	☐	☐	☐	☐
Crop rotations	☐	☐	☐	☐
Animal manure	☐	☐	☐	☐
Plant legumes	☐	☐	☐	☐
Yield goals	☐	☐	☐	☐
Late spring nitrogen test	☐	☐	☐	☐
Integrated Crop Management (ICM)	☐	☐	☐	☐
Variable fertilizer rates	☐	☐	☐	☐
Test strips	☐	☐	☐	☐
N-Serve or N-Stabilizer	☐	☐	☐	☐
Stalk N tests	☐	☐	☐	☐
Aerial photos or remote sensing	☐	☐	☐	☐
Soil temperatures	☐	☐	☐	☐
SPAD (chlorophyll) meter	☐	☐	☐	☐
Controlled drainage	☐	☐	☐	☐
Wetlands	☐	☐	☐	☐

«QAID7»

22a) **Please indicate each form of nitrogen you applied on your corn acres last year.**
SELECT ALL ANSWERS THAT APPLY.

- ☐ Anhydrous Ammonia
- ☐ Liquid Nitrogen
- ☐ Dry (granular) Nitrogen
- ☐ Manure

22b) **Please indicate the number of your corn acres that received this form of nitrogen.**
WRITE IN ANSWER.

	Number of Corn Acres
Anhydrous Ammonia	______
Liquid Nitrogen	______
Dry (granular) Nitrogen	______
Manure	______

Manure Application

00003008

23a) **What type of manure do you have?** *SELECT ONE ANSWER ONLY.*

- ☐ Do not use manure .... *Go to Question 26*
- ☐ Liquid
- ☐ Solid
- ☐ Combination liquid and solid

23b) **On how many crop acres each year and at what rate do you distribute manure?**
WRITE IN ANSWER.

	Acres	Amount		Don't know
Solid	______	______	tons/acre	☐
Liquid	______	______	gallons/acre	☐

23c) **Manure is applied prior to the following crops:** *SELECT ALL ANSWERS THAT APPLY.*

- ☐ Corn
- ☐ Soybeans
- ☐ Alfalfa
- ☐ Small grain
- ☐ Other

«QAID8»

23d) **Do you adjust commercial nitrogen rates to reflect the contribution from manure?**
SELECT ONE ANSWER ONLY.

☐ Yes.......... *Go to Question 23d1*
☐ No............ *Go to Question 23e*

23d1) **If yes, please explain how you calculate manure nutrient credit you take by crop.**

23e) **Do you adjust commercial phosphorus rates to reflect the contribution from manure?**
SELECT ONE ANSWER ONLY.

☐ Yes........... *Go to Question 23e1*
☐ No............. *Go to Question 23f*

23e1) **If yes, please explain how you calculate the phosphorus rate credit you take by crop.**

23f) **Have you tested manure for its nitrogen/phosphorus nutrient availability?**
SELECT ONE ANSWER ON EACH LINE ACROSS.

	Yes	No
Nitrogen	☐	☐
Phosphorus................	☐	☐

00003009

23f1) **If you tested manure for its nitrogen nutrient availability, what was the average nitrogen level?** *WRITE IN ANSWER.*

	Average Nitrogen Level
Pounds per ton (solid)..................................	|_|_|_|_|_|
Pounds per 1,000 gallons (liquid)	|_|_|_|_|_|

23f2) **If you tested manure for its phosphorus nutrient availability, what was the average phosphorus level?** *WRITE IN ANSWER.*

	Average Phosphorus Level
Pounds per ton (solid)..................................	|_|_|_|_|_|
Pounds per 1,000 gallons (liquid)	|_|_|_|_|_|

«QAID9»

24) **How do you decide where to apply manure?** *SELECT ALL ANSWERS THAT APPLY.*

- ☐ According to my manure management plan
- ☐ Systematically rotate applications depending upon soil nutrient needs
- ☐ Apply mostly in fields near my livestock facilities
- ☐ Apply manure evenly in most or all of my fields
- ☐ Apply in most convenient locations
- ☐ Apply according to schedule that involves rotation of fields
- ☐ Consultant's recommendation

25) **When you apply manure, what is the major factor you use to determine application rates?** *SELECT ONE ANSWER ONLY.*

- ☐ Crop nutrient requirements
- ☐ Ease of application
- ☐ Use own judgment based on experience
- ☐ Use manure sample
- ☐ Use soil tests
- ☐ Follow spreader manufacturer's recommendations
- ☐ Follow recommendations from agricultural scientists
- ☐ Pay little or no attention to application rate
- ☐ Follow consultant's recommendation

00003010

26) **How would you describe your farming systems?** *SELECT ALL ANSWERS THAT APPLY.*

- ☐ Conventional
- ☐ No-till
- ☐ Reduced tillage
- ☐ Grass-based
- ☐ Short-term rotation (3 years or less)
- ☐ Long-term rotation (4 plus years)

Performance-Incentive Program

27) **Do you participate in the Performance-Incentive program (using the indexes to change management of farmland) in your watershed?** *SELECT ONE ANSWER ONLY.*

☐ Yes ☐ No ☐ Not sure

«QAID10

28) **Has your participation caused you to add new conservation activities?** *SELECT ONE ANSWER ONLY.*

☐ Yes ☐ No

28a) **Please explain.**

29) **Has the Performance-Incentive program helped make your operation more profitable?** *SELECT ONE ANSWER ONLY.*

☐ Yes ☐ Somewhat ☐ No

30) **Do you feel the Performance-Incentive program fairly compensates you for your conservation activities?** *SELECT ONE ANSWER ONLY.*

☐ Yes ☐ Somewhat ☐ No

31) **Do you feel that the Performance-Incentive program rewards a conservation systems approach?** *SELECT ONE ANSWER ONLY.*

☐ Yes ☐ No

00003011

32) **Do you think the program encourages farmers to change management?** *SELECT ONE ANSWER ONLY.*

☐ Yes ☐ Somewhat ☐ No

32a) **Give an example.**

33) **Do you think the program is having positive effects on the environment?** *SELECT ONE ANSWER ONLY.*

☐ Yes ☐ Not sure ☐ No

34) **Do you think the program is having an impact on those farmers who are not enrolled?** *SELECT ONE ANSWER ONLY.*

☐ Yes ☐ Maybe ☐ No

34a) **Additional comments.**

eQAID11

35) Does the Soil Conditioning Index (SCI) fairly measure soil quality? *SELECT ONE ANSWER ONLY.*

☐ Good ☐ Adequate ☐ Not adequate ☐ Unsure

35a) **If not adequate or unsure, why?**

36) **What do you think of the P-index as a measure of phosphorus loss risk?** *SELECT ONE ANSWER ONLY.*

☐ Good ☐ Adequate ☐ Not adequate ☐ Unsure

36a) **If not adequate or unsure, why?**

37) **What do you think of the stalk nitrate test as a measure of your nitrogen application program?** *SELECT ONE ANSWER ONLY.*

☐ Good ☐ Adequate ☐ Not adequate ☐ Unsure

37a) **If not adequate or unsure, why?**

00003012

38) **To what extent have you talked with other farmers about performance-based management (using the indexes to change management of farmland)?** *SELECT ONE ANSWER ONLY.*

☐ Not at all ☐ Some ☐ Often

38a) **Additional comments.**

39) **This is my:** *SELECT ONE ANSWER ONLY.*

☐ First year in the project
☐ Second year in the project
☐ Third year in the project
☐ Fourth year in the project
☐ Fifth year in the project
☐ Not a participant

«QAID12

Farm Characteristics

40) Farm Characteristics *WRITE IN ANSWER.*

a) Cropland, 2008

	Number of Acres Owned	Number of Acres Rented
Acres planted in corn		
Acres planted in soybeans		
Acres planted in other grain		
Acres in hay or pasture		
Acres set aside in the Payment in Kind program		
Other additional acreage (timber, waste, etc)		
Total acreage owned		

Did you have any livestock in 2008? *SELECT ONE ANSWER ONLY.*

- ☐ No .... *Go to Question 41*
- ☐ Yes

00003013

b) Please indicate the number of that type of livestock you managed in 2008. *WRITE IN ANSWER.*

	Number
Beef cows	
Feeder calves	
Finished cattle	
Dairy cows	
Sows	
Market hogs	
Ewes	
Horses	
Turkeys	
Laying hens	

eQAID13

41) **What is your age?** .... |__|__|__| years

42) **Please select the category that best represents your total net household income (including farm and off-farm income) for 2008.** *SELECT ONE ANSWER ONLY.*

- ☐ Less than $2,500
- ☐ $2,500 to $9,999
- ☐ $10,000 to $19,999
- ☐ $20,000 to $34,999
- ☐ $35,000 to $49,999
- ☐ $50,000 to $74,999
- ☐ $75,000 to $99,999
- ☐ $100,000 or more

43) **How many years have you lived on this farm?** .... |__|__|__| years

Thank you for your help.

Please return survey to:

Lois Wright Morton
Department of Sociology
Iowa State University
303 East Hall
Ames, IA 50011-1070

00003014

If you are interested in the results of this survey, please contact:

Chad Ingels
Northeast Iowa Water Quality Project
PO Box 487
Fayette, Iowa 52142-0487
(563) 425-3233

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«QAID14

REFERENCES

Albrecht, Don E. and Steve Murdoch. 2002. “Rural Environments and Agriculture.” Pp. 192-221 in *Handbook of Environmental Sociology* edited by R.E. Dunlap and W. Michelson. Westport, Connecticut: Greenwood Press.

Alexander, Richard B., Richard A. Smith, Gregory E. Schwarz, Elizabeth W. Boyle, Jacqueline V. Nolan and John W. Brakebill. 2008. “Differences in Phosphorus and Nitrogen Delivery to the Gulf of Mexico from the Mississippi River Basin.” *Environmental Science & Technology*. 42:822-830.

Arbuckle, Jr., J. Gordon, Paul Lasley, Pete Korsching and Chris Kast. 2009. *2009 Summary Report: Iowa Farm and Rural Life Poll*. Ames, Iowa: Iowa State University Extension

Buckland, Jerry. 2004. *Ploughing Up the Farm: Neoliberalism, Modern Technology and the State of the World’s Farmers*. New York: Zed Books.

Burke, Peter J. 1991. “Identity Processes and Social Stress.” *American Sociological Review*. 56(6):836–849.

Burke, Peter J. 2004. “Identities and Social Structures: The 2003 Cooley-Mead Award Address.” *Social Psychology Quarterly*. 67(1):5-15.

Burke, Peter J. 2006. “Identity Change.” *Social Psychology Quarterly.* 69(1):81–96.

Burke, Peter J. and Jan E Stets. 2000. “Identity Theory and Social Identity Theory.” *Social Psychology Quarterly*. 63(3):224-237.

Burton, Rob J.F. 2004. “Seeing Through the ‘Good Farmer’s’ Eyes: Towards Developing an Understanding of the Social Symbolic Value of ‘Productivist’ Behaviour.” *Sociologia Ruralis*. 44(2):195-216.

Burton, R.J.F. and G.A. Wilson. 2006. “Injecting social psychology theory into conceptualisations of agricultural agency: towards a ‘post-productivist’ farmer self-identity” *Journal of Rural Studies*. 22(1):95–115.

Clay, Jason. 2004. *World Agriculture and the Environment: A Commodity-by Commodity Guide to Impacts and Practices*. Washington D.C.: Public Island Press.

Copeland, Claudia. 1999. *Clean Water Act: A Summary of the Law*. Washington D.C.: Congressional Research Service.

Deaux, Kay and Anne Reid. 2000. "Contemplating Collectivism" Pp. 172-190 in *Self, Identity and Social Movements* edited by S. Stryker, T.J. Owens and R.W. White. Minneapolis, Minnesota: University of Minnesota Press.

Environmental Protection Agency. 2010a. *Summary of Clean Water Act.* Downloaded on April 28, 2010 from (http://www.epa.gov/lawsregs/laws/cwa.html

Environmental Protection Agency. 2010b. *Clean Water Act Enforcement*. Downloaded on April 28, 2010 from http://www.epa.gov/compliance/civil/cwa/cwaenfstatreq.html#statute

Feagin, Joe R., Anthony M. Orum, and Gideon Sjoberg. 1991. *A case for the case study*. Chapel Hill, North Carolina: University of North Carolina Press.

Gamson, William. 1992. "The Social Psychology of Collective Action." Pp. 53-76 in *Frontiers in Social Movement Theory* edited by A.D. Morris and C.M. Mueller. New Haven, Connecticut: Yale University Press.

Harris, Craig K., and Conner Bailey. 2002. "Public Support for a Clean, Green, U.S Agriculture Machine." Pp. 31-42 in *The Social Risks of Agriculture: Americans Speak Out on Food, Farming and the Environment* edited by R.C. Wimberley, C.K. Harris, J.J. Molnar, and T.J. Tomazic. Westport, Connecticut: Praeger.

Iowa Department of Natural Resources (IDNR). 2002. *Iowa's Final 2002 Impaired Waters List*. Downloaded June 29, 2010 from http://www.igsb.uiowa.edu/wqm/wqa/303d/2002/2002FinalList_EPA%20approved.pdf

Iowa Watershed Improvement Review Board (IWIRB). 2010. *Watershed Improvement Review Board Calendar Year 2009 Annual Report.* Downloaded June 29, 2010 from http://www.iowaagriculture.gov/IWIRB/pdf/2009WIRBAnnualReport.pdf

Kazdin, Alan E. 2011. *Single-case research design: Methods for clinical and applied settings.* New York: Oxford University Press.

McCall, George I. 2006. "Symbolic Interaction." Pp. 1-23 in *Contemporary social psychological theories,* edited by P.J. Burke. Stanford, California: Stanford University Press.

McGuire, Jean and Lois W. Morton. 2009. *Executive Summary of Change over Time in Northeast Iowa Farmer-led Performance-based Environmental Management Watershed Groups.* Unpublished report.

Morton, Lois Wright. 2003."Civic Watershed Communities." Pp. 121-134 in *Walking Towards Justice: Democratization in Rural Life,* edited by M. Bell, F.T. Hendricks, and A. Bacal. New York: JAI.

Morton, Lois Wright and Jean McGuire. 2011. "Getting to Performance-based Outcomes at the Watershed Level" in *The Citizen Effect: Pathways for Getting to Better Water Quality Outcomes* edited by L.W. Morton and S.S. Brown. New York: Springer Press.

National Research Council (NRC). 2010. *Toward Sustainable Agricultural Systems in the 21st Century.* Washington D.C.: National Academies Press.

Natural Resource Conservation Service. 2010a. *Conservation Reserve Program*. Downloaded on May 10, 2010 from http://www.nrcs.usda.gov/programs/crp/

Natural Resource Conservation Service. 2010b. *The Environmental Quality Incentives.* Downloaded on May 10, 2010 from http://www.nrcs.usda.gov/programs/eqip/index.html#intro

Neuman, William L. 2006. *Social research methods: Qualitative and quantitative approaches.* Boston, Massachusetts: Allyn and Bacon.

Porter, Paul, Lori Scott, and Steve Simmons. 2010. "Northern Midwest (U.S.) Farmers' Views of the Conversion Process." Pp. 67-90 in *Conversion to Sustainable*

Agriculture: Principles, Processes and Practices edited by S.R. Gliessman, and M.E. Rosemeyer. Boca Raton, Florida: CRC Press.

Powers, William T. 1973. *Behavior: The Control of Perception*. Chicago, Illinois: Aldine.

Pretty, Jules N. 1995. *Regenerating Agriculture: Policies and Practices for Sustainability and Self-Reliance*. Washington D.C.: John Henry Press.

Reeder, Randall, and Dale Westermann. 2006. “Soil Management Practices” Pp. 3-87 in *Environmental Benefits of Conservation Cropland: The Status of Our* Knowledge edited by M. Schnepf and C. Cox. Ankeny, Iowa: Soil and Water Conservation Society.

Rodecap, John. 2009. *Hewitt Creek Watershed Project – Final Report*. Prepared for and submitted to the Iowa Watershed Improvement Review Board.

Stets, Jan E. 2006a. “Identity Theory.” Pp. 88-110 in *Contemporary Social Psychological Theories,* edited by P.J. Burke. Stanford, California: Stanford University Press.

Stets, Jan E. 2006b. “Identity Theory and Emotions” Pp. 203-223 in *Handbook of the Sociology of Emotions*, edited by J.E. Stets and J.H. Turner. New York: Springer.

Stets, Jan C. and Peter J. Burke. 2000. “Identity Theory and Social Identity Theory.” *Social Psychology Quarterly*. 63(3): 224-237.

Stets, Jan C. and Peter J. Burke. 2003. “A Sociological Approach to Self and Identity.” Pp. 128-152 in *Handbook of Self and Identity,* edited by M.R. Leary and J.P. Tangney. NewYork: The Guilford Press.

Stryker, Sheldon. 1980. *Symbolic Interactionism: A Social Structural Version*. Menlo Park, California: The Benjamin/Cummings Publishing Company.

Stryker, Sheldon. 2000. “Identity Competition: Key to Differential Social Movement Participation?” Pp. 21-40 in *Self, Identity, and Social Movements* edited by S. Stryker, T.J. Owens and R.W. White. Minneapolis, Minnesota; University of Minnesota Press.

Tajfel, Henri. 1972. Social categorization. English manuscript of “La categorisation sociale” in *Introduction a la Psychologie Sociale.* Edited b y S. Moscovici. 1:272-302. Paris: Larousse.

Tsushima, Teresa, and Peter Burke. 1999. “Levels, Agency, and Control in the Parent Identity.” *Social Psychology Quarterly*. 62:173-189.

United States of Department of Agriculture. 2009. *2007 Census of Agriculture.* Downloaded from http://www.agcensus.usda.gov/Publications/2007/Full_Report/usv1.pdf on April 13, 2010.

United States Geological Survey. 2000. *Restoring Life to the Dead Zone: Addressing Gulf Hypoxia, a National Problem.* Fact Sheet 016-00. Lafayette, Louisiana: National Wetlands Research Center.

Wimberley, Ronald C. 2002. “Social, Agricultural and Environmental Interdependence.” Pp. 1-13 in *The Social Risks of Agriculture: Americans Speak Out on Food, Farming and the Environment* edited by R.C. Wimberley, C.K. Harris, J.J. Molnar, and T.J. Tomazic. Westport, Connecticut: Praeger.